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Working Paper

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Papers on Economics and Evolution, No. 1001

Provided in Cooperation with:
Max Planck Institute of Economics

Suggested Citation: Hodgson, Geoffrey M. (2010) : A philosophical perspective on contemporary evolutionary economics, Papers on Economics and Evolution, No. 1001, Max Planck Institute of Economics, Jena

This Version is available at:
https://hdl.handle.net/10419/32649

PAPERS on Economics & Evolution

1001

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by

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The *Papers on Economics and Evolution* are edited by the Evolutionary Economics Group, MPI Jena. For editorial correspondence, please contact: evopapers@econ.mpg.de

ISSN 1430-4716

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Version of 12 February 2010

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ABSTRACT

There has been a remarkable growth in evolutionary economics since the 1980s. But despite this outward success there has been inner disagreement on fundamental issues including the building blocks of evolutionary theory and the very meaning of 'evolution' itself. This essay provides a philosophical perspective on both the defining agreements and ongoing disputes within evolutionary economics. Its primary emphasis is on ontology. It shows that some major disputes derive not from incompatible propositions but the choice of different levels of analysis. A route toward reconciliation of different viewpoints is thus exposed.

A Philosophical Perspective on Contemporary Evolutionary Economics

Geoffrey M. Hodgson

Although there are many precursors, the modern wave of evolutionary economics began in the 1980s, particularly after the publication of Richard Nelson's and Sidney Winter's (1982) *Evolutionary Theory of Economic Change.*[1] In the following years much of the work in this genre was applied and policy-oriented. Theoretical developments have been significant, but there has not yet been convergence on an integrated approach (Silva and Teixeira 2009). It is partly for the reason that there has been an intensifying debate since the 1990s on evolutionary principles and the underlying ontological assumptions of evolutionary economics.

The aim of this article is to examine the philosophical communalities and divergences that have been revealed in the literature. Seven sections follow. The first sketches the historical background. It notes that despite the looseness and imprecision of the term 'evolution', there is an identifiable international network or 'college' of 'evolutionary economists' whose work can be placed under philosophical scrutiny. The second section considers the philosophical differences in broad terms and directs attention to ontology as the basis of much relevant agreement and dispute. The third section considers a number of ontological communalities in evolutionary economics. It is followed by two sections on ontological divergences. Of these, the fifth section outlines the ontology of complex population systems. This lays the ground for the discussion of generalised Darwinism in the sixth section. The final section shows that some of the key disputes within evolutionary economics derive not from incompatible propositions but from different levels of abstraction within a single ontological framework. A strategy for the reconciliation of apparent differences is thus revealed.

1. History and Meanings

Any consideration of the philosophical aspects of evolutionary economics immediately faces the problem that the term has been used historically in a wide variety of ways. The first use of the term 'evolutionary economics' in English was probably by Thorstein Veblen (1898, p. 398). Although Veblen was one of the founders of the original institutional economics, his followers abandoned his Darwinian legacy (Hodgson 2004). While they retained the word 'evolutionary', it was used to refer more broadly to development and change, as with the Association for Evolutionary Economics in the USA.

[1] The author is very grateful to John Davis, Wade Hands, Dick Nelson and Ulrich Witt for especially helpful comments on preceding versions of this essay.

Joseph Schumpeter famously described capitalist development as an evolutionary process. Work influenced by Schumpeter is also described as 'evolutionary economics' as evidenced by the title of the *Journal of Evolutionary Economics*, published by the International Joseph Schumpeter Society. Much work in the tradition of Nelson and Winter, particularly concerning industrial dynamics, is identified within this genre.

The Austrian School of economists is often described as 'evolutionary', as portrayed in Carl Menger's theory of the evolution of money and other institutions, and by the extensive use of evolutionary ideas in the later works of Friedrich Hayek.

In addition, the economics of assorted writers such as Adam Smith, Karl Marx, Alfred Marshall and others are sometimes described as 'evolutionary' in character. Finally, evolutionary game theory is a prominent recent development in mainstream economics.

There is no good reason to claim than any one approach has greater claim to the 'evolutionary' mantle than another. Consideration of philosophical underpinnings is thus greatly complicated by this diversity of analysis and lack of consensus over meaning.

In particular, there is nothing in the etymology or usage of the term 'evolution' that necessarily connotes Darwinism. The word was used long before Charles Darwin; it was first applied to natural phenomena by the German biologist Albrecht von Haller in 1744. Darwin himself used the word sparingly.

