

Herbert Spencer's 'Energetic Sociology' of Social Evolution  
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Abstract

Herbert Spencer is usually thought to use a biological metaphor for understanding social-evolutionary processes. Spencer's evolutionary theory is an 'energetic' theory, premised on a particular understanding of physical principles; he applied these 'energetic' principles equally to inorganic, organic and supra-organic (social) evolution. The centrality of energy makes Spencer's theory of social evolution directly relevant in a global society faced with looming energy shortages and the threat of global warming. The omission of non-human energy forms is addressed in the context of its implications for his theory of evolution as a whole, and a corrective proposed.

Keywords:

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It is now a well established tradition that any discussion of Spencer, if it does not begin with Durkheim's famous critique, must commence with Talcott Parsons's rhetorical question 'who now reads Spencer?' The answer to this question remains largely the same as it did in 1937: almost nobody.

In contrast to the rich classical inheritance of sociology in the French or German speaking world, or in the English speaking world, the American contributions of pragmatism and functionalism, British Sociology has sometimes seemed the poor cousin. If we leave aside the English political theorists and the social thinkers of the Scottish Enlightenment, all of whom have lacked substantial influence in sociology *per se*, classical British Sociology's best known representative is Spencer—and Spencer has sometimes been treated as more of an embarrassment than as the British envoy to the pantheon of classical sociologists. In fact, Spencer was abandoned (or better, actively excluded from the British sociological discourse long before he got the cold shoulder elsewhere: Spencer's sociology was seen as antithetical to the ameliorism of all but the advocates of eugenics in early 20<sup>th</sup> Century British Sociology (Abrams 1968).

Here I want to replace the interrogative in Parsons' rhetorical question with a different one: 'why now read Spencer?' Although there a number of reasons for reading Spencer (Battistelli 1993; Turner 1996; Mark 1998; Offer 2004), for my purposes it is Spencer's 'energetic sociology' that makes him once again an important thinker for macro-historical sociology in the 21<sup>st</sup> Century. Since climate change and peak oil have become—for good reason—part of the political agenda, and more slowly the starting point for a sociological problematic (Dennis and Urry 2009; Giddens 2009), a classical

sociological theorist for whom energy is central to social organization, now demands reconsideration.

For the most part, the sociology's 'classical' inheritance has neglected, or perhaps even repressed, the role of energy in society. For Marx, the driving forces of human history are the labour of workers and the struggle over the appropriation of workers labour power. While Marx does discuss the manifold ways that capitalists strive to replace 'live labour with dead', the latter indicating energy intensive technology, in the last instance (to borrow a later Marxian term), value is produced only by human labour (but see Foster 2000). For Durkheim, as for Adam Smith, it is the higher productivity of differentiated human labour that is constitutive of modern society's enormous efficiency. While Weber recognises that the so-called 'iron cage' of modern capitalism will last 'until the day that the last ton of fossil fuel has been consumed' ([1905-6] 2002: 121), for Weber it is primarily the *psychic* energy of the Spirit of Capitalism in social relations that is truly the motive power of modernity. Of course Marx had very good political reasons for his position, and Weber and Durkheim good disciplinary reasons for bracketing out the human use of non-human energy, but the central classics have thereby left the discipline of sociology somewhat bereft of conceptual tools for dealing with modern fossil-fuel civilization; and this is one reason for the rather limited attention sociologists have given to questions of energy and society (Author, 2007).

Sociologists talk a great deal about "power", but when we do, we are almost inevitably talking about *social* power, typically to the exclusion of the concept of power as a synonym for (physical) energy. With the exception of those moments where the exercise of social power entails physical coercion, sociologists inevitably see the social,

rather than physical power as their particular preserve. Nonetheless, behind many of the sociological conceptions of social power lies a metaphor drawn originally from physics. Consider, for example, the broadly Weberian notion of power as the capacity to accomplish some desired end despite resistance. The only difference here between the sociological and the physical lies in the resistance to the desired end and the end itself. For the physicist, the resistance to moving an object might be gravity or friction, the sociologist would consider various forms of social resistance to social movement. In Spencer's sociology, these two forms of power are not nearly so far removed from one another as our discipline has regularly come to assume. Indeed, Spencer's entire sociology is premised on his understanding of physical power, which he refers to simply as energy, or more often, as Force.

Spencer provides a conceptual framework which brings the question of energy to the fore. His work provides a conception of society structured by the logic of energy, and his sociology provides an important starting point for considering the centrality of energy in modern society. Indeed, so important is energy in Spencer's conception of society that it is more accurate to talk about society *as* an energetic system than to discuss the way he conceptualises the relationship between energy and society.

