

Alfred Marshall's annotations on Herbert Spencer's Principles of Biology *

John Laurent

Griffith University

A number of authors have discussed the importance of biological analogy and evolutionary theory in Alfred Marshall's economics (see, e.g., Thomas, Niman, Foss, 1991; Hodgson, 1993, 1995; Nightingale, 1993; Schabas, Limoges and Menard, 1994; Groenewegen, 1995), and this is easily verified from an examination of Marshall's writing. In chapter VIII of the fourth (1898) edition of *Principles of Economics*, for example, Marshall writes as follows:

Before Adam Smith's [*Wealth of Nations*] had yet found many readers, biologists were already beginning to make great advances towards understanding the real nature of the differences in organization which separate the higher from the lower animals; and before two more generations had elapsed, Malthus' historical account of man's struggle for existence started Darwin on that inquiry as to the effects of the struggle for existence in the animal and vegetable world, which issued in his discovery of the selective influence constantly played by it. Since that time biology has more than repaid her debt; and economists in their turn owed much to the many profound analogies which have been discovered between social and especially industrial organization on the one side and the physical organization of the higher animals on the other (Marshall, 1898, pp.319-20).

Elsewhere in this edition of the *Principles* Marshall says that a large part of his book (chapters II-VI) is intended to "emphasize the notion that economics is a science of life, and is akin to biology rather than mechanics" (p.9), and again, on p.101, he describes the difference between his approach to economics from that of Ricardo as a difference between "the uses of mechanical and of biological analogies." Many commentators have taken what Marshall seems to be saying at face value here. They have assumed that when Marshall talks about biology he means *Darwinian* biology (as one would judge from the indented quote). However, even from a reading of what Marshall says after the mention of Darwin's name in the quote above, one already meets with some problems for such an interpretation. Where Marshall talks about the "many profound analogies" that had allegedly been found between "social and industrial organization" on the one hand, and the "physical organization of the higher animals" on the other, he is going beyond anything that Darwin wrote. Darwin does not make any such comparison in any of his books.

The closest he comes to it (and I suppose it must be the passage that Marshall has in mind) is where he writes the following, in a section on 'Divergence of character' in *The Origin of Species*:

The advantage of diversification of structure in the inhabitants of the same region is, in fact, the same as that of the physiological division of labour in the organs of the same body - a subject so well elucidated by [Henri] Milne Edwards. No physiologist doubts that a stomach adapted to digest

vegetable matter alone, or flesh alone, draws most nutrient from these substances. So in the general economy of any land, the more widely and perfectly the animals and plants are diversified for different habits of life, so will a greater number of individuals be capable of their supporting themselves. A set of animals, with their organisation but little diversified, could hardly compete with a set more perfectly diversified in structure (Darwin, n.d., p.86).

As can be seen, nowhere does Darwin make any reference to "social and industrial organization": his analogy is drawn between the "division of labour" as applied to the organs of a single organism on the other hand, and the "animals and plants...diversified for different habits of life" in the "general economy of any land" on the other. Darwin certainly has nothing remotely related to what Marshall goes on to say immediately following the above indented quote, viz:

In a few cases indeed the apparent analogies disappeared on closer inquiry: but many of those which seemed at first sight most fanciful, have gradually been supplemented by others, and have at last established their claim to illustrate a fundamental unity of action between the laws of nature in the physical and in the moral world. This central unity is set forth in the general rule, to which there are not many exceptions, that the development of the organism, whether social or physical, involves an increasing sub-division of functions between the separate parts on the one hand, and on the other a more intimate connection between them. Each part gets to be less and less self-sufficient, to depend for its well being more and more on other parts, so that any disorder in any part of a highly developed organism will affect other parts also (Marshall, 1898, p.320).

That what Marshall is saying here is not in Darwin is in any case suggested by Marshall in a footnote at the bottom of the page on which these just quoted and which refers to the German biologists Haeckel (Haeckel) and Schäffle and the economists Bagehot and Hearn, "*Besides the writings of Herbert Spencer on this subject*" (emphasis added), but not to Darwin. It is true that on the next couple of pages of *Principles of Economics* Marshall says things like "The law of 'survival of the fittest' states that those organisms tend to survive which are best fitted to utilize the environment for their own purposes", and "[T]he struggle for existence causes in the long run those races of men to survive in which the individual is most willing to sacrifice himself for the benefit of those around him, and which are consequently the best adapted collectively to make use of their environment" (Marshall, 1898, pp.321, 322), which accurately enough reflect the content of *The Origin of Species* and the *Descent of Man* (see below) respectively (although 'survival of the fittest' is Herbert Spencer's phrase, not Darwin's). But on the whole, Marshall's 'evolutionary' economics as contained in the *Principles*, as Thomas (1991), Hodgson (1993a) and Nightingale (1993) have shown, much more closely resembles Herbert Spencer's evolutionary theorizing than

