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## Faculty Working Papers

NEWTON VS DARWIN IN 19TH CENTURY ECONOMICS

Royall Brandis, Professor of Economics

#489

College of Commerce and Business Administration  
University of Illinois at Urbana-Champaign



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Summary:

This essay presents an overview of the attitudes of leading nineteenth century economists towards the adoption of an analogy to natural science as an appropriate model for economics. This involved a choice between physical science and biological science as well as a rejection of earlier roots in social philosophy. The impact of Darwinian evolutionary theory in the last four decades of the century created serious differences over this question of method.





Newton vs Darwin in 19th Century Economics\*

Analogias undique indagato

-- Jeremy Bentham

by Royall Brandis  
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There are several approaches to the study of the history of economics none of which do I take to be mutually exclusive, for the shaping of the discipline has been a multi-faceted development. The history of the times, the demands of policy decisions, the previous development of economic thought itself, the psychological needs of certain seminal minds--all these are of unquestioned importance in any search for an understanding of why economics took a particular turning, followed a particular path in a given period. This paper, however, is focused upon still another element which I believe to be important--the intellectual environment beyond economics itself which surrounded those who wrote on economics, particularly those who wrote on economic theory. I do not presume to explore the zeitgeist in its entirety, but, rather, an area which appears to me to be of particular importance--the influence of Newtonian and Darwinian ideas on the development of economics in the nineteenth century.

The nineteenth century was in many respects the crucial century for the development of economics. Despite the inclination to date the modern version of the discipline from 1776 and the Wealth of Nations, I believe the nature of the discipline was fixed in the nineteenth rather than the eighteenth century.



A brief, introductory sketch may be useful here. Three lines of development converged in the Wealth of Nations: (1) the practical, policy-oriented, pragmatic approach of the mercantilists,<sup>1</sup> (2) the moral philosophy approach of Locke and Hume and (3) the abstract, rationalistic, model-building approach of the Physiocrats. Smith's attack on mercantilism is well-known, but in his own concern with policy and with the practical, he is by no means independent of the mercantilist approach even when arguing most strongly against their policy conclusions. His avowed fundamental difference with the mercantilists--that they considered, "production, and not consumption, as the ultimate end and object of all industry and commerce",<sup>2</sup> is, itself, a moral judgment. Smith's less well-known attack on physiocracy is softened because it had, "never been adopted by any nation, and it at present exists only in the speculations of a few men of great learning and ingenuity in France. It would not, surely, be worth while to examine at great length the errors of a system which never has done, and probably never will do any harm in any part of the world."<sup>3</sup> Yet he does speak of physiocracy as "with all its imperfections...perhaps the nearest approximation to the truth that has yet been published upon the subject of political economy"<sup>4</sup> and, consequently, worth the attention of any student of "the principles of that very important science."<sup>5</sup> Finally, Smith's own proposal of "the obvious and simple system of natural liberty"<sup>6</sup> comes straight from John Locke's "Freedom of Men Under Government" which is "A Liberty to follow my own Will in all things, where the Rule prescribes not."<sup>7</sup> And this freedom is derived from "The Natural Liberty of Man"<sup>8</sup> as modified by the necessities of a "well order'd Commonwealth."



### The Natural Science Analogy

The use of natural science as a model for economics neither began nor ended with the nineteenth century, but it was in that epoch that it was most evident in the approach of writers on economics. Indeed, an analogy to a particular natural science was often explicitly advocated although, as we shall see, there was no agreement on which natural science was the appropriate one for economists to use.

We need to make clear at the outset that there are several ways in which an analogy between economics and natural science may be drawn. One is in the general sense of method. Natural scientists are taken to be objective in their work. They aim to provide useful generalized descriptions of phenomena. They are unbiased observers whose observations have no effect on the phenomena observed. Their reports of these observations are made without any intent other than accuracy and the diffusion of knowledge. Personal or political aggrandizement has no place in this process of observation, report, and generalization. Indeed, the pure scientist is thought to have no interest in whether his discovery has any meaning for mankind other than that it adds to man's knowledge of nature. This view of natural science (whether correct or not) is often held before us as an ideal which social scientists should seek to emulate.

A second sense in which the natural science analogy is intended is based on the idea of mapping economics onto the structure of a natural science by finding correspondences between phenomena for each domain. For example, we may find a one-to-one correspondence between the individual consumer in an economic system and the individual particle of Newtonian physics. Or, again, we may view an economic system or its



major parts as biological organisms--growing, changing, developing in response to the interaction with the environment, natural or social. These uses of the analogy to natural science require that one hold the view that man's economic life is subject to law or laws which are akin to the laws of nature. And the economist's task becomes one of searching out those laws.

Perhaps the strongest sense in which the natural science analogy can be made is to argue that man, himself, is a creature of nature and obeys its laws--physical and biological. Hence, we can understand man's social relations if we understand the physical and biological laws which govern him. In this view, social science (including economics) becomes a mere adjunct of natural science. This view was adopted by Hobbes in the first flush of the post-Renaissance scientific discoveries: "Heart, but a Spring; and the Nerves but so many Strings; and the Joynts, but so many Wheeles ..." <sup>9</sup> and, in turn, the state "is but an Artificiall Man ..." <sup>10</sup> Clearly, a problem arises with free will in such a treatment.

Still another way--a compromise way, perhaps,--is to take the view that man in society (say, man in a market) exhibits behavior in accordance with statistical laws, given a sufficiently large number of actors, but is not subject to law in any individual case. There may, of course, be tendencies or leanings in the individual case, but care is taken that a sufficient opening is left for free will. In economics, this approach could be expected to appear reasonably satisfactory when treating of pure competition, but would cause trouble when dealing with fewness of actors--an obvious interest of economists.