### Why not read Spencer?

Of all the classical sociologists, Spencer is one of the most widely misunderstood; he is certainly one of the most disregarded and ignored of all those who are still considered, in some fashion, part of the sociological canon. Several widely held assumptions about Spencer's sociology need to be put into question before embarking on

an assessment of Spencer's potential contributions to a contemporary 'energetic sociology'. The first of these is the sense that Durkheim's famous critiques, originally levelled against Spencer in *The Division of Labour in Society* ([1897] 1933), constitute a damning indictment. The second concern involves Spencer's supposed Social Darwinism and the ethical/political, as well as theoretical deficiencies that stem from this. Each of these will be addressed briefly below.

It is undoubtedly ironic that Spencer, who saw himself as a great system-builder, extrapolating sociological laws from first principles, would have left behind such a dissonant corpus of texts. Werner Stark long ago observed that there are three contradictory sociologies in Spencer (1961). Likewise, the Spencer scholar Robert Perrin finds in Spencer four different, but again incompatible, theories of social evolution (1976). To say that Spencer's work is multifaceted and contradictory is undoubtedly to criticise his consistency, but it does not mean that his work may not be useful, either in whole, in part, or in reconstruction. It also means, in the case of the Durkheimian, anti-evolutionary, and ethical critiques, that, while there is some truth to many of the criticisms, these cannot address all of the (often contradictory) strands running through Spencer's work as a whole. In this way, one of Spencer's greatest liabilities (lack of consistency) becomes something of an asset. There is a diversity of veins to be mined in his text, and although some have clearly collapsed, but there are rich ones still waiting to be exploited.

The end product of Durkheim's one-sided debate with Spencer has been to make the debate even more lopsided. George Simpson, the translator of Durkheim's *Division of Labour*, expressed the feelings of many subsequent sociologists when he wrote 'there

would seem to be no reason for being interested in Spencer's ideas after Durkheim has finished with them' (Durkheim, 1933: x). Durkheim's critiques address what is, in fact, a fairly limited dimension of Spencer's work, and in fact Durkheim's own arguments are much closer to Spencer than one can easily infer on the basis of Durkheim's texts alone. Durkheim appropriates a great deal of Spencer's theoretical work, and, for the few contemporary scholars who have taken the time to read much of Spencer's sociological writings, it is readily evident that Durkheim's criticisms of Spencer are so fierce because the distinction between them is sometimes, in the scheme of things, relatively small (Corning, 1982; Perrin, 1995)—or at least that it appears to be (Jones, 1974).

Spencer famously argued that social evolution entails the increasing integration of social life, and that 'savages' are less socially integrated than are people in modern society. Society develops from the 'contracts' formed by groups of homogeneous individuals who have shared interests (defence, economic production and exchange, social reproduction), and that as the groups so formed face and overcome shared challenges, they form an increasingly integrated social whole (Spencer, 1885). Durkheim and Spencer agree about the increasing social integration entailed in an increasingly complex division of labour. What they disagree about is the starting point. For Durkheim, 'primitive' society is formed not by a social contract between utilitarian individuals, but that cooperation presupposes a social bond, such as that which he would later describe in *The Elementary Forms of the Religious Life* ([1912] 1995).

Durkheim agrees with Spencer that individuals in a primitive society are more homogenous, but he argues that they are nonetheless also highly integrated with one another. Durkheim constructs the notion of mechanical solidarity to overcome the

deficiency he finds in Spencer's conception of 'primitive' life-- but the subsequent story he tells about the organic solidarity sounds remarkably like Spencer's conception of increasing social integration through the division of labour. In short, Durkheim's primary issue with Spencer's story about social evolution is neither about the process, nor about the description of the inter-relation of parts within a social whole, but about the origins of the process, where we find certain assumptions about human nature (Perrin, 1995).

Whilst Durkheim castigates Spencer for applying modern, individualist and contract-based exchange assumptions to primitive societies, Durkheim knows full well that Spencer's work is as holistic as his own when it comes to comprehending modern society. Spencer's entire sociology is constructed on the basis of a metaphor that compares biological organisms in their evolutionary development with 'supra biological' organisms (societies) in their evolutionary development. In fact, the biological metaphors are much more explicit and emphatic in Spencer than in Durkheim. Nonetheless, Durkheim writes that 'since the social kingdom is no less natural than the animal kingdom [we should not follow Spencer and] present social life as the mere resultant of individual natures alone, since, on the contrary, it is the latter that arises from the former' (Durkheim, 1984: 286). It is quite reasonable to wonder at this point whether Durkheim knows that he is being disingenuous. Although there is certainly a methodological individualist strand in Spencer's thinking (picked up by some Rational Choice Theorists (for a critical discussion, see Zafirovski, 2000)), Spencer is by no means a nominalist about the existence of society. Rather, Spencer explicitly argues that society is much more than simply a name for a group of aggregated individuals. Rather, like a house, it may be made up of individual components (bricks, mortar, wood beams, etc.), but these