Darwin's, and this has important implications for economic thought in so far as Spencer's largely philosophical, deductive conception of evolution no longer carries any scientific standing.^[1]

In fact, it is quite possible that Marshall mainly obtained his knowledge of Darwin's ideas secondhand from two of the other authors mentioned in his footnote, W.E. Hearn and Walter Bagehot, whose *Plutology* and *Physics and Politics* respectively are among Marshall's books bequeathed to the University of Cambridge on his death in 1924 and now housed in the Marshall

Library. This possibility is strengthened by the fact that while Marshall has marked passages and annotations in both *Plutology* and *Physics and Politics*, he has no such markings in his copies of *The Origin of Species* and *The Descent of Man* (which are now housed in the Cambridge University Library).

But manifestly of much more importance to Marshall than any of these books were the writings of Herbert Spencer. There are thirteen titles by Spencer amongst Marshall's books in the Marshall Library, a number of which have been heavily annotated and marked by Marshall. Spencer's influence is in any case plain from any examination of *Principles of Economics*. To refer again to the first of the indented quotes above: Marshall writes of the "organism", it was seen, whether "social or physical", and in which "development" (the original word used for evolution - see, e.g., Kingsley, 1889, p.150) results in "an increasing subdivision of functions between the separate parts on the one hand and on the other a more intimate connection between them." And as I've indicated, such accounts have nothing to do with Darwin. Other instances in *Principles of Economics* of Marshall's calling upon Darwin's name in putting forward Spencerian-style arguments can be cited.

In the second indented quote above, Marshall, having shortly before mentioned Darwin, spoke of "integration", or the "growing intimacy and firmness of the connections between the separate parts of the industrial organism"; and on pages 119-20 he cites Darwin as having demonstrated (*Origin*, ch.14) that "those parts of the structure which determine the habits of life and the general place of each being in the economy of nature are as a rule not those which throw most light on its origin" in making a case that "in like manner those properties of an economic institution which play the most important part in fitting it for the work which it has to do now, are for that very reason likely to be in great measure of recent growth." As with Spencer, Marshall's argument is based on pure *analogy*. It does not follow *logically* from what Darwin said, nor is there any obvious connection between the phenomena described by Darwin and the situation referred to by Marshall.

Marshall's debt to Spencer rather than to Darwin is confirmed by an examination of Spencer's books. As some of the above quotes indicate, Spencer's conception of human society is that of a biological organism (Spencer sometimes says "super-organism"). In *First Principles*, for

example, under the heading 'The Law of Evolution', Spencer (1867, pp.316-7) writes as follows:

[I]n the social organism integrative changes are abundantly exemplified...A civilised society is made unlike a savage tribe by the establishment of regulative classes - governmental, administrative, military, ecclesiastical, legal, etc., which...are held together as a general class by a certain community or privileges, of blood, of education, of intercourse...The integrations seen throughout the operative or industrial organization, later in origin, [are] consequent on the growths of adjacent parts performing like functions, as, for instance, the junction of Manchester with its calico-weaving suburbs.

Spencer's references to "civilised society" versus a "savage tribe" are in keeping with the Social Darwinism that has been associated with his name, but it is Spencer's organic analogy that we are interested in here. Spencer uses this language in a specifically *economic* context in this passage, so it is not surprising that Marshall felt able to use it similarly. And direct evidence that it was from Spencer that Marshall gained this idiom can be found in Marshall's copy of *First Principles*, where Marshall has marked the following passage (which occurs a few pages after the last quote):

The successive phases through which societies pass, very eloquently display the progress from indeterminate arrangement to determinate arrangement. A wandering tribe of savages, neither fixed in its locality nor in its internal distribution, is far less definite in the relative positions of its parts than a nation. In such a tribe the social relations are similarly confused and unsettled. Political authority is neither well established nor precise. Distinctions of rank are neither clearly marked nor impassable. And save in the different occupations of men and women, there are no complete industrial divisions. Only in tribes, is the economical differentiation decided (Spencer, 1867, p.373).