There are, no doubt, other applications of the natural science analogy in economics, but the four discussed above would appear to be the most important historically. Obviously, different writers have been led to adopt different approaches.

#### The Newtonian Analogy--Early Views

We may begin our survey with J. B. Say's, A Treatise on Political Economy, first published in 1803.<sup>11</sup> As opposed to Smith's expression of his mostly implicit views in the Wealth of Nations, Say begins his volume with an explicit statement on method:

"In political economy, as in natural philosophy, and in every other study, systems have been formed before facts have been established; the place of the latter being supplied by purely gratuitous assertions. More recently, the inductive method of philosophizing, which, since the time of Bacon, has so much contributed to the advancement of every other science, has been applied to the conduct of our researches in this."<sup>12</sup>

And then he calls, more specifically, for:

"a twofold classification of sciences; namely, those which may be styled descriptive, which arrange and accurately designate the properties of certain objects, as botany and natural history; and those which may be styled experimental, which unfold the reciprocal action of substances on each other, or in other words, the connexion between cause and effect, as chemistry and natural philosophy [i.e., physics and astronomy]... Political economy belongs to the latter; in showing the manner in which events take place in relation to wealth, it forms a part of experimental science."<sup>13</sup>

Say is in no doubt about the similarity between economics and the exact sciences: "Political economy, in the same manner as the exact sciences, is composed of a few fundamental principles, and of a great number of corollaries or conclusions, drawn from these principles."<sup>14</sup>



At the same time, Say, in a manner which would be echoed in a more cautious way by Marshall at the end of the century, did not believe mathematical analysis had any usefulness in the discipline: "It would, however, be idle to imagine that greater precision, or a more steady direction could be given to this study, by the application of mathematics to the solution of its problems."<sup>15</sup> The difficulty, according to Say, lay in the condition that while some of the phenomena studied in economics could be given numerical values (e.g., prices) and so fall "within the range of mathematical inquiry," other aspects of the same phenomena were "not susceptible of any rigorous appreciation, and cannot, therefore, furnish any data for absolute calculations."<sup>16</sup>

A further distinction was made by Say between theory--now seen as the result of empirical scientific investigation--and policy. Economics

"no longer attempts to offer counsel to public authorities. Should they, however, be desirous of ascertaining the good or evil consequences likely to result from any favourite project, they may consult this science, exactly as they would consult hydraulics upon the construction of a pump or sluice."<sup>17</sup>

Say's is the most forthright early statement of what later would be known as the positive-normative distinction in defining the discipline: "The belief that moral and political science is founded upon chimerical theories arises chiefly from our almost continually confounding questions of right with matters of fact...Questions of right are always more or less matters of opinion; matters of fact, on the contrary, are susceptible of proof and demonstration."<sup>18</sup>

Say leaves no doubt in the reader's mind that he wishes to **sever economics from its connection with social philosophy. His faith in a Baconian approach to the subject is unwavering:**



"It was but reasonable to expect from the lights of the age, and from that method of philosophizing which has so powerfully contributed to the advancement of other sciences, that I might at all times be able to ascend to the nature of things, and never lay down an abstract principle that was not immediately applicable in practice; so that, always compared with well established facts any one could easily find its confirmation by at the same time discovering its utility."<sup>19</sup>

This optimism about what could be accomplished in economics by adopting the correct scientific method was not unique to Say. Indeed, Robert Torrens had it in even greater measure. Torrens's An Essay on the Production of Wealth<sup>20</sup> is seen by its author as occupying the methodological middle ground between (in Torrens's view) Ricardo's overly deductive Principles and Malthus's overly empirical Essay on Population and Inquiry into the Nature and Progress of Rent. As Torrens put it:

"The science of Political Economy is analogous to the mixed [i.e., applied] mathematics. The data upon which it proceeds are furnished by observation and experience; while the conclusions to which it leads, are attained by a process of ratiocination self-evident in all its steps."<sup>21</sup>

Furthermore, the present controversies (Torrens appears to be referring particularly to that between Ricardo and Malthus) in economics were like those that affected other sciences as they matured. He mentions specifically the controversy in chemistry that eventuated in the overthrow of the phlogiston theory. Finally: "With respect to Political Economy the period of controversy is passing away, and that of unanimity rapidly approaching. Twenty years hence there will scarcely exist a doubt respecting any of its fundamental principles."<sup>22</sup>

Five years later, in a new edition of his An Essay on the External Corn Trade,<sup>23</sup> Torrens was even more optimistic: "On a former occasion, the



Author ventured to predict, that, at no distant period, controversy amongst the professors of political economy would cease, and unanimity prevail respecting the fundamental principles of the science. He thinks he can already perceive the unequivocal signs of the approaching fulfillment of this prediction."<sup>24</sup> Alas, a century and a half has passed and Torrens's prediction seems no nearer fulfillment.