individual components all contribute to, and become components of a greater whole, a totality which is more than the sum of its parts (1896: vol. 2, 436). Spencer does not, however, go as far as Durkheim does, however, and argue that the individual “arises from” society. Instead, for Spencer, there is an interaction between the two, whereby individuals and society shape one another—hardly a scandalous or unreasonable view of the matter.

Durkheim’s other major and well known criticism of Spencer is that Spencer’s theory of social evolution is teleological and deterministic. Pointing to one of Spencer’s arguments in *First Principles*, where he argues that simple, homogeneous substances (inorganic, organic and supra-organic) tend to be relatively unstable, and hence evolve more differentiated stability (an argument to which I shall return at some length subsequently), Durkheim objects *piano forte*. On the contrary, Durkheim argues, population pressure provides particular challenges to societies, to which evolutionarily successful societies solve by specialising (1933:266).

Durkheim is quite right to identify a ‘progressive’ teleology in Spencer’s evolutionary thought; especially in Spencer’s earlier work, progress is, or at least appears to be, inevitable. This is particularly clear in the *First Principles* (1897), but a progressive teleology may also be found, even if there are growing reservations about it expressed, in *The Principles of Sociology* (1885). As Robert Perrin demonstrates, however, Durkheim draws his riposte to Spencer from Spencer’s own work! While Spencer does make the argument that Durkheim attributes to him, he also argues (repeatedly) that the challenges of population pressure and scarce resources provide challenges to which social differentiation is often the adaptive solution (Spencer, 1896: vol. 3, part 8; Perrin, 1975:

547; Perrin, 1995). A greater division of labour is more efficient and can therefore provide for a greater population, so the problem of population pressure is one that keeps returning. This does not entirely deal with the problem of teleology in Spencer's 'energetic sociology' from which it is sometimes difficult to untangle. Durkheim's objection, however, points to a problem to be corrected; it is not a reason for ignoring Spencer altogether-- something Durkheim himself certainly did not do.

Although sometimes castigated as a Social Darwinist, most famously by Richard Hofstadter (1955) who coined the term, Spencer is by no means a Darwinian, even if some of his ideas were later picked up by Social Darwinists, with whom some of Spencer's ethical-political thinking bears some affinity. Spencer outlined his first theory of biological evolution in 1857, two years before Darwin published *On the Origin of the Species* (1859). Spencer's theory of evolution differs markedly from that of Darwin: it is more Lamarckian (Gondermann, 2007), accepting the inheritance of developed traits, and, unlike Darwin's theory of evolution, his thinking is much more prone to teleology. As a result, Darwin's growing popularity vis à vis Lamarck had a deleterious impact on Spencer's reputation in his later years. Ironically, however, it has been his purported Social Darwinism that has been the albatross on Spencer's reputation more recently. It is undoubtedly the imputed political implications of Spencer's sociology that has earned him the greatest objection, or better, neglect, from sociologists. Spencer's thinking is far more nuanced than most of his critics have given him credit for; to most contemporary sociologists, much of his political philosophy (his proto-feminist arguments aside) is admittedly unpalatable, in particular, his anti-democratic politics (Francis, 2007: 313-26). While Spencer's overall project may be marred by his political philosophy (which bears

at times some similarities to the dodgier, liberal *ethical* arguments of social Darwinism), this at very least ought not to exclude the possibility that particular aspects of Spencer's analytic thought might not be very useful, and even timely. While I have no interest in defending those problematic dimensions of Spencer's work, that some of his work is marred by ethical tendencies we find abhorrent seems a poor reason for ignoring his richer offerings. Here, I argue that Spencer's energetic sociology makes an important and timely contribution to thinking about the role of energy in society.

### An Energetic Sociology

Spencer's corpus is by no means limited to the discipline of 'sociology' (which was in any case still somewhat nebulously configured); rather, sociology was but one component of his ambitious Philosophy, which was, if it was to qualify as Philosophy, needed to encompass all the major branches of scientific knowledge. As he puts it in his foundational text *First Principles*:

...we cannot be said to have arrived at that unified knowledge constituting Philosophy, until we have seen how existences of all orders do exhibit progressive integration of Matter and concomitant loss of Motion. Tracing, so far as we may by observation and inference, the objects dealt with by the Astronomer and the Geologist, as well as those which Biology, Psychology and Sociology treat of, we have to consider what direct proof there is that the Cosmos, in general and in detail, conforms to this law (1897:317).