'Evolution' is a term of wide meaning, often connoting little more than development or change. This is especially the case in modern French and some other languages, where 'evolution' or its equivalent is used frequently in everyday parlance to refer to any process of development, often referring to single entities. In English its usage is less common, and it sometimes refers more restrictively to natural selection, but there is no warrant to insist on that narrower meaning.

In the social sciences as a whole, the term 'evolution' fell out of favour between the two world wars. The term did not become more widespread until after the publication of Kenneth Boulding's (1981) *Evolutionary Economics*, Richard Nelson and Sidney Winter´s (1982) *An Evolutionary Theory of Economic Change* and Friedrich Hayek's (1988) *Fatal Conceit* (which developed evolutionary ideas from some of Hayek's earlier works from the 1960s and 1970s).

This shift in usage is clear from the bibliometric evidence. The number of articles or books in economics (in English) with the word 'evolution' (or derivatives) in their title or subtitle leapt from none in the 1940s and fifteen in the 1970s to 75 in the 1980s (Hodgson 2004, p. 416). From 1990 the count has increased well into the hundreds (Silva and Teixeira 2009).

Although the books by Boulding, Hayek, and Nelson and Winter all incorporated Darwinian ideas, their use was qualified, reluctant or even inexplicit (Hodgson 1993, 1999). Being the most influential of the three, Nelson and Winter's (1982) volume mentioned Darwin only once in passing, ignored Veblen, and claimed a pre-eminently 'Schumpeterian' influence for its approach. Yet their theory embodied Darwinian processes of variety-creation, information inheritance, and selection. They even drew an analogy between routines and genes. But ironically Joseph Schumpeter eschewed the use of Darwinian ideas in economics and all biological analogies (Hodgson 1993, Witt 2002. Andersen 2009).

Although the word evolution became popular, and Darwinian ideas were stalking in the shadows, many economists remained reluctant to go so far as Veblen and tackle economic

evolution with the core principles of Darwinism. Nazism, racism, eugenics and other horrors of the twentieth century had repelled many social scientists from any use of ideas from biology (Degler 1991). This resistance is still apparent today.

Despite this, by the 1990s it was possible to write of an international network or 'invisible college' of 'evolutionary economists' who, despite their differences of approach, were focusing on the problem of analysing structural, technological, cultural and institutional change in economic systems (Verspagen and Werker 2003, Witt 2008, Silva and Teixeira 2009). Reference within this informal college is typically made to a variety of alleged precursors such as Schumpeter, Hayek, Marshall and Veblen, but the evolutionary college is too amorphous and eclectic to warrant a description in terms of a single mentor or school. Notably, although this college has many outposts in Asia, Australasia and the Western Hemisphere, it is particularly strong in Europe.

Despite its internal heterogeneity and lack of consensus on key issues, the networks, journals and forums that developed after the late 1980s created a scattered but linked community of scholars addressing common problems and overlapping research agendas. They were also united by their common dislike of the static and equilibrium approaches that dominated mainstream economics.

Despite the lack of a commonly agreed theoretical framework, evolutionary economists began to make considerable headway in the application of their ideas to empirical and policy matters. Evolutionary economics quickly established an impressive research programme and had a major impact on economic policy, particularly in the areas of technology policy, corporate strategy and national systems of innovation (Dosi *et al.*, 1988).

Consequently it is possible to identify a loose community of 'evolutionary economists' and proceed to examine the philosophical issues that underlie both their achievements and their disputes. This task is further facilitated by a growing discourse within 'evolutionary economics' on philosophical questions.

2. Philosophical differences broadly considered

Scientific reasoning occurs on different levels, and disputes can occur on one or more of these. There is the ontological level concerning assumptions about the nature of reality, the epistemological level concerning how knowledge is gained and justified, the heuristic level concerning how problems are framed, and the methodological level concerning theoretical explanations and their construction. I indicate below that ontology is the most important for understanding differences of approach within evolutionary economics.

But there are important epistemological and methodological divergences as well. The ancient epistemological dispute between rationalism (deduction) and empiricism (induction) is reflected within evolutionary genres in the contrast between the axiomatic approach of evolutionary game theory and, on the other hand, the more empirically-oriented research.