There is a striking similarity between the views on method of Malthus and Say. The first sentence of the former's Principles of Political Economy<sup>25</sup> reads, "It has been said, and perhaps with truth, that the conclusions of Political Economy partake more of the certainty of the stricter sciences than those of most of the other branches of human knowledge."<sup>26</sup> But this statement is immediately modified to caution against the belief that where phenomena are dependent upon "so variable a being as man, and the qualities of so variable a compound as the soil" we can obtain conclusions as certain as "those which relate to figure and number."<sup>27</sup> Finally, Malthus concludes that "the science of political economy bears a nearer resemblance to the science of morals and politics than to that of mathematics."<sup>28</sup>

But it is to Newton as philosopher of science that Malthus appeals in arguing that both sides of the bullionist controversy had over-simplified the problem and, thus, both had erred (even though Malthus was inclined to give the Bullionists the better of the argument).<sup>29</sup> In distinguishing between the "law of nature" and "the laws that regulate the movements of human society," Malthus makes the point that the "effects" of the latter laws "are continually modified by human interference." The laws themselves





(not forgetting his earlier caveat) appear to have a status not unlike that of the laws of nature.<sup>30</sup>

About Ricardo we can have little to say in a paper such as this, and what we do say will be largely inference, for he seems never to have set out his views on method in any comprehensive way. Yet, there seems no reason to doubt that the "laws" referred to in his famous statement that "To determine the laws which regulate this distribution [of rent, profit, and wages], is the principal problem in Political Economy..."<sup>31</sup> are conceived in a fashion roughly similar to that of Say, Torrens, and Malthus. Indeed, one might make the argument that Ricardo, who said the least about method, did the most to fix a particular method upon the mainstream of economics in the nineteenth century. Certainly much of the work in economics that proceeded from "self-evident" axioms through deductive logic to irrefutable conclusions was, consciously or not, following Ricardo's method in the Principles.

Before leaving this (roughly) first quarter of the century under study we want to note another concern about the discipline which may have underlain some of the later reactions to Darwin. Our example is Archbishop Whately's review of Nassau Senior's two early works.<sup>32</sup> Whately has a recurring theme, the need to strike the proper balance between the requirements of religion and those of science. In the process of his argument, he makes clear his opinions: (1) that economics is a science and deserves to be treated as such and (2) that there are moral and religious overtones to the study of economics that cannot be (safely) ignored. Thus, "if the cultivation of this branch of knowledge



be left by the advocates of religion, and of social order, in the hands of those who are hostile to both, the result may easily be foreseen."<sup>33</sup>

On the other hand, "The Bible, it should be remembered, was not designed to teach men Astronomy or Geology, or, it may be added, Political Economy, but Religion..."<sup>34</sup> We know, by a prior reference, that Whately's mention of astronomy stemmed from the Church's rejection of the Copernican view of the solar system. We can only speculate as to whether his choice of geology for his second case refers to the early roots of evolutionary theory to be found in some geological works of the period (e.g., Lyell's).

Whately's remarks have another significance. When one remembers the close ties between moral philosophy and religion in that era, Whately can be seen as acknowledging the independence of economics as a science from its moral philosophical origins. To put it mildly, Whately was premature.

#### The Newtonian Analogy--Later Views

If we turn to the most influential work between Ricardo and Marshall--John Stuart Mill's Principles of Political Economy<sup>35</sup>--we sense a revolt against treating economics as a branch of Newtonian mechanics (and even a revolt against the earlier Mill). Mill harkens back to Smith's Wealth of Nations and vows to expand the topic beyond "abstract speculation. For practical purposes, Political Economy is inseparably intertwined with many other branches of social philosophy."<sup>36</sup> A new, comprehensive work is needed not only because of the advances in economics since 1776, but also because "the philosophy of society, from which that eminent thinker [Smith] never separated his more peculiar theme, though still in a very early stage of its progress, has advanced many steps beyond the point at which he left it."<sup>37</sup>



All of this, however, was just a prelude to Mill's well-known distinction between the laws of production which man can learn, but not change, and the laws of distribution which man can change. There is a further distinction which is not so often noted, but which is important. The reason the laws of production are immutable is that they are derived from the laws of nature which man can do nothing about and from "other truths relating to human nature"<sup>38</sup> which are equally immutable. We can only speculate on what those "other truths" are. (His treatment of labor in production suggests at one point an almost Hobbesian "matter in motion" view.<sup>39</sup>)

In the same fashion, there is a frustrating vagueness about the second part of his dichotomy. The laws of distribution are "partly of human institution." But "though governments or nations have the power of deciding what institutions shall exist, they cannot arbitrarily determine how those institutions shall work."<sup>40</sup> This last statement is then explicated by "The conditions on which the power they possess over the distribution of wealth is dependent, and the manner in which the distribution is effected by the various modes of conduct which society may think fit to adopt, are as much a subject for scientific enquiry as any of the physical laws of nature."<sup>41</sup>

When he turns later in the work to the subject of distribution, Mill, in his introductory remarks repeats his statement about Production, but distribution is now "a matter of human institution solely"<sup>42</sup> where it had been only "partly" so earlier. The rules of distribution are whatever a society chooses to make them. Mill will consider "not the causes, but the consequences, of the rules" and these consequences "have as much the



character of physical laws, as the law of production."<sup>43</sup> There is little that I can offer in exegesis. I believe Mill was simply trying, methodologically, to have it both ways. He need not abandon the method of physical science, but neither need he abandon the social philosophy he believed best for mankind. Indeed, he may have hoped to gain the imprimatur of physical science for a distributive scheme embodying justice in his social philosophy. If so, he would not be the last economist to seek that chimera.