Spencer's *System of Synthetic Philosophy*, can be said to begin (analytically at least) with *First Principles*, first published in book form in 1862 (although in serial form it was

begun in 1860), and was revised three times, as he worked on his works on the *Principles* of different subject matter (each also undergoing revision), including *The Principles of Biology* (first edition 1874), *The Principles of Sociology* (first edition 1876), *The Principles of Ethics* (first edition 1879), and *The Principles of Psychology* (1855). Of these, only the *Principles of Psychology* predates the publication of Spencer's foundational philosophy, and, in the Preface to the first edition of *First Principles*, Spencer includes the work on Psychology as an extrapolation of his principles elaborated in *First Principles*. Volume one of the 1892 edition of *The Principles of Psychology* is numbered as volume IX of *A System of Synthetic Philosophy*.

I will not attempt here to disentangle all of the complicated details in Spencer's evolving thought, which is made more convoluted by his iterative process: each work in the series of *Principles* was revised as he worked on subsequent topics. (For readers interested in a sophisticated account of Spencer's intellectual development as a whole, Mark Francis' (2007) intellectual biography is to be heartily recommended). Here, I will outline one dimension of Spencer's sociological thought using the last revision of his *First Principles* (fourth edition, 1897), and the last revision of his *Principles of Sociology* (third edition, 1896). Spencer increasingly diverged from the teleology that is so characteristic of his earlier 'progressive' notions, although they were by no means written out of the later revisions of his major works. When, in fact, we focus on the strand that constitutes his energetic sociology, this aspect of his thinking is by no means free of teleology or energetic determinism.

Spencer is often seen as a biological-evolutionary thinker who extrapolated from biological principles to form his socio-cultural evolutionary theories. This is a significant

misconception. For Spencer, the inorganic, organic and social (or ‘super-organic’, as he tended to call it) share the same evolutionary processes; As such, the universe and planetary-geological evolution, as well as living organisms and societies are all to be understood in terms of the same evolutionary principles. For Spencer these principles of evolution are derived from his understanding of the principles of energy, or, as he usually prefers to call it, Force. While Spencer’s physics and biology do not find many contemporary admirers<sup>1</sup>, I argue that Spencer’s sociological use of ‘energetic’ principles makes a significant, and largely neglected, contribution to sociological thinking.

Spencer derives his biological evolutionary principles from his understanding of energy and physics, and, given his early work as a railway engineer in the 1830s, this is perhaps not very surprising. Thus, while it is often observed that Spencer uses biological metaphors to understand sociological topics, it is not often recognised that behind these biological figures, we find tropes drawn from (19<sup>th</sup> Century) physics. Particularly important in this respect are the first and second laws of thermodynamics: conservation of force, and the tendency towards entropy. Spencer’s understanding of the second law may be somewhat odd, but it is no less central to his project for that. For Spencer, the dissipation of motion leads to increased integration and organization; it is for this reason that evolution is both inevitable and progressive—in the inorganic, organic, and in the social world (and hence Durkheim’s objection).

Thus, for Spencer, organic growth and evolution primarily entail

...the formation of an aggregate, by the continued incorporation of matter

previously spread through a wider space. Merely reminding the reader that every

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<sup>1</sup> Spencer’s contention that entropy is the driving force of biological evolution has found some contemporary advocates, though they are seem unaware of Spencer’s earlier work (Schneider and Sagan 2005).

plant grows by concentrating in itself elements that were before diffused as gasses, and that every animal grows by re-concentrating these elements previously dispersed in surrounding plants and animals; it will be here proper to complete the conception by pointing out that the early history of a plant or animal, still more clearly than its later history, shows us this fundamental process....  
(1897:321)

Thus, in a plant, the dissipation of matter in motion (gasses in the air) is concentrated in plants; animals concentrate matter formerly dispersed in plant life. This 'primary evolution' goes in tandem with what Spencer refers to as 'secondary evolution', the increasingly complex division of labour within the plant, or within the animal: 'along with the formation of a larger mass of matter, there goes on a drawing together and consolidation of the matter into parts, as well as an increasingly intimate combination of parts' (1897:321).