Intermediate epistemological positions are possible. Darwin himself saw theory as a necessary prerequisite of empirical investigation: 'without the making of theories I am convinced there would be no observation' (F. Darwin, 1887, vol. 2, p. 315). Alfred Marshall (1920, p. 29) quoted and endorsed Gustav Schmoller's statement that: 'Induction and deduction are both needed for scientific thought as the left foot and the right foot are both needed for walking.' Similarly, the approach adopted by Richard Nelson and others combines

elements of grand theory with extensive empirical investigation (Nelson and Winter 1982, Malerba et al. 1999). Alongside the theoretical features of his earlier work, Nelson (2006, p. 491) has gone so far as to express qualified support for generalising Darwinian principles to cover social evolution.

Nevertheless, this epistemological divide between induction and deduction, and attempts to establish intermediate positions, are familiar throughout the history of economics and further exploration in general terms would add little that is new.

A major methodological difference concerns whether social phenomena can eventually be explained largely in biological terms (e.g. Hirshleifer 1977), or biological influences or constraints are too important to be ignored alongside additional cultural influences (Veblen 1899, Boyd and Richerson 1985, Camerer et al. 2005), or biological influences are so unimportant that they generally can be ignored in considering human potential (Rose et al. 1984). Underling this issue are important ontological assumptions about causal relations (Hodgson 2007a), particularly concerning the causal links between human biology and individual preferences and beliefs. It is possible that some denials of biological influences on preferences or beliefs are grounded on an ontological dualism, where the realms of human society and thought are somehow causally disconnected from biology and nature.

Once again, ontological issues lie beneath the surface. This has led to a growing literature on the ontology of evolutionary economics (Foss 1994, Herrmann-Pillath 2001, Hodgson 2002, Dopfer and Potts 2004, Vromen 2004, Hodgson and Knudsen 2006, Witt 2008). For these and other reasons the primary focus of this essay is on ontology. We turn to this in the following sections.

3. Primary ontological communalities with some secondary divergences

What is the nature of the world to which the principles of evolutionary economics apply? Among contemporary evolutionary economists there is universal agreement on four important features. But as we shall see below, basic agreement on the fourth feature within the evolutionary college is combined with some important additional differences of stress or interpretation, in addition to further differences explored in the next section.

First, and above all, it is a world of change. But this change is not merely quantitative or parametric: it involves qualitative changes in technology, organisations and the structure of the economy (Schumpeter 1934). The equilibrium orientation of much mainstream economics is criticised precisely for its limited ability to embrace such qualitative change (Klaes 2004).

Second, an important feature of economic change is the generation of novelty. Variety and its replenishment through novelty and creativity is a central theme of contemporary evolutionary economics. Nicolai Foss (1994, p. 21) argues that evolutionary economics of the type developed by Giovanni Dosi, Richard Nelson, Sidney Winter, Ulrich Witt and others is concerned with ‘the transformation of already existing structures and the emergence and possible spread of novelties.’ Accordingly, Witt (1992, p. 3) writes: ‘for a proper notion of socioeconomic evolution, an appreciation of the crucial role of novelty, its emergence, and its dissemination, is indispensable.’ And Witt (2009) addresses novelty in more depth.

Novelty drives technological and institutional evolution. But by its nature it is unpredictable (Popper 1960) and implies a unidirectional arrow of time. Consequently modern evolutionary economists are generally cautious about the possibilities for prediction

and regard the predictions of mainstream economists as typically grounded on a neglect of novelty, uncertainty, and surprise.

Third, evolutionary economists stress the complexity of economic systems. There are various definitions of ontological complexity, but many invoke the key idea of causal interaction between a number of entities with varied characteristics (Saviotti 1996). Such complex ontologies involve non-linear and chaotic interactions, further limiting predictability. They create the possibility of emergent properties and further novelties. And generally the combination of novelty and complexity make many evolutionary changes irreversible (Dosi and Metcalfe 1991).

Fourth, just as Darwin showed that intricate and complex phenomena can emerge without God or design, evolutionary economists adopt the insight of Friedrich Hayek and others that many human institutions and other social arrangements evolve spontaneously through individual interactions, without an overall planner or blueprint.

But universal acceptance of the importance of self-organisation or undesigned order does not mean unanimity on its ontological details or its explanatory significance. One crucial problem is whether markets or exchange are the universal ether of human interaction (from which spontaneous order emerges) or whether markets and contracts depend significantly on other institutions (such as the state) and whose evolution has to be explained, which may in fact involve a significant measure of planning or design, as well as spontaneity (Vanberg 1986, Hodgson 1993, 2009). Differences of view over the latter issue lead to a variety of policy positions over the roles of states or markets in the evolutionary college, which I do not begin to explore here.