When, a quarter century later, we reach Jevons and Walras, Mill's doubts and compromises are gone. It is not much of an overstatement to say that, for these two, economics is physics. "In any case, the establishment sooner or later of economics as an exact science is no longer in our hands and need not concern us. It is already perfectly clear that economics, like astronomy and mechanics, is both an empirical and a rational science."<sup>44</sup>

Walras's call for economic theory to become a mathematical theory is well-known and will not be stressed here. It was, of course, only one aspect of his broader desire to see an economics modeled on physics. It also seems to have led him to confuse mathematics with science.<sup>45</sup>

Walras, more profound than Jevons in one respect, was careful to distinguish between natural science and moral science. The former studies the phenomena resulting from the "blind and ineluctable forces of nature" while the latter studies the phenomena that "result from the exercise of the human will, a force that is free and cognitive."<sup>46</sup> We might suppose that this distinction would close off the natural science analogy for Walras, but that is not the case. For, "any value in exchange, once





established, partakes of the character of a natural phenomenon, natural in its origins, natural in its manifestations and natural in essence."<sup>47</sup> And this makes possible the "pure theory of economics." Furthermore, "this pure theory of economics is a science which resembles the physico-mathematical sciences in every respect."<sup>48</sup>

By 1896, Walras could be completely explicit on the analogy:

"By demonstrating rigorously first the elementary theorems of geometry and algebra, and then the resulting theorems of the calculus and mechanics, in order to apply them to experimental data, we have achieved the marvels of modern industry. Let us follow the same procedure in economics, and, without doubt, we shall eventually succeed in having the same control over the nature of things in the economic and social order as we already have in the physical and industrial order."<sup>49</sup>

We need not stop long with Jevons. His views were clear and clearly expressed: "The Theory of Economy thus treated [i.e., mathematically] presents a close analogy to the science of Statical Mechanics, and the Laws of Exchange are found to resemble the Laws of Equilibrium of a lever as determined by the principle of virtual velocities."<sup>50</sup> And, "I know not when we shall have a perfect system of statistics, but the want of it is the only insuperable obstacle in the way of making Economics an exact science."<sup>51</sup> Finally,

"the theory here given may be described as the mechanics of utility and self-interest...its method is as sure and demonstrative as that of kinematics or statics, nay, almost as self-evident as are the elements of Euclid, when the real meaning of the formulæ is fully seized."<sup>52</sup>

We may speculate on what lay behind this insistence on an analogy for which the evidence was, to say the least, far from being all in. In both cases--Walras and Jevons--there is evident confusion between **mathematics** and physical science, but the nature of the confusion is, **itself,**



unclear. Did Jevons, for example, believe that economics, because of the nature of its subject matter, was like physics? His emphasis on "quantities" suggests this. Or, did he believe that use of mathematical techniques like those used by Newton and his successors made economics into a science like physics? His infatuation with Newton's invention, the differential calculus, might suggest the latter. With Walras, the mystery deepens. Why, after making a careful, and one would think useful, distinction between "pure natural science" and "pure moral science" did he then, by a strained logic, convert value in exchange into a "natural" phenomenon which he could then argue should be treated in the manner of a natural science?

We are not helped by the fact that Jevons held the French economists in high regard while Walras found little good in them (save Cournot, of course), except to allow some credit to the Physiocrats, but only in "social economics" and "applied economics," not in pure, i.e. theoretical economics.<sup>53</sup> (In fact, what Walras did find "of enduring value," despite their emphasis on quantities, were only two conclusions of the physiocrats--that all taxation should be levied on land-rent and that laissez-faire was the best policy.)<sup>54</sup>

Were both Jevons and Walras over-stating the case in order to stem the tide of Darwinism? This seems unlikely. Walras dismisses Darwin in an off-hand manner in the Elements: "the human race is subject to a law...that vegetable and animal species tend to perpetuate themselves by rapid and large increases. The conclusions which Darwin drew from this fact are debatable, but the fact itself is not."<sup>55</sup> Jevons, seven years before publication of the Origin of Species, had recorded in his



journal his own belief that, "all animals have been transformed out of one primitive form by the continued influence...of climate, geography, etc."<sup>56</sup> Consequently, although there is no mention of Darwin in the Principles of Political Economy, it seems unlikely that Jevons would have agreed with Walras's evaluation.

What is puzzling is that both men, believing and announcing that they were setting out to revolutionize economic theory (and not just by mathematizing it) ended in a fundamental sense very much in the methodological mainstream and with hardly a passing glance at the Darwinian intellectual revolution that was going on all about them. Two other revolutionaries of the period--Marx and Veblen--reacted very differently to the winds of intellectual change.

#### The Darwinian Analogy

The second major theme of this paper--Darwin's theory of evolution and, more generally, the biological analogy--has a history strikingly different from the first theme just described. Evolution was not something received with the authority of scientific truth at the opening of the nineteenth century. Rather, evolution was an idea that was "in the air" and put there as much by social scientists as by biological scientists.<sup>57</sup> Herbert Spencer's Social Statics<sup>58</sup> appeared eight years before Darwin's Origin of Species. It was here that Spencer, not for the first time but more systematically, developed the ideas of social and human evolution that would permeate what came to be called "Social Darwinism."



"Progress," said Spencer, "therefore, is not an accident, but a necessity. Instead of civilization being artificial, it is a part of nature; all of a piece with the development of the embryo or the unfolding of a flower. The modifications mankind have undergone, and are still undergoing, result from a law underlying the whole organic creation..."<sup>59</sup>

And, for the economist: "the analogy [after describing the biology of the human body] between an individual being and a human society, in which each man, whilst helping to subserve some public want, absorbs a portion of the circulating stock of commodities brought to his door, is palpable enough."<sup>60</sup> Finally, "the inferences of political economy are true, only because they are discoveries by a roundabout process of what the moral law commands."<sup>61</sup> And "moral truth...proves to be a development of physiological truth."<sup>62</sup>

Even closer to economists was the well-known and well-documented, attribution to Malthus (Essay on Population) by Darwin of the seminal idea (the "struggle for existence") in Darwin's theory of evolution.<sup>63</sup>

The impact of Darwin on economic thought in the last four decades of the nineteenth century is most strikingly evident in the work of three men, Karl Marx, William Graham Sumner, and Thorstein Veblen. Each in his own way can be seen as the voice of a movement--Marxism, Social Darwinism, and Institutionalism. Two of the three are viable intellectual movements in social thought (including economic thought) today; the third (Social Darwinism) may well be also, but the name having fallen into intellectual disrepute, if so it goes by other appellations.