Biological growth and evolution is, however, one instance exemplifying general principles, which apply as much to the formation of planets in the solar system as to the growth of societies. In the summary to *First Principles* (1897), Spencer argues that

The integration of Matter and concomitant dissipation of Motion was traced not in each whole only, but in the parts into which each whole divides. By the aggregate Solar System, as well as by each planet and satellite, progressive concentration has been, and is still being, exemplified. In each organism that general incorporation of dispersed materials which causes growth, is accompanied by local incorporations, forming what we call organs. Every society while it displays the aggregative process by its increasing mass of population, displays it also by

the rise of dense masses in special parts of its area. And in all cases, along with these direct integrations there go the indirect integrations there go the indirect integrations by which parts are made mutually dependent (1897:557).

The increasing *social* concentration (primary evolution) and integration (secondary integration), of course, becomes one of the major themes in Spencer's *Principles of Sociology*. An increase in social mass results in an increased social differentiation:

In Societies, as in living bodies, increase in mass is habitually accompanied by increase of structure. Along with that of integration which is the primary trait of evolution, both exhibit in high degrees the secondary trait, which is differentiation (1896: vol. 2-1: 459).

This was the strand in Spencer's thinking that most enervated Durkheim. Increasing social integration is the result of increasing mass, just as increasing mass in a plant results in a more complicated structure. The sociological principle is derived from a more general principle that applies equally in the inorganic world of planets, and in the organic world of plants and animals. It is, thus, as Durkheim rightly sees, inevitable, even if, in Durkheim's critique, he lays rather more emphasis on the inevitability of secondary evolution (differentiation), than on the fact that it is only inevitable where there is an increasing social mass (primary evolution). The linkage between the two principles brings Spencer and Durkheim rather closer together than Durkheim would want to admit.

Since motion will travel along the lines of least resistance (like water in a river bed), structural change, including increasing social integration, tends to follow the line of least resistance. This principle has significant implications for the way Spencer construes 'natural selection':

It may be well in passing just to note the bearing of the principle on the development of species. From a dynamic point of view, “natural selection” implies structural changes along lines of least resistance. The multiplication of any kind of plant or animal in localities that are favourable to it is a growth where the antagonistic forces are less than elsewhere. And the preservation of varieties that succeed better than their allies in coping with surrounding conditions is the continuance of vital movement in those directions where the obstacles to it are most eluded (1897:244).

Again, these processes apply as much for human societies as it does for planets or plants. Pushed by contending forces, and needing to expend energy in order to survive, the population of social groups, like plants or populations of animals, follow the path of least resistance, this path being determined by the ‘composition of forces’ that make up the immediate environment. Note that we find here Spencer’s explanation of ‘natural selection’ without any reference to the ‘survival of the fittest’; instead, ‘natural selection’ is about the way that any organism adapts to its environment. Such an argument, Spencer argues, applies as much to the social ‘supra-organism’ as it would to a biological organism:

Thus, when we contemplate a society as an organism, and observe the direction of its growth, we find this direction to be that in which the average of opposing forces is the least. Its units have energies to be expended in self-maintenance and reproduction. These energies are met by the various environing energies that are antagonistic to them—those of geological origin, those of climate, of wild

animals, of other human races with whom they are at enmity or in competition. And the tracts the society spreads over are those in which there is the smallest total antagonism. Or, reducing the matter to its ultimate terms, we may say that these social units have jointly and severally to preserve themselves and their offspring from those inorganic and organic forces which are ever tending to destroy them...; that these forces are either counteracted by others which are available in the shape of food, clothing, habitations and appliances of defence...; and that population spreads in whichever directions there is the readiest escape from these forces, or at least exertion in obtaining the materials for resisting them, or both (1897:249).

The forces of the environment do not just provide barriers to movement, and paths of least resistance which shape human population flow, but societies also use other forces (in short, culture) to counteract the forces which threaten population, using them in order to survive and reproduce themselves.

Spencer (like Hobbes, St. Simon, Comte, and Durkheim) uses a biological metaphor, the social body, a image which has often been criticised (Levine 1995). In using this metaphor, however, pushes Spencer (unlike Durkheim) to emphasise the embodied, material needs of social groups; in this, he is really only matched by Marx among the classical tradition. Spencer pushes the metaphor further, arguing that this social body maintains itself, just as a physical body would, by appropriating from the earth: food, clothing, warmth and shelter and so forth. Pursuing the metaphor further, he argues that the lowest stratum of society functions as the 'alimentary system', collecting and 'digesting' raw materials from the earth. This is the site of primary production. The

merchants, who buy, sell and trade, move the necessities of life from where they are produced to where they are needed constitute the society's 'vascular system'. Trade follows particular 'arteries', moving life's necessities from the alimentary system to the other parts of the body where its nutrients may be used. Finally, the organs of the state provide the coordinating functions of the body's 'central nervous system' (1896: vol. 2-1, 481). While this powerful image of the social body is problematic in certain respects (a point to which I shall return), it firmly grounds social organization in the biological needs (food, clothing, shelter, warmth) of the individuals that constitute the social body.