There is also a divergence over whether the idea of self-organisation is sufficient to explain social evolution (Foster 1997, p. 444), or is an ‘abstract, general description of evolutionary processes’ (Witt 1997, p. 489), or has to be supplemented by other major mechanisms such as selection (Kauffman 1993, Hodgson and Knudsen 2006, in press, Aldrich et al. 2008, Geisendorf 2009).

4. First primary ontological divergence: dualism versus monism

There are two major areas of (overt or covert) ontological dispute within the evolutionary college. The first concerns monism versus dualism. The second concerns the demarcation of entities within the evolving system, and the impact of that demarcation on theory construction. These two divergences are addressed sequentially in this and the following section.

The ontological dispute between monism and dualism is central to philosophy and has major (but often unacknowledged) implications for the social sciences. Ontological dualism asserts that mind (or spirit) and matter are disconnected and fundamentally distinct kinds of substances. By contrast, monists uphold that ultimate reality is entirely of one kind of substance, and accordingly there is potential causal interaction between any one segment of reality and another.

Most modern monists describe the stuff of reality as matter. By contrast there is an alternative idealist-monist tradition that sees ideas as the essential stuff of the universe, as recently posited by evolutionary economists Kurt Dopfer and Jason Potts (2008, p. 3).

Emergentist materialism is a relatively nuanced version, and does not deny the reality of mind. It upholds that material reality is structured in different levels, resulting from complexities of interaction and emergent properties (e.g. Bunge 1977, 1979). Mario Bunge (1980) classifies Darwin as an emergentist materialist. Darwin saw the human mind and intentionality as themselves *caused* – rather than *insignificant*, as some misinterpreters suggest – and hence potentially subject to causal explanation (Dennett 1995, Hodgson 2004). Partly for the reason, Darwinism had an early impact on philosophy, psychology and the social sciences (James 1890, Veblen 1898, Dewey 1910).

By contrast, some economists deny that intentions and beliefs are caused on the grounds that to assume otherwise would undermine the reality of human agency or spontaneity. Hence, George Shackle (1986, pp. 281-2) posits the "uncaused cause" and Lanse Minkler (2008, p. 21) argues for an individual "free of external causes." Jack Vromen (2001) ably counters such arguments: the fact that intentions are somehow caused or determined does not mean that human agency is any less substantial or real. If our intentions are caused it does not mean that we are released from responsibility for our actions. And even if they were uncaused it would not mean that individual responsibility was real (Dewey 1894, Hodgson 2004, pp. 61-2).

Sometimes reflecting an implicit dualism, much of social science takes preferences, reasons or beliefs as given. This 'folk psychology' obscures a much more complex neurophysiological reality. It cannot adequately explain the origins of preferences, reasons and beliefs. Commonplace 'mind-first' explanations of human behaviour are unable to explain adequately such phenomena as sleep, memory, learning, mental illness, or the effects of chemicals or drugs on our perceptions or actions (Bunge 1980, Damasio 1994, Rosenberg 1995, Kilpinen 1999).

Witt (2008) emphasises the importance of the divergence between monism and dualism for evolutionary economics. He points out that much theorising in the Schumpeterian and Nelson-Winter traditions fails to examine possible biological influences on economic phenomena, such as the impact of the human genetic endowment on human capabilities and behaviour. But to be fair, this neglect does not necessarily stem from ontological dualism. It could flow from a monist ontology combined with a view that human nature is highly malleable, and that genetic constraints are of lesser explanatory importance. Whether the latter view is valid is different matter. Its veracity or falsehood cannot be determined without empirical enquiry.

Witt stresses not only ontological monism but also the significance of understanding the causal and constraining roles of the human genetic endowment in social science. On this basis Witt (2004, pp. 131-2) establishes the 'continuity hypothesis' according to which natural evolution has 'shaped the ground, and still defines the constraints, for man-made, or cultural, evolution … economic evolution can be conceived as emerging from, and being embedded in, the constraints shaped by evolution in nature.' But this important idea pre-dates Darwin and modern evolutionary theory. For example, Auguste Comte (1853, vol. 2, p. 112) wrote: 'Biology will be seen to afford the starting point of all social speculation in accordance with the analysis of the social faculties of Man and the organic conditions which determine its character.' Today the idea that the natural world shapes and conditions the social has become commonplace, even among social scientists. The problem is that social scientists disagree on the nature, impact and relevance of the genetic constraints.