Veblen was certainly an evolutionist, but by no means a pure Darwinian. His speculation on the non-sexual differences between men and women is as much LaMarckian as Darwinian.<sup>64</sup> Veblen, we may guess, wanted such





propositions as the predatory nature of men compared to women to have the force of a Darwinian product of natural selection, but he was much too impatient to wait for the necessary amount of time to pass.<sup>65</sup> So he is prepared to let the nature of one's social role speed up the natural selection process.

Veblen, of course, was far more ambitious for the evolutionary analogy than such a single example would suggest. His well-known essay on the subject<sup>66</sup> urged that economists adopt the evolutionary model because it fit the realities of man's economic life better than any of the mechanical models which orthodox economists used. Veblen, however, went beyond this criticism of purely static models to criticize what might be called dynamic models of the classical and neo-classical schools, and (what may not be so generally recalled) of the Social Darwinians. His basis for criticism is, I believe, important: He rejected any developmental model which had a conclusion in some final structure. As he put it with regard to classical economics; "To meet the high classical requirement, a sequence--and a developmental process especially-- must be apprehended in terms of a consistent propensity tending to some spiritually legitimate end."<sup>67</sup>

Veblen argued two points. One was that the time-path of human society did not, necessarily, lead to some end, some "absolute truth" which was a "spiritual fact." Indeed, there was no reason to suppose that any particular end, spiritual or not, lay down the evolutionary path. All the evidence both biological and social pointed to endless variation. Evolutionary theory of the modern (Darwinian) sort offered



an explanation of this variation--an explanation that did not require an end or goal to the process.

The second point of Veblen's argument was a corollary of the argument just made. The classical economists' insistence on the "normal" or the "natural" (that is, an equilibrium) as what their economic laws were directed to was a result of their imputing "to things a tendency to work out what the instructed common sense of the time accepts as the adequate or worthy end of human effort."<sup>68</sup>

To Veblen (in a passage that indicates his awareness of the influence of a physical science model on this classical approach):

"By this method the theory of an institution or a phase of life may be stated in conventionalised terms of the apparatus whereby life is carried on, the apparatus being invested with a tendency to an equilibrium at the normal, and the theory being a formulation of the conditions under which this putative equilibrium supervenes. In this way we have come into the usufruct of a cost-of-production theory of value which is pungently reminiscent of the time when Nature abhorred a vacuum."<sup>69</sup>

Finally,

"The evolutionary point of view, therefore, leaves no place for a formulation of natural laws in terms of definitive normality, whether in economics or in any other branch of inquiry. Neither does it leave room for that other question of normality, What should be the end of the developmental process under discussion?"<sup>70</sup>

It comes as no surprise that Marx, as an intellectual descendant of Hegel, found evolutionary theory more satisfactory than mechanistic models in picturing the world. Fifteen years before the Origin of Species, Marx was writing, "The object of labor, is, therefore the objectification of man's species life."<sup>71</sup> And this discussion of man as species leads



directly into Marx's treatment of alienation.<sup>72</sup> This way of thinking about man's essence as his species characteristics prepares the way for Marx to endorse the view that his Capital is evolutionary theory applied to economic life.

As early as the preface to the first German edition of Capital (1867), Marx is saying that from his standpoint, "the evolution of the economic formation of society is viewed as a process of natural history..."<sup>73</sup> This coincides remarkably with the belief expressed twenty-three years earlier that social science was properly a part of natural history.<sup>74</sup> And the two specific references to Darwin in the first volume of Capital are clearly intended to strengthen Marx's argument by appeal to Darwinian analogy.<sup>75</sup>

But Marx's own ideas on all this seem best revealed by the quotation from a Russian review of Capital which he used in the Afterword to the second German edition (1873) of the book in order to make clear his own view on method.

"'in his [Marx's] opinion every historical period has laws of its own...In a word, economic life offers us a phenomena analogous to the history of evolution in other branches of biology. The old economists misunderstood the nature of economic laws when they likened them to the laws of physics and chemistry. A more thorough analysis of phenomena shows that social organisms differ among themselves as fundamentally as plants or animals...The scientific value of such an inquiry lies in the disclosing of the special laws that regulate the origin, existence, development, death of a given social organism and its replacement by another and higher one. And it is this value that, in point of fact, Marx's book has.'"<sup>76</sup>

To this, Marx added, "...what else is he picturing but the dialectic method?" And by the end of the century, Enrico Ferri is writing a book



to demonstrate, "...that Marxian Socialism...is only the practical and fruitful fulfilment, in the social life, of that modern scientific revolution which...has triumphed in our times, thanks to the works of Charles Darwin and Herbert Spencer."<sup>77</sup>

The root of Marx's relationship with Darwinian thought lies at a deeper level than that already treated. It lies in Marx's organic view of society, in, that is, a biological analogy of which evolution is only one aspect. The very notion of "class" is of an organism that is different from, and more than, the individual units that comprise its parts. As Marx said in his first preface,

"...the body, as an organic whole, is more easy of study than are the cells of that body...But in bourgeois society the commodity-form of the product of labor--or the value-form of the commodity--is the economic cell-forms. To the superficial observer, the analysis of these forms seems to turn upon minutiae. It does in fact deal with minutiae, but they are of the same order as those dealt with in microscopic anatomy."<sup>78</sup>

I will say little about Social Darwinism, for that is a topic that has been many times studied and restudied. Once one has quoted Sumner, ("the law of the survival of the fittest was not made by man and cannot be abrogated by man. We can only, by interfering with it, produce the survival of the unfittest."<sup>79</sup>), there is very little more to say. What is, perhaps, worth noting is that this use of the Darwinian analogy served to support and justify the status quo of social and economic arrangements while the two revolutionaries in economic thought of the period--Marx and Veblen--were drawing very different inferences from the same analogy.