Spencer's social body is one that grows and evolve; in his account the ways in which it does stems from the principle of least resistance. In fact, Spencer's account of the division of labour is construed in precisely these terms, as an example of this principle. The practice of barter begins

...as soon as it facilitates the fulfilment of men's desires, by diminishing the exertion needed to reach the objects of those desires. When, instead of growing his own corn, weaving his own cloth, sewing his own shoes, each man (sic) began to confine himself to farming, or weaving, or shoemaking; it was because each found it more laborious to make everything that he wanted, than to make a great quantity of one thing and barter the surplus for the rest: by exchange, each procured the necessaries of life without encountering so much resistance (1897:251).

Spencer, unlike many of his contemporaries is quite conscious of the fact that the division of labour is gendered (cf. 1896: vol. 3, 354), something which is not readily apparent here. As previously discussed, he is also explicit that in order for such a division of

labour to begin to develop, a certain critical mass is necessary, from which point, increases in mass (primary evolution) lead to increases in differentiation (1896: vol. 2-1, 459). The way this division of labour develops and its basic structure, springs from the principle of least resistance. Among other things, this explains the regional variation in production. If something desirable or necessary takes less energy to make it locally than to buy and transport it, then trade will not occur:

So long as the forces to be overcome in procuring any necessary of life in the district where it is consumed are less than the forces to be overcome in procuring it from an adjacent district, exchange does not take place. But when the adjacent district produces it with an economy that is not out-balanced by the cost of transit—when the distance is so small and the route so easy that the labour of conveyance plus the labour of production is less than the labour of the production in the consuming district, transfer commences (1897:252).

The logic of a division of labour is the same when exchange presupposes money, which embodies the relative efforts to produce any given product (1896: vol 3, 354). Trade, the circulatory system of society, thus tends to follow routes of least resistance as well, and as these are developed, arteries of trade form along which more trade will be conducted. The initial paths of trade become more established, and these established routes typically become well entrenched and easier to travel.

Movement in the direction of least resistance is also seen in the establishment of the channels along which intercourse takes place. At the outset, when goods are carried on the backs of men and horses, the paths chosen are those which combine shortness with levelness and freedom from obstacles—those achieved with the

smallest exertion. And in the subsequent formation of each highway, the course taken is that which deviates horizontally from a straight line so far only as is needful to avoid vertical deviations entailing created labour in draught. The smallest total of obstructive forces determines the route, even in seemingly exceptional cases; as where a detour is made to avoid the opposition of a land-owner. All subsequent improvements, ending in macadamized roads, canals and railways, which reduce the antagonism of friction and gravity to a minimum, exemplify the same truth. After there comes to be a choice of roads between one point and another, we still see that the road chosen is that along which the cost of transit is the least: cost being the measure of resistance. Even where, time being a consideration, the more expensive route is followed, it is so because the loss of time involves loss of force (1897: 252).

Perhaps because of his experience as a younger man as a railway engineer building in land transportation, Spencer is not as sensitive to the role of transportation by water. Indeed he seems to neglect the role of rivers and oceans as “the main arteries of trade” (Albert, 1972:7). This was the cheapest means of transportation, particularly for heavy or bulky goods. Indeed, the development of the English turnpike system emerges because of various obstacles to river and ocean transport (which do ‘indeed reduce the antagonism of friction and gravity to a minimum’). These obstacles included piracy and war on the open ocean (especially in the 17<sup>th</sup> and early 18<sup>th</sup> centuries) and the limited navigability of many rivers, as well as the limited natural geographical scope of the river systems (before the introduction of canal systems), and subject to seasonal variation. Furthermore, as Albert observes, contrary to Spencer’s claim that the use of a route always improves its use,

many waterways and harbours became clogged with ballast dumped from ships, as well as the increasing use of rivers for powering mills (Albert, 1972). Such corrections to Spencer's argument, however, do not force an alteration of his basic point, as the development of road transport systems (excluding the Roman roads) begins in full force precisely because of obstacles to water transport.