Thus Spencer traces the 'evolution' of human society from a "wandering tribe of savages" to larger groups of people in which "economical differentiation" has taken place. And Marshall's interest in Spencer's concept is confirmed by his marking of this passage. Of course Marshall's interest in Spencer is fairly well known, but few people (with the notable exception of Thomas [1991] and Hodgson [1993a]) have looked at precisely *what* in Spencer's writing interested Marshall and how this may have influenced Marshall's biological analogy. Other marked passages in Marshall's copies of Spencer's books provide additional insights into this interest. Thus, in his copy of the first volume of Spencer's *Essays: Scientific, Political and Speculative*, in chapter 10 - 'The Social Organism' - the most extensively marked and annotated chapter in the book - Marshall has marginally scored the following paragraph:

Another fact which should not be passed over is that in the evolution of a large society out of an aggregation of small ones, there is a gradual obliteration of the original lines of separation - a change to which, also, we may see analogies in living bodies. Throughout the sub-kingdom *Annulosa*, this is clearly and variously illustrated. Among the lower types of this sub-kingdom, the body consists of numerous segments that are alike in nearly every particular. Each has its external ring; its pair of legs, if the creature has legs; its equal portion of intestines, or else

its separate stomach; its equal portion of the great blood-vessel, or, in some cases, its separate heart; its equal portion of the nervous cord, and, perhaps, its separate pair of ganglia. But in the higher types, as in the large *Crustacea*, many of the segments are completely fused together; and the internal organs are no longer uniformly repeated in all the segments. Now the segments of which nations at first consist, lose their separate external and internal structures in a similar manner. In feudal times, the minor communities governed by feudal lords, were severally organised in the same rude way; and were held together only by the fealty of their respective rulers to some suzerain. But along with the growth of a central power, the demarcations of these local communities disappeared; and their separate organisations merged into the general organisation

(Spencer, 1868, pp.408-9).

The limitations of Spencer's method are manifest in this passage. As he says, we may draw *analogies* between "living bodies" and societies, yet he quickly loses sight of what he is doing. The slide from what is clearly a literary device for describing loose collections of people to talking about "communities governed by feudal lords...organised in the *same...way*" easily escapes the reader's notice. Nevertheless, one would have thought that Marshall would have been aware of what Spencer's use of this language is meant to convey, and that he would not have taken him too literally. However Marshall's next pencilling-in in his copy of *Essays: Scientific, Political and Speculative* does not inspire much confidence that this was so. The passage concerned - two pages further on - reads as follows:

One more parallelism to be noted, is, that the different parts of the social organism, like the different parts of an individual organism, compete for nourishment; and severally obtain more or less of it according as they are discharging more or less duty. If a man's brain be over-excited, it will abstract blood from his viscera and stop digestion; or digestion actively going on, will so affect the circulation through the brain as to cause drowsiness; or great muscular exertion will determine such a quantity of blood to the limbs as to arrest digestion or cerebral action, as the case may be. So, *likewise* [emphasis added], in a society, it frequently happens that great activity in some one direction causes partial arrest of activity elsewhere, by abstracting capital, that is, commodities: as instance the way in which the sudden development of our railway-system hampered commercial operations; or the way in which the raising of a large military force temporarily stops the growth of leading industries (Spencer, 1869, p.411).

At the side of this paragraph Marshall has written: "Capital and blood have strong analogies. See further [below?]" - which would appear to refer to the following passage (p.414) as well, similarly marginally scored by Marshall:

An increase in the number of unlike organs which add to the blood their waste matter, and demand from it the different materials they severally need, implies a blood more heterogeneous in composition - an *à priori*

conclusion which, according to Dr. [?] Williams, is inductively confirmed by examination of the blood throughout the various grades of the animal kingdom. And *similarly* [ditto], it is manifest that as fast as the division of labour among the classes of a community becomes greater, there must be an increasing heterogeneity in the currents of merchandise flowing throughout that community.