The Dualism of Marshall

And so we come to Marshall, in this connection (as in so many other aspects of nineteenth century economics) a dualist. In the middle of the 1870's he is writing with obvious agreement, "Mill has brought out the fact that there is a close analogy between the methods of economic science, and those of the science of mechanics."<sup>80</sup>

At the same time, he was writing,

"...there are many...classes of movement in the physical world, which are exact copies of movements that have gone before. But every movement that takes place in the moral world alters the magnitude if not the character of the forces that govern succeeding movements. And economic forces belong to the moral world in so far as they depend upon human habits and affections, upon man's knowledge and industrial skill."<sup>81</sup>

Even the cryptic motto of the Principles--unchanged through eight editions, "Natura non facit saltum" can be interpreted, not only as Whitaker does, to be Darwinian,<sup>82</sup> but also as a bow to Newton, the inventor of the differential calculus. The latter interpretation is encouraged by W. R. Scott's obituary<sup>83</sup> on Marshall in which he attributes the source of the idea of the motto for Marshall to Kant's Critique of Pure Reason which is Newtonian through and through.

When we reach the Principles itself, we find the same dualism. When Marshall speaks of method he sounds very much like an evolutionist:

"The notion of continuity with regard to development is common to all modern schools of economic thought, whether the chief influences acting on them are those of biology, as represented by Herbert Spencer; or of history and philosophy, as represented by Hegel's Philosophy of History, and by more recent ethico-historical studies on the Continent and elsewhere. These two kinds of influences have affected, more than any other, the substance of the views expressed in the present book..."<sup>84</sup>



Yet, only one chapter,<sup>85</sup> the first (and shortest) of the five chapters devoted to "Industrial Organization," is Darwinian throughout.

By the eighth edition, thirty years later, Marshall is fully aware of the contradiction, but is still trying to have it both ways:

"The Mecca of the economist lies in economic biology rather than in economic dynamics. But biological conceptions are more complex than those of mechanics; a volume on Foundations must therefore give a relatively large place to mechanical analogies; and frequent use is made of the term 'equilibrium,' which suggests something of statical analogy."<sup>86</sup>

Since there can be little doubt that Marshall thought the biological analogy and the Darwinian point of view the appropriate model for economics,<sup>87</sup> how did he come to produce a work (and keep it in print through eight editions over thirty years) that, by his own, somewhat belated admission, did not follow that method? I would like to suggest three possible contributors to Marshall's ambivalence: (1) Marshall's well-known desire not to make a clean break with the classical tradition would seem to imply that the analogy to Newtonian mechanics could not really be discarded since it had received the imprimatur of John Stuart Mill; (2) Darwinism, however well defended by some (but not all) of England's leading intellectuals, was still not quite respectable in the Victorian Age. And a man who, when a thirty-three year old bachelor, would write home to his mother that "there is scarcely a virtuous woman in the state of Nevada" is not likely to push too hard on the limits of respectability; (3) Whether, indeed, economics was any kind of a science was not all that settled in Marshall's formative professional years.

This third matter came to a head in 1877 when a group including no less a personage than Francis Galton led a move to drop Section F



(Statistics and Economics) from the British Association for the Advancement of Science,<sup>88</sup> Sir Rawson Rawson reported to the Royal Statistical Society that, "Mr. Sclater, and one or two others, took the opportunity of suggesting that Economic Science was not so pure and exact as some of the other sciences, and that as there was a Social Science Congress it was not necessary that statistics and economics should be represented at the British Association."<sup>89</sup> Later, Galton wrote a communication to the Society in which he listed the titles of nearly one hundred papers read in Section F at recent British A.A.S. meetings. He found only a handful suitable for a scientific association. (Jevons's paper on the relation of sunspots to the price of corn was the only strictly economics paper on Galton's approved list.) Galton concluded that, "It would appear that the subjects commonly brought before Section F cannot be considered scientific."<sup>90</sup>

Given Marshall's personality, his desire to be the leader of British economics, and his belief in continuity with the past, it is only to be expected that he would not make the kind of whole-hearted commitment to the Darwinian analogy that some of his remarks may indicate he contemplated making. He was no Marx or Veblen.

Thus, for economics, the nineteenth century closed on an ambiguous note regarding the methodological path that would predominate in the twentieth century. And the question of whether any natural science analogy was appropriate was lost sight of in the disagreement over which natural science analogy was to be followed.<sup>91</sup>



Notes

\*This paper is a fragment of a more ambitious work-in-progress. Consequently, two draconian constraints have been set for this particular paper: (1) Full-length volumes on the methodology of economics published during the period are not discussed. Thus, there is no mention of important works such as those of Cairnes, Senior, or J. N. Keynes; (2) modern studies relating to the same period and subject are not referred to or critically discussed. For the most recent example, my discussion here of Marx makes no reference to the article by Enrique Ureña in History of Political Economy (Winter 1977), an article which takes a different view of the relation of Marx to Darwin and goes into the matter in much greater detail than I could hope to do in what is, essentially, a survey article.

One other introductory remark may be useful. I take "Newton" to represent the point of view that in the methods especially, but to some extent in the substance, of physical science lay the path to truth in economics. "Darwin," on the other hand, represents the point of view that it was in biological science, and especially in the idea of evolution, that the appropriate guide to economic truth was to be found. This is not exact because inevitably in a discussion of the nineteenth century, Darwin the man will intrude, while by that same period, the Newtonians of physical science had gone beyond Newton (or, perhaps, retrogressed in subtle ways) so that we cannot be certain Newton would have been a good nineteenth century Newtonian. But the Newtonians thought they were being true to Newton's teaching which is really all we need to justify using his name in the title.