Production (alimentation), no less than trade (circulation) in Spencer's estimation follows the basic principle of least resistance, not just in the division of labour, but also in the formation of industrial production centres. 'Artisans,' he explains 'flock to places where resistance is least (highest wages, facilities for production), and capital flows into businesses yielding the highest returns' (1897: 252-3). Although he undoubtedly underestimates the significance of social 'friction' to such movement (to which I shall return subsequently), Spencer does acknowledge that it does not necessarily entail a smooth flow of people:

When, in any region, there has taken place that adaptation of nature which the appropriate occupation produces, there is resistance to alteration of function; as, for example, there would be if the body of Lancashire weavers had to become coal-miners. Even a change in the topical division of labour, such as migration of most of the woollen manufacture from Gloucestershire to Yorkshire, illustrates the same influence; since, by the proximity to a wool-importing place, and by the presence of abundant coal, serving as a better source of power than water, the resistance to the production of cloth as measured in cost of freight, labour, and fuel (severally presenting so much human effort) is less than it was in the original seat of the industry (1896: vol 3, 354).

## The evolution of Human Energy Use

Talcott Parsons observes that the ability to identify key long term historical trends is essential for any theory of social evolution (1977). For all of Spencer's attention to society as an energetic system, shaped by the energy requirements for the flow of goods and people along paths of least resistance, Spencer seems to have largely missed a major secular trend, or at least failed to see its significance for his larger sociological project. Spencer lived through a period characterised by a massive explosion in the human use of non-human energy—the age of coal and steam. But this massive increase in non-human energy use was itself the culmination of a very long-term trend, arguably stretching back to the beginnings of human social evolution (Crosby, 2006; Odum, 2007; Smil, 2008; Burke, 2009).

In the course of social evolution, societies have added ever greater sources of power to their capacities for accomplishing tasks—harnessing the power of fire (Goudsblom, 1987; Rehder, 2000), animals (Schweber, 1994; Kelekna, 2009), moving water (White, 1962; Reynolds, 1983), and wind—both for mechanical tasks (Hills, 1994) and for transporting persons and goods (Block, 2003). The development of fossil-fuelled energy use built on this long trajectory of increasing use of non-human energy, but added enormously to the range of mechanical and transportation tasks that could be accomplished, and perhaps most importantly, the speed in which they could be accomplished (Schivelbusch, 1980; Bruland, 2004). Looked at over the *longue durée*, developments in societies' energy use has been thoroughly intertwined with the process of human social evolution—some would even say human biological evolution

(Wrangham and Conclin-Brittain, 2002)—such that the social evolutionary processes Spencer discusses are scarcely imaginable without them.

Spencer does chart this trajectory, but only briefly, and in the very broadest brush strokes. ‘Human progress’, he explains, ‘is measured by the degree in which simple acquisition is replaced by production; achieved first by manual power, then by animal power, and finally by machine power’ (1896: vol. 3, 356). Unfortunately, Spencer does not develop this trajectory from manual power to animal power to machine power, or elaborate its implications for his energetic theory of energetic social evolution. The ability of societies to use new prime-movers, beyond simple muscle power, is by no means incidental to the questions Spencer raises about the shape of social organization as it follows the lines of least resistance.

Spencer’s argued that societies use a variety of resources to counteract the forces that threaten to destroy them (cold, famine, thirst, hostile animals and other societies), and to adapt successfully and flourish in their environments. The various new prime movers that human societies have added to their repertoires of available resources can be understood in the same way—as nourishment absorbed by the social body’s alimentary system, just like food to the human body.

The basic social processes of production (alimentation) and distribution (circulation) do not depend on human energy expenditure alone; rather, human societies have, since pre-history, used non-human energy forms in order to accomplish the basic task of meeting social needs. The increasing social concentration, differentiation and integration that Spencer (and Durkheim) identified as fundamental traits of social organisation and evolution depend on such energy uses.

Much of the increasing integration and differentiation Spencer discusses has been accomplished by means of humans using non-human energy forms as prime-movers for accomplishing things that their own muscles would have found inefficient or even impossible. By means of animals and wind, and later steam power and the internal combustion engine, ever greater areas have been connected into growing webs of specialisation and integration. Trade may well follow the path of least resistance, but where that path flows, and how far and how fast it may be traveled, depends in significant measure on the means by which it is travelled, and how that journey is powered. Resistance is relative to the means and the efficiency with which one may overcome it.

Spencer discusses the growing interdependence of different regions, each with particular economic specialisations. Such geographically dispersed economic integration depends on long distance trade, and relative difference between the energy expenditure of making something locally, and that of importing it. When the energy expended to import it is much less than that of making it locally, Spencer argues, it is more likely to be imported—that is the principle of least resistance. What Spencer seems to have had in mind, however, was the human energy expended in the effort of carrying goods.