So it is easy to see where Marshall got his biological analogy from, and how he was able to express the opinion that "economists have...owed much to the profound analogies which have been discovered between social and especially industrial organization on the one side and the physical organization of the higher animals on the other." And in this, I would suggest, Marshall can be seen to be at least partly responsible for a largely spurious line of thinking in economics which has plagued the subject to this day in its efforts to be more 'scientific' in its theoretical underpinnings. I refer to the claim that economics is based on 'Darwinian' principles, and is an

'evolutionary' social science - a claim currently enjoying something of a renaissance in so-called 'evolutionary economics'. As argued here, and as Hodgson (1993a, p.410) has shown, Marshall's 'evolutionism' owes much more to Spencer than to Darwin, which in turn means that Marshall's economics looks more to *Lamarck*, whose theory of inheritance of acquired characteristics, now fairly well universally rejected by biologists^[ii], was accepted by Spencer and in fact formed a major plank of his theory of social evolution. That Marshall apparently subscribed to Spencer's Lamarckism is clear from some further marked passages in his copies of Spencer's books, such as this one in *Principles of Biology*:

The direct inheritance of an acquired peculiarity is sometimes observable. Mr. [George Henry] Lewes gives a case. He 'had a puppy taken from its mother at six weeks old, who, although never taught, spontaneously took to begging for everything he wanted when about seven or eight months old: he would beg for food, beg to be let out of the room, and one day was found opposite a rabbit hutch begging for rabbits'" (Spencer, 1865, p.247).

Whatever the explanation for Spencer's remarkable story, it evidently impressed Marshall, as is witnessed by his further marking of another purported case of inheritance of acquired characteristics in *Principles of Biology*, this time allegedly citing *Darwin* in support:

Mr Darwin says: - 'Petrels are the most aerial and oceanic of birds, but in the quiet sounds of Tiera del Fuego, the *Puffinuria berardi*, in its general habits, in its astonishing power of diving, its manner of swimming, and of flying when unwillingly it takes flight, would be mistaken by anyone for an auk or a grebe; nevertheless, it is essentially a petrel, but with many parts of its organisation profoundly modified.' Now if we suppose these grebe-like habits to be continued through a long epoch, the petrel form to be still more obscured, and the approximation to the grebe - form still closer; it is manifest that while the chicks of the grebe and the *Puffinuria* will, during their early stages of development, display that likeness involved by their common deviations, representative of the ancestral petrel-structure, and will afterwards begin to lose these distinctions and assume the grebe structure (Spencer, 1865, p.368).

In the margin beside this passage Marshall has written: *Analogies to this may be seen in the growth of mental, moral, social and political conceptions, methods, and habits both in the race and the individual* (my emphasis). Whatever Darwin meant by the term "modified" in Spencer's citation from *The Origin of Species* (see footnote 3), Marshall has clearly accepted Spencer's Lamarckian version of *biological* evolution here and, as he has noted, sees analogies between this and "moral, social and political" (under which he surely includes economic) evolution

("growth"). Marshall, then, in this instance, is arguing at a level two steps removed from Darwin: He is (1) accepting Spencer's Lamarckian interpretation of Darwin in this instance^[iii], and then (2) moving on to his *own* application of this interpretation in the social (economic) sphere. While there is no evidence that Marshall read Lamarck directly, there would seem to be no question that he strongly subscribed to a Lamarckian rather than a Darwinian view of evolution (see Groenewegen, 1995, pp.483-5 - who points out that it was only reluctantly and gradually, over the last four editions, that Marshall removed a Lamarckian example of evolution concerning increased

webbing between the toes of aquatic birds "from the inherited effects of use" in the mathematical appendix of the *Principles*^[iv], and that he learnt this from Spencer.

But 'evolutionary' economics does not *have* to follow Spencer via Marshall. Other important economics thinkers have been able to take an evolutionary approach to their subject, and one closer to Darwin's understanding - that understanding most universally accepted by biologists since the formulation of the 'neo-Darwinian synthesis' (incorporating Mendellian insights) of the 1930s and '40s.^[v] An obvious figure in this connection is Thorstein Veblen. Rather than content himself with Spencer's view, which was that human social evolution depended upon the organic modification of individual human beings through Lamarckian use and disuse principles, Veblen accepted *Darwin's* theory, as argued in *The Descent of Man* (there is nothing about human evolution in *The Origin of Species*^[vi]), i.e., that social evolution is essentially a *group* process, involving selection of groups of cooperating individuals - such as could be found to operate at the level of economic institutions (see Hodgson, 1993. 1998).