The continuity hypothesis directs our attention at possible biological determinants of human behaviour. But contrary to one of its supporters (Cordes 2006), there is nothing in this hypotheses that overturns the different idea that Darwinian principles can be generalised to embrace social evolution (as outlined later below). For Witt this enquiry does not overturn generalised Darwinism, but neither does it require it.

5. Second primary ontological divergence: a population ontology

A second ontological divergence is less prominent in the history of philosophy, although it was discussed by Alfred N. Whitehead (1929). I suggest the term 'plurality principle' to refer to an ontological plurality of demarcated entities. This is not the same as ontological pluralism, which refers to multiple, disconnected kinds of being, and of which ontological dualism is one example. Instead it 'conveys the notion of disjunctive diversity ... There are many "beings" in disjunctive diversity' (Whitehead 1929, p. 31). The plurality principle is consistent with monism because the plurality of entities could be made of the same substance. It upholds that reality consists of many demarcated entities, and every entity is different (at least in terms of its timing or position) from every other entity.

Whitehead influenced systems theory, where notions of system and subsystem are ubiquitous (Miller 1978). In turn there may be sub-sub-systems, and so on. Entities within populations may themselves contain populations, leading to a more complex ontology. In any case the problem here is to define and account for the boundaries and integrity of each entity or subsystem in the plurality. This task is very tricky, and there is no consensus on a clear definitional formula. The plurality principle relies on the existence of sufficient integrity and coherence within multiple entities, including sufficient interdependence of each entity and its components, to establish boundaries between multiple entities and establish a plurality of (sub)systems.

A population ontology is a special plurality of demarcated entities. There are many individually different and demarcated entities, grouped in populations according to some shared characteristics. Obvious examples would be industries containing firms, and hence such a population ontology will be recognised by most evolutionary economists. Divergences in the college occur partly because of different degrees of ontological salience given to the plurality principle and the role it plays in the development of theory.

Consider, for example, the question of endogenous versus exogenous change. In his studies of economic evolution, Schumpeter (1934, p. 63) repeatedly emphasised the sources of change 'from within'. Other evolutionary economists, including Witt (1992) and Esben Sloth Andersen (1994), have followed this definitional emphasis on a self-transforming economic system. For this claim of endogenous change to be meaningful there must be some notion of a bounded system that does not itself exhaust the universe. If there is nothing without that system, then the claim that change is driven from within is trivial. So where do the boundaries lie? One passage is illuminating. Witt (2008, p. 551) writes:

> Consider something that evolves, be it the gene pool of a species, a language spoken in a human community, the technology and institutions of an economy, or the set of ideas produced by the human mind. Although such entities can change over time in response to exogenous ... forces ... their genuinely evolutionary feature is that they are capable of transforming themselves endogenously over time. ... In the biological domain, for instance, the crucial processes are genetic recombination and mutation.

Notice first that the first sentence refers to 'something that evolves' (despite several items on the list clearly having multiple members). This establishes the foremost boundary around the whole 'something' or the 'set', and downplays any additional boundaries around individual members of any set. In other words, the population characteristics of any set are given less emphasis. Second, there is no explanation given why self-transformation (of one entity) is more 'genuine' than other forms of evolution (such as those that involve multiple entities). Third, population characteristics are overlooked even when Witt turns to biology for illustration. Accordingly, the last quoted sentence concerning 'the biological domain' sympotomatically omits any mention of natural selection.[2]

Importantly, selection is meaningful only within an ontology of populations of multiple entities. Consequently 'population thinking' becomes necessary (Mayr 1976, 1982). A corollary of the plurality principle is that their evolution can involve not only the immanent transformation of individual entities, but also changes resulting from interactions with other entities, as well as with their environment. Once we have an ontology involving such populations, then questions arise not only concerning the development of each individual entity, but also how each entity interacts with others, and why some entities survive longer and are more successful in some sense than others.