The balances change quite dramatically, however, when animals can be used to carry goods, or to pull them in a wagon, over long inland routes. Moreover, the transport of goods (even relatively bulky goods) over water and propelled by wind power made for the feasible economic integration of regions much further apart. Without the development and use of sailing vessels that could cross the Atlantic, the integration of the ‘old’ and ‘new’ worlds would simply have been impossible. One cannot row across the Atlantic

Ocean<sup>2</sup>. One simply cannot carry food and water for the number of rowers necessary for the journey, without adding more rowers, which of course increases the requirements for food and water. Wind power was a necessary (though not sufficient) requirement of the Columbian Exchange (Crosby 2006), at least during an interglacial period.

Until the rise of steam-powered locomotive systems, integration of areas separated by long distances of water was much easier than between relatively short distances over land. Canals have a long history, stretching back a millennium in China, and were dug to enable inland areas to become integrated into the systems of natural waterways. Before the beginning of the railroad age, canal construction underwent an enormous boom, because, as Hobsbawm describes it, ‘to be within reach of a port was to be within reach of the world: in a real sense, London was closer to Plymouth or Leith than to villages in the Breckland of Norfolk...’ (1977:22). With steam-powered ships, of course, distances over water likewise began to shrink dramatically (Cohn, 2005).

The primary point is that the growing social integration of larger populations over larger distances was, as Spencer would argue, organised by the logic of energy and different levels of energy that encourages such integration. But the ever larger areas of social and economic integration have been heavily dependent on increasingly energy intensive means of transport. The truly global market that has emerged over the course of the twentieth century, has emerged on the back of even more energy intensive (and also more energy efficient) systems of transportation powered not just by coal and steam, but subsequently also by petroleum and the internal combustion engine (Author, 2007).

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<sup>2</sup> The Atlantic has in fact been crossed using muscle power on a number of occasions since the late 19<sup>th</sup> century, but only in small boats unsuitable for exploration or trade.

If society's circulatory systems have been expanded and re-organised by the increasingly intensive use of forms of non-human energy use, so has the social body's alimentary system. The growing specialisation of industry presupposes that it is possible to grow food without all available hands needing to be put to use tilling, sowing and harvesting. And much of such agricultural efficiency has been derived from putting non-human energy to use. First there were draft-horses and ploughs; later, there were tractors running on diesel fuel. This fossil-fuelled farming has also entailed the development of a vast array of specialised, mechanically operated set of tools (for sowing, harvesting, processing, not to mention shipping and storing).

Likewise, wind and water mills initially took over work from horses or humans turning grindstones, but eventually they began to take on a variety of different manufacturing uses: sawing timber, operating bellows, pressing oil, operating pumps, spinning yarn, weaving, and so forth. The list of tasks that could be accomplished mechanically grew, as did the efficiency of these processes. The early factories of the industrial revolution were predominantly powered by water, and enabled the manufacture of goods that could not be produced using human power alone, or vastly increased the output of human labour power (Reynolds, 1983; Langdon, 2006). Such energy sources were eventually supplemented by coal-fired steam engines, but these built onto a pre-existing system, and continued to play a relatively small role in manufacturing until the 1870s, even in Britain (Crafts and Mills 2002).

## Conclusion

Herbert Spencer brings the question of energy to the forefront of sociological theory by conceiving society as an energetic system: trade and production, Spencer argues, are shaped by the necessary energy expenditures and the flow of goods and people along paths of least resistance. As such, energy is not something secondary to social organization, but its vital Force in its struggle to survive and thrive. Spencer's theory of social evolution would have been even stronger, however, had he taken adequate account of the way that increasing social integration and differentiation, the two most basic components of social evolution, have been energy dependent in a second sense. Human societies, as they have become increasingly differentiated and integrated, they have likewise become increasingly dependent on non-human forms of energy. The continued trajectory of human energy use need not be taken as inevitable (Podobnik 2006; Author 2007), but the historical course of increasing energy use does suggest that considerable effort and ingenuity will be necessary in order to alter this path of least resistance.

Even though Spencer does not develop the implications of non-human energy use, his sociological theory, placing energy at its very core, brings us closer to the fundamental reconsideration of social evolution that such an energetic sociology requires. With the possible exception of Patrick Geddes, who is finally beginning to receive much needed attention, along with the way his theories are developed by Lewis Mumford (Studholme 2008; Renwick and Gunn 2008), Spencer is arguably the most important classical resource for exploring the roles of energy in society and social evolution. Given

the challenges that lie ahead for an energy-intensive and energy-dependent global society; the time for reconsideration of his 'energetic sociology' is certainly at hand.

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