Curiously though, Marshall, as indicated earlier, was also at least *aware* of Darwin's argument here, as where he referred to the struggle for existence allowing "those races of men to survive in which the individual is most consequently the best adapted collectively to make use of their environment." This certainly is Darwin's argument in *Descent of Man*. As Darwin says in that book, "[e]very one will admit that man is a social being", and this is probably the evolutionary result of the fact that "those...social animals...which stand high in the scale [of nature] are largely guided by special instincts in the aid which they give to the members of the same community", and "individuals which took the greatest pleasure in society would best escape various dangers, while those that cared least for their comrades, and lived solitary, would perish in greater numbers" (Darwin, n.d. pp.478, 480-1). And it may well be that as Marshall got older his youthful infatuation with Spencer was replaced with an increasing recognition of Darwin's importance for an understanding of the human condition. In the fourth (and final) edition of *Industry and Trade*, for instance, while Spencer's name does not appear in the Index, there are two pages listed there devoted to "Darwin's law of the survival of the fittest", in which Marshall writes things like: "[A]lmost every increase in power, which any race of men has acquired, can be traced to some social qualities which have enabled that race to overcome the difficulties that lie in the way of obtaining the necessaries and comforts of life; or to overcome its human enemies, or both...[T]hose institutions tend to survive which have the greatest faculty for utilizing the environment in developing their own strength" (Marshall, 1923, p.176).

But as also indicated above, it is not clear whether Marshall obtained his knowledge of Darwin's ideas directly, or secondhand from such works as Walter Bagehot's *Physics and Politics*. And while he has not marked the passage concerned in his copy of the book, these lines in *First Principles* are *also* obviously, and surprisingly, very close to Darwin's concept: "Under the head of organic integrations, there remain to be noted some which do not occur within the limits of one organism...There are the integrations by which organisms are made dependant on one another...More or less of the gregarious tendency is general in animals; and when it is marked, there is, in addition to simple aggregation, a certain degree of combination. Creatures that hunt

in packs, or that have sentinels, or that are governed by leaders, form bodies partially united by cooperation" (Spencer, 1867, p.401). What is particularly interesting about Spencer's words here is that they were written at least four years before *The Descent of Man*. Yet it was Spencer's naive organicism and Lamarckism rather than his prescient Darwinism that most clearly influenced Marshall's major work, *Principles of Economics*. That the just quoted lines are only a small part of *First Principles* may be part of the answer as to how this came to be (and as he hasn't marked them, we can't even be sure that Marshall read them). Undoubtedly there were other factors at work, including Marshall's intellectual background and his *receptiveness* towards organicist views - but this must be the topic of another article.

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* School of Science, Griffith University, Queensland Australia 4111. The author wishes to express his thanks to Rowland Thomas, Librarian of the Marshall Library of Economics, Cambridge, for kindly allowing access to Marshall's copies of Spencer's books and for other assistance, and to Peter Groenewegen, Peter Healy, Geoff Hodgson, and John Nightingale for helpful suggestions and comments.

[i] This is not to invalidate Marshall's theorizing based on the acceptance of biological evolution *as such*. As Thomas (1991) and Hodgson (1993a) convincingly demonstrate, much of what Marshall wrote - with growing conviction as he grew older - about, e.g., irreversibly increasing returns to scale over time can only be fully appreciated within the context of such an acceptance. As Hodgson shows, Marshall's later difficulty with the notion of the 'representative firm' can likewise be explained (though a Spencerian rather than a Darwinian conception of evolution made it easier for him to maintain this fiction).

[ii] There has of course been the occasional dissenter. See E.J. Steele et al., *Lamarck's Signature: How Retrogenes are Changing Darwin's Natural Selection Paradigm*, Sydney, Allen and Unwin, 1998.

[iii] While Darwin undoubtedly has passages which can be so interpreted, this one is far from unequivocal in this respect. Darwin may simply mean that *Puffinuria*, which, through *chance variation* of heritable characteristics are enabled to swim and dive like auks, would *then* display in their "habits" their enhanced abilities.

[iv] The note concerned expands on two sentences in chapter VIII of *Principles of Economics* which read: "Mr Herbert Spencer has done more than anyone else to establish the truth and the significance of the law that if any physical or mental exercise gives pleasure, and is therefore frequent, those physical or mental organs which are used in it are likely to grow rapidly. Among the lower animals indeed the action of this law is so intimately interwoven with that of the survival of the fittest, that the distinction between the two need not often be emphasized" (Marshall, 1898, p.326).

[v] See, e.g., Smocovitis (n.d., c. 1997). (I am grateful to Prof. Jim Thompson, of the Biology Department, Austin Peay State University, Clarksville, Tennessee, for drawing my attention to this book, and for very kindly sending me a copy of it.)

[vi] This is apart from the one sentence on the second last page of the book in which Darwin expresses the hope that the book's arguments may shed "light on the origin of man and his history" (Darwin, n.d. p.373).

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