<sup>1</sup>Sir James Steuart summed up well the seldom explicit dislike of the mercantilist mind for abstract model-building: "when inquiries are made concerning the complicated interests of society, the vivacity of an author's genius is apt to prevent him from attending to the variety of circumstances which render uncertain every consequence, almost, which he can draw from his reasoning. To this I ascribe the habit of running into what the French call Systèmes...Such systems are mere conceits; they mislead the understanding, and efface the path to truth." An Inquiry into the Principles of Political Economy, [1767], Edinburgh, 1966, p. 8.

<sup>2</sup>Adam Smith, The Wealth of Nations, [1776], New York, 1937, p. 625.

<sup>3</sup>Ibid., p. 627.

<sup>4</sup>Ibid., p. 642.

<sup>5</sup>Ibid.

<sup>6</sup>Ibid., p. 651.

<sup>7</sup>John Locke, Two Treatises of Government, [1690], New York, 1965, Second Treatise, Section 22 (emphasis in original).

<sup>8</sup>Ibid. (Emphasis in original.)

<sup>9</sup>Thomas Hobbes, Leviathan, [1651], Pelican Books, 1972, p. 81 (emphasis in original).





<sup>10</sup>Ibid. See, also, C. B. MacPherson's "Introduction" to this edition: "This was Hobbes's striking scientific hypothesis. All human actions could be resolved into elementary motions of body and mind which the scientist could recombine in a way that would explain everything. Hobbes believed that he had done this." (p. 29)

<sup>11</sup>Translated from the fourth edition by C. R. Prinsep and Clement C. Biddle, Philadelphia, 1841.

<sup>12</sup>Ibid., p. XVII.

<sup>13</sup>Ibid., pp. XVII-XVIII.

<sup>14</sup>Ibid., p. XXVI.

<sup>15</sup>Ibid., p. XXVI.

<sup>16</sup>Ibid., p. XXVI, (emphasis in original).

<sup>17</sup>Ibid., p. LVIII.

<sup>18</sup>Ibid., p. XXXV, ft. (emphasis in original).

<sup>19</sup>Ibid., p. XLV.

<sup>20</sup>London, 1821.

<sup>21</sup>Essay on the Production of Wealth, p. X.

<sup>22</sup>Ibid., p. XIII.

<sup>23</sup>Third edition, London, 1826. Clement Biddle, the editor of the 1841 American edition of Say's Treatise, noted Torrens's remarks approvingly. Op.cit., p. XXV, note.

<sup>24</sup>Essay on the External Corn Trade, p. XI.

<sup>25</sup>Thomas Robert Malthus, Principles of Political Economy, [1836] second edition, Clifton, N.J., 1974. Quotations in this paper appear also in the first (1820) edition.

<sup>26</sup>Ibid., p. 1.

<sup>27</sup>Ibid.

<sup>28</sup>Ibid.

<sup>29</sup>Ibid., pp. 5-6.

<sup>30</sup>Ibid., p. 10.

<sup>31</sup>David Ricardo, On the Principles of Political Economy and Taxation, [1817], Cambridge, 1951, p. 5.

<sup>32</sup>Edinburgh Review, v. 48, no. 95, September 1828, pp. 170-84. Attribution is by Frank W. Fetter, "The Authorship of Economic Articles in the Edinburgh Review, 1802-47," Jour. of Pol. Econ., vol. 61, June 1953. Whately had been Senior's tutor at Oxford. The works reviewed were: An Introductory Lecture on Political Economy (1827) and Three Lectures on the Transmission of the Precious Metals from Country to Country, and the Mercantile Theory of Wealth, (1828). See Schumpeter's History (pp. 483-4) for his high opinion of Whately.

<sup>33</sup>Edinburgh Review, op. cit., pp. 170-71.

<sup>34</sup>Ibid., p. 172.



<sup>35</sup>[1848] In two volumes, edited by J. M. Robson, Toronto, 1965.

<sup>36</sup>Ibid., p. XCI.

<sup>37</sup>Ibid., p. XCII.

<sup>38</sup>Ibid., p. 21.

<sup>39</sup>Ibid., p. 27.

<sup>40</sup>Ibid., p. 21.

<sup>41</sup>Ibid., p. 21. In the manuscript, Mill had said that the "conditions" were "determined by laws as rigid, and as independent of human control, as those of Production itself." Ibid., note mm.

<sup>42</sup>Ibid., p. 199.

<sup>43</sup>Ibid., p. 200.

<sup>44</sup>Leon Walras, Elements of Pure Economics, [1874] translated by William Jaffé, Homewood, Ill., 1954, p. 47. Quotation is from the preface to the fourth edition (1900). Lessons 1 and 2 of the Elements contain a very useful discussion of some of the same points made in this paper, including consideration of some writers not here mentioned. The all-too-human Walras could see the myopia in the sight of other economists, but was blind to his own.

<sup>45</sup>"Thus when the geometer states that an equilateral triangle is at the same time equiangular and when the astronomer states that the planets move in an elliptical orbit at one of the foci of which is the sun, they are making statements which are scientific in the strict sense of the term." Ibid., p. 52 (emphasis in original).

<sup>46</sup>Ibid., p. 61.

<sup>47</sup>Ibid., p. 69.

<sup>48</sup>Ibid., p. 71.

<sup>49</sup>Ibid., p. 471. (This statement first appeared in the third edition, 1896).

<sup>50</sup>W. Stanley Jevons, The Theory of Political Economy, [1871], New York, 1965, p. VII. This theme recurs on p. 133.