This ontological consideration is relevant for another group of researchers, which overlap to some degree with the evolutionary college. Much of 'complexity theory' addresses not complex phenomena in general, but a particular form of complexity typically described by John Holland (1992), Brian Goodwin (1994), Stuart Kauffman (1995), Ralph Stacey (1996, 2003), Brian Arthur *et al*. (1997) and many others as a 'complex adaptive system'. Although many accounts address singular systems, often these are made up of multiple interconnected entities. In complex adaptive systems theory a number of agents interact with each other and together form a system that adapts to its environment. Consideration of whether a particular object of analysis involves a population ontology is relevant for this literature as well.

6. From complex population systems to generalised Darwinism

Population ontologies involving further important characteristics are described as 'complex population systems' (Hodgson and Knudsen 2006, in press, Aldrich et al. 2008). By definition, complex population systems contain multiple varied (intentional or non-intentional) entities that interact with the environment and each other. They face immediately scarce resources and struggle to survive, whether through conflict or cooperation. They are mortal or degradable and thus engaged in a *struggle for existence* (Darwin 1859, pp. 62-63). They adapt and may pass on information to others, through replication or imitation. (Information here is defined very broadly, in the Shannon-Weaver sense of conditional dispositions or coding that can be transmitted to other entities and cause a response.) Examples of complex population systems are plentiful both in nature and in human society, despite their special definitional features. They include every biological species, from amoeba

[2] In a written comment on a previous version of this paper, Witt explained that he omitted selection here 'because it reduces variety rather than creating it.' This may be true of subset selection but not generally of successor selection. Subset selection simply means the elimination of some members of a set. By contrast, in successor selection – which is important in both natural and social evolution – new entities are created alongside others that expire (Price 1995, Hodgson and Knudsen, in press, ch. 5).

to humans. And importantly for the social scientist, they include human organisations, as long as we regard organisations as cohesive entities having some capacity for the retention of information. An economic example is an industry involving cohesive organizational entities such as business firms.

In this manner, the common ontological features of all complex population systems, including in nature and human society, are established, without ignoring the huge differences of detail between them.

The evolution of any complex population system *must* involve the three Darwinian principles of variation, selection and retention (Campbell 1965). These abstract principles do not themselves provide all the necessary details, but nevertheless they must be honoured, for otherwise the explanation of evolution will be inadequate. In particular, investigations into complex population systems must address (a) the sources and replenishment of variety in the population, (b) how information is passed from one entity in the population to another, and (c) why some entities are more successful in surviving or passing on information than others. These three explanatory requirements map onto the three core Darwinian principles of variation, replication and selection. To make this move, these Darwinian principles have to be defined in sufficiently abstract and general terms, so that they are no longer confined to the biological domain (Hull 1988, Hull et al. 2001, Hodgson and Knudsen, in press).

Consider these explanatory requirements in more detail. First, there must be some explanation of how variety is generated and replenished in a population. In biological systems the answers – established since Darwin's death – involve genetic recombination and mutations. By contrast, the evolution of social institutions involves innovation, planning and other mechanisms very different from the detailed processes found in biology (Crozier 2008).

Second, there must be an explanation for how useful information concerning solutions to particular adaptive problems is retained and passed on. This requirement follows directly from our assumptions concerning the broad nature of complex population systems, wherein there must be some mechanism by which adaptive solutions are copied and passed on. In biology, these mechanisms often involve genes and DNA. In social evolution, we may include the very different replication or imitation of habits, customs, rules and routines, all of which may carry solutions to adaptive problems.

Third, and not least, there must be an explanation of the fact that entities differ in their longevity and fecundity. In given contexts, some entities are more adapted than others, some survive longer than others, and some are more successful in producing offspring or copies of themselves. This is the principle of selection. In its abstract definition, selection involves an anterior set of entities, each interacting with its environment and somehow being transformed into a posterior set where all members of the posterior set are sufficiently similar to some members of the anterior set, and where the resulting frequencies of posterior entities depend upon their properties in the environmental context (Price 1995). Through selection, a set of entities, a population, will gradually adapt in response to the criteria defined by an environmental factor. Even when both variety-creation and selection involve human agency, as often is the case in the human domain, the two processes are quite distinct. Innovation is about the creation of new variations, whereas selection is about how they are tested in the real world. It is important to emphasise that although fitness characteristics play a role in selection, in neither the biological nor the social world is the outcome necessarily optimal, efficient or desirable (Dupré 1987, Hodgson 1993, Gould 2002).