<sup>51</sup>Ibid., p. 12.

<sup>52</sup>Ibid., p. 21.

<sup>53</sup>See on this point, Ibid., pp. XLIV-XLV, and Walras, Elements, pp. 54-57; 393-97.

<sup>54</sup>Walras, Elements, pp. 396-97.

<sup>55</sup>Ibid., p. 387.

<sup>56</sup>Papers and Correspondence of William Stanley Jevons, edited by R. D. Collison Black and Rosamond Könekamp, vol. 1, London, 1972, p. 66.

<sup>57</sup>Physical science had nothing positive to offer in this regard since the ideas of growth and change were alien to the static, Newtonian view. Indeed, the prestige of physical science as represented in Britain by Lord Kelvin, served to delay acceptance of Darwin's evolutionary theory. Kelvin mistakenly calculated the age of the earth at some two hundred



million years--much too short a time to give one confidence in Darwin's explanation of the origin of species.

<sup>58</sup>London, 1851. The fascination with Darwin's Origin of Species leads to a curious treatment of Spencer. One could read Richard Hofstadter's minor classic, Social Darwinism in American Thought, and not realize that Spencer, in important respects, antedated the Origin by at least a decade.

<sup>59</sup>Social Statics, p. 65.

<sup>60</sup>Ibid., p. 451.

<sup>61</sup>Ibid., p. 460.

<sup>62</sup>Ibid., p. 461.

<sup>63</sup>Charles Darwin, On the Origin of Species, [1859], New York, 1963, pp. XXIX and 47. His autobiography carries an even more explicit statement of indebtedness. This is a touchy point, apparently, with some natural scientists. Indeed, the edition of the Origin cited above omits all mention of Malthus from the rather detailed index (which does include reference to a Mr. W. C. Martin's drawing of a mule with striped legs). Sic transit gloria mundi. How well-known the Malthus-Darwin relationship is may be seen by noting reference to it in such a remote place as Alfred North Whitehead, An Introduction to Mathematics, [1911], New York, 1969, p. 101.

<sup>64</sup>See his hypothetical history of this differentiation in The Theory of the Leisure Class, [1899], New York, 1967, pp. 13-15.

<sup>65</sup>I am compelled to stray beyond the end point of the nineteenth century in fairness to Veblen to point out that in a later work Veblen indicated an awareness of the difference between LaMarck and Darwin and of Darwin's superiority as an evolutionary theorist. The Theory of Business Enterprise, [1904], New York, 1932, p. 175 and p. 222, ft. 31.

<sup>66</sup>"Why is Economics Not an Evolutionary Science?" [1897], Max Lerner, ed., The Portable Veblen, New York, 1948, pp. 215-40.

<sup>67</sup>Ibid., p. 221.

<sup>68</sup>Ibid., p. 224.

<sup>69</sup>Ibid., p. 226.

<sup>70</sup>Ibid., p. 235.

<sup>71</sup>Economic and Philosophic Manuscripts of 1844, trans. by Martin Milligan, New York, 1965, p. 114. (Emphasis in original.)

<sup>72</sup>Ibid., p. 114 ff.

<sup>73</sup>Capital, vol. 1, [1867], New York, 1967, p. 10.

<sup>74</sup>Economic and Philosophic Manuscripts.

<sup>75</sup>Capital, p. 341, ft. 1; p. 372, ft. 3.

<sup>76</sup>Ibid., pp. 18-19.



<sup>77</sup> Socialism and Modern Science (Darwin, Spencer, Marx), [1894], translated by Robert Rives La Monte, 3rd Edition, Chicago, 1917, p. 9.

<sup>78</sup> Capital, p. 8.

<sup>79</sup> William Graham Sumner, "Sociology," [1881], in Darwinism and the American Intellectual, Homewood, Ill., 1967, p. 143.

<sup>80</sup> J. K. Whitaker, editor, The Early Economic Writings of Alfred Marshall, 1867-1890, vol. 2, New York, 1975, p. 118. ("The Pure Theory of Foreign Trade").

<sup>81</sup> Ibid., p. 163.

<sup>82</sup> Ibid., vol. 1, p. 109.

<sup>83</sup> Quoted in Ibid., p. 108.

<sup>84</sup> Alfred Marshall, Principles of Economics [1890], ninth edition, London, 1961, p. IX. (From the first edition. We may speculate on why Darwin was not named.)

<sup>85</sup> Ibid., pp. 240-49.

<sup>86</sup> Ibid., p. XIV.

<sup>87</sup> In addition to the citations in the body of this paper, Appendix C of the Principles is particularly instructive, e.g., "economics, like biology, deals with a matter, of which the inner nature and constitution, as well as the outer form, are constantly changing." Ibid., p. 772.

<sup>88</sup> Journal of the Royal Statistical Society, vol. 40, 1877, pp. 342-45, 468-73.

<sup>89</sup> Ibid., p. 344.

<sup>90</sup> Ibid., p. 472.

<sup>91</sup> This paper was presented at the History of Economics Society meetings, May 1978. I can, here, only acknowledge with thanks and mention briefly the comments of the two discussants on that occasion: Professor Abraham Hirsch of the City University of New York and Professor Donald A. Walker of Indiana University (Pennsylvania). Professor Hirsch pointed out that confusion of mathematics with physical science was more widespread in economics than suggested by my reference to it with regard to Jevons and Walras. Both he and Professor Walker felt that the "war" between Newtonians and Darwinians in nineteenth century economics never was more than a skirmish which the Darwinians lost. However, even if one accepted this proposition, the fact that both Marx and Veblen need to be counted among the Darwinians should make us suspect that the influence of the battle on economics cannot be ignored.















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