What is suggested here is that core abstract Darwinian principles themselves have a wider application than to biology alone. Darwin (1859, 1871) himself proposed that they might apply to the evolution of language and morality, as well as to biological organisms. Consideration of such a generalised Darwinism has a long history, including Veblen (1899), Donald T. Campbell (1965) and Richard Dawkins (1983).

But because the ontological presumptions of a complex population system are not universal, Dawkin's use of the term 'universal Darwinism' is misleading. That is why several authors prefer the term 'generalised' Darwinism (Hodgson and Knudsen 2006, in press, Aldrich et al. 2008, Stoelhorst 2008).

Second, it is important to emphasise that while Darwinian principles are employed, generalised Darwinism does not mean that social evolution is explained largely or wholly in biological terms. Indeed, the principles would apply to social evolution even if there were no significant genetic change. Darwinian principles are instead applied to *socio-economic* units, including organisations and their component customs or routines.

Third, generalised Darwinism is not a matter of biological analogies. It rests instead on purported ontological communality. Analogies take phenomena and processes in one domain as reference points for the study of similar phenomena or processes in another domain. Differences are regarded as dis-analogies. Social evolution is clearly dis-analogous to genetic evolution, because of the very different entities and mechanisms of replication (Crozier 2008).

By contrast, generalisation in science starts from a deliberately copious array of different phenomena and processes, without giving analytical priority to any of them. Where possible, scientists adduce shared principles. Given that the entities and processes involved are very different, these common principles will be fairly abstract and will not reflect detailed mechanisms unique to any particular domain. The very triumph of successful generalization is in the face of real and acknowledged differences at the level of detail (Kitcher 1981).

7. Conclusion: a strategy of reconciliation

From this perspective, a central feature of Witt's (2008) argument requires further thought. Witt (2008, pp. 551-5) distinguishes between two 'heuristic strategies', namely a 'generic concept of evolution' involving the 'twin concept' of 'novelty emergence and dissemination' and 'generalized Darwinian concepts'. He combines these two heuristics with the ontological split between monism and dualism to form a two-by-two matrix of types of evolutionary economics.

A problem with this configuration is that, contrary to Witt, generalised Darwinism is not simply a heuristic strategy but also more importantly it rests on specific ontological presuppositions. When we examine these presuppositions it is clear that Witt's 'generic concept of evolution' does not exclude generalised Darwinism. The latter also embraces the vital issue of 'novelty emergence and dissemination'. Hence contrary to a possible interpretation of Witt's two-by-two matrix there is no dichotomy between Witt's 'generic

concept of evolution' and the ontology of generalised Darwinism: the latter is a special case of the former.[3]

Cordes (2006) and Witt (2008, p. 559) warn of the dangers in adopting generalised Darwinism because it is 'domain specific'. But its principles are not specific to biology alone: they are specific to all complex population systems, including human society.

Obversely, one might warn of the dangers of confining ourselves to ontologies that are too domain general. Witt's 'generic concept of evolution' involves an ontology of singular 'somethings' that evolve. But for much analysis in the social domain it is important to get inside these 'somethings' and acknowledge their internal differention in terms of multiple entities. If multiple entities were fully acknowledged, then Witt's 'generic concept of evolution' would cease to be generic in a fullest sense. In particular, the failure to acknowledge multiple entities means that the nature of the process of diffusion of novelty must be considered within the whole, not from demarcated entity to entity. Similarly, this 'generic concept of evolution' cannot accommodate competition between different entities, without ceasing to be generic.

It is not clear how much can be built upon this extremely general ontological specification without adding additional features. In practice, it would seem that any application of this 'generic concept of evolution' to economic evolution must adopt a series of specific modifications that render the concept no longer generic. Furthermore, the more abstract of these modifications – such as the specification of an ontology of populations – are likely to move in the direction of complex population systems, as defined above. Witt's 'generic concept of evolution' is not wrong but insufficient.

Of course, there are many further important modifications that make the ontology even more specific than that of the complex population system. Important additional features that have to be brought into the picture at some stage are human intentionality, the capacity of humans for mental analysis and prefiguration, the nature of human sociality and cooperation, social institutions, and the development of different types and technologies of information transmission (Hodgson and Knudsen, in press). This means that the generalised Darwinian framework is also insufficient, but not that it is wrong (Hodgson and Knudsen 2006). To make any progress we have to move through several nested ontological specifications and levels of analysis (Hodgson 2001, pp. 329-30).

Consequently it seems possible to reconcile conflicting positions in this recent and intense dispute. Witt (2008, p. 559) complains that generalised Darwinism relies on abstract principles that apply to evolutionary biology and are then 'claimed to govern evolutionary processes in all spheres of reality.' If this were true it would apply *a fortiori* to Witt's 'generic concept of evolution' as well.

The fact that both generalised Darwinism and Witt's 'generic concept of evolution' apply to both biological and social evolution does not make them invalid. We are addressing abstract common principles that apply to both domains. This has been recognised by several leading evolutionary economists. As Sidney Winter (1987, p. 617) writes:

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[3] In a written comment on a previous version of this paper, Witt clarifies that while the choice between columns of his matrix (between monism and dualism) is dichotomous, the row choice between the two different 'heuristics' is 'not a dichotomy but a difference.'

> In sum, natural selection and evolution should not be viewed as concepts developed for the specific purposes of biology and possibly appropriable for the specific purposes of economics, but rather as elements of the framework of a new conceptual structure that biology, economics and other social sciences can comfortably share.

J. Stanley Metcalfe (1998, pp. 21-2) developed this point in more detail:

> That evolution is a core concept in biology does not mean that it is an inherently biological concept. Evolution can happen in other domains providing that conditions for an evolutionary process are in place. Thus, as economists applying evolutionary ideas to economic phenomena, we can learn from the debates on evolutionary biology in order to understand better the logical status of concepts such as fitness, adaptation and unit of selection without in any sense needing to absorb the associated biological context.

Metcalfe (p. 36) continues:

> Nothing I have said is intrinsically a matter of biological analogy, it is a matter of evolutionary logic. Evolutionary theory is a manner of reasoning in its own right quite independently of the use made of it by biologists. They simply got there first …

Both these authors hint at Darwinism without mentioning it by name. They also show explicitly that leading evolutionary economists start from general, abstract principles that apply to both biological and social evolution. The latter is also true of Witt (2008). This common ground suggests the possibility of reconciliation on some fundamental issues, while retaining a creativity diversity of detailed approaches.

The first step in strategy of reconciliation proposed here is to acknowledge that Witt's 'generic concept of evolution' and generalised Darwinian principles both apply to social and economic evolution, by virtue of their overlapping ontological stress on novelty and change. The further ontological presuppositions of generalised Darwinism are a special case of Witt's 'generic concept of evolution'. The second step is to understand that they are on different levels of abstraction. The third is to acknowledge that no single level of abstraction is adequate to approach the details and specificities involved.

While both Witt's 'generic concept of evolution' and generalized Darwinian principles apply, it is clear that the detailed mechanisms in society and nature are very different. Darwinism thus provides a metatheoretical framework, within which specific, detailed explanations must be placed. Darwinism, as such, cannot provide all the answers. Similar remarks apply to Witt's 'generic concept of evolution'.

The challenge for both generalized Darwinism and Witt's 'generic concept of evolution' is to show that they can have an important impact on the development of middle-range theory and serve as a useful guide for empirical enquiry. As Sandra Silva and Aurora Teixeira (2009) reveal, empirical work in evolutionary economics is relatively scarce, and there is a need to redirect the evolutionary research agenda. But theoretical frameworks are always necessary to guide empirical enquiry, and some consensus on theoretical fundamentals should empower this mission. A common recognition of the overlapping and nested ontologies discussed above, combined with a shared acknowledgment that vital matters of detail must always be added, provides a route towards reconciliation of apparently conflicting positions and a means of joining forces and framing shared problems in empirical analysis and middle-range theory construction.

Given these developments, the possibility emerges that evolutionary economics begins to generate a theoretical paradigm that to rival mainstream theory. This involves the shared evolutionary assumptions of a changing complex world that generates novelty. Agents therein have limited memories and cognitive capacities and assume that the rationality of others is similarly bounded (Hodgson 2007b). The work of Nelson and Winter (1982) has already generated extensive discussion of the role of routines in storing information within organisations (Becker 2008). More broadly, generalised Darwinian principles point to the need to examine different mechanisms of information retention and transmission between institutions, and the conditions of informational replication that have the potential to generate greater complexity (Hodgson and Knudsen, in press). Witt (2008, 2009) and others enhance this theoretical agenda of information transmission and complexity-generation, by pointing to the wellspring of novelty and examining the extent to which biological factors frame economic evolution. The overall promise here is for an economics that transcends static theory and accommodates a richer picture of the complexities and specificities of economic change.

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