

## Evolutionary Theorizing Beyond Lamarckism: a reply to Richard Nelson

Geoffrey M. Hodgson · Thorbjørn Knudsen

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We welcome the debate that our article ‘Dismantling Lamarckism: Why Descriptions of Socio-Economic Evolution as Lamarckian Are Misleading’ (Hodgson and Knudsen 2006b) has inspired. A purpose of our article was to clarify the nature of the processes that are supposedly captured by the notion of Lamarckism. This topic relates to a wider set of issues on the agenda of evolutionary thinking in economics, business studies and the social sciences more broadly. As our focus in this paper was Lamarckism, the article did not engage with this broader set of issues relating to general advances in evolutionary theories of economic and cultural change.<sup>1</sup>

Richard Nelson raises a number of important points in his commentary to our article. There are several points of agreement, including his remark that socio-cultural evolution involves the generally unplanned selection of entities and the whole process is thereby ‘Darwinian in spirit.’

His criticisms can usefully be grouped in two sets. Firstly, disagreement as regards the notion of Lamarckism and nature of the empirical processes this term is supposed to characterize. Secondly, a skeptical assessment of our perspective—elaborated not in Hodgson and Knudsen (2006b) but principally in other works—on the broader set of issues relating to evolutionary thinking in economics, business

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<sup>1</sup>Some of these have been considered in companion articles, particularly Hodgson and Knudsen (2006a).

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G. M. Hodgson (✉) · T. Knudsen  
The Business School, University of Hertfordshire, De Havilland Campus, Hatfield, Hertfordshire  
AL10 9AB, UK  
e-mail: g.m.hodgson@herts.ac.uk

G. M. Hodgson · T. Knudsen  
Strategic Organization Design Unit (SOD), Department of Marketing and Management,  
University of Southern Denmark, Odense Campus, 5230 Odense M, Denmark

studies and the social sciences. We welcome the opportunity here to further clarify our position on both of these topics.

## 1 Lamarckism: a vaguely defined and little used term in economics

Our article on Lamarckism upheld that the term is vaguely defined. We identified three meanings that are historically associated with the term: 1) inheritance of acquired characters, 2) evolution towards increased complexity, and 3) emphasis on deliberation and purposiveness in processes of evolutionary change. It was our impression that authors in the social sciences often use the term in the sense of the first meaning. For example, Nelson and Winter (1982) had earlier considered the inheritance of acquired characters and the timely appearance of new variation as prominent Lamarckian features of their evolutionary theory of economic change.<sup>2</sup>

Nelson's commentary finds our definition of Lamarckism in terms of the inheritance of acquired characters inappropriate and generally takes issue with the concept of inheritance. In his commentary he defines Lamarckism in terms of the adoption of profitable practices.<sup>3</sup> While a reasonable description of social learning is associated with imitation and diffusion of technology, we find it odd to describe such processes as Lamarckian. However, this raises the concern that we might have overlooked common agreement in economics that invests Lamarckism with such a meaning.

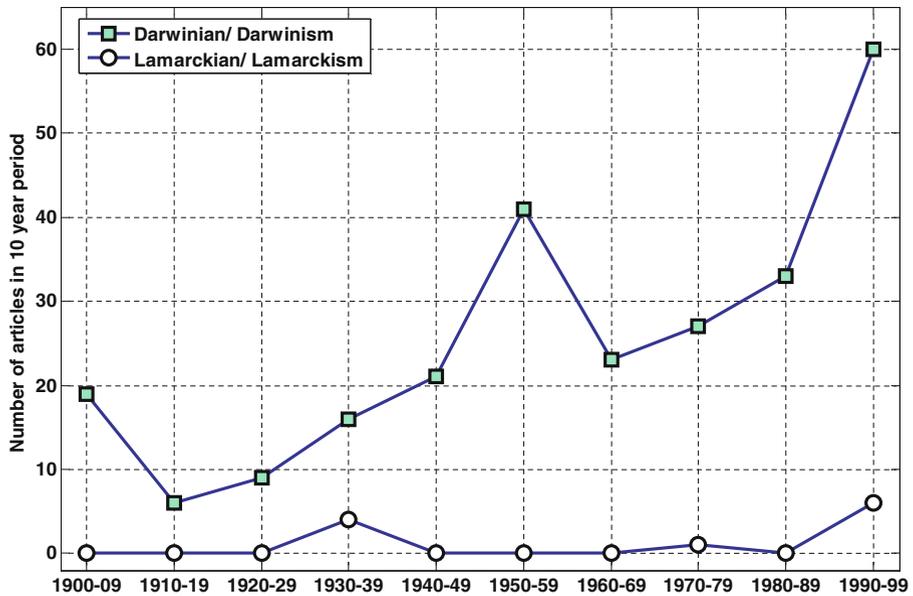
To address this issue we have now conducted a search of the 27 economics journals contained in the JSTOR database. Our search spanned the period from 1900–1999. It identified regular articles that contained either of the terms 'Lamarckism' or 'Lamarckian.' For purposes of comparison, we conducted a similar search for either of the terms 'Darwinism' or 'Darwinian.'

Perhaps surprisingly, the immediate result of our search was that that the notion of Lamarckism turned out to be unimportant in economics (see Fig. 1). This is despite Nelson and Winter (1982) and other prominent economists such as Hayek (1988) using the term. Over the last 100 years, only 11 articles in the 27 journals representing the economics literature in JSTOR have used the terms Lamarckism or Lamarckian. Among those few articles that actually contain either 'Lamarckism' or 'Lamarckian,' there is a notable vagueness in the definitions of these terms. We did not find a single article that defined Lamarckism in terms of adoption of profitable practices, the definition now proposed by Nelson. It therefore strikes us as peculiar to promote a new use of the term Lamarckism in the way that Nelson suggests in his commentary. We can find no prominent precedent. Even though purposeful change and adoption of practices are important phenomena in economics, we do not

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<sup>2</sup> An oft quoted passage reads: 'our theory is unabashedly Lamarckian: it contemplates both the 'inheritance' of acquired characters and the timely appearance of variation under the stimulus of adversity.' (Nelson and Winter 1982, p. 11). However, Nelson offers a new characterization of Lamarckism in his commentary on our 'Dismantling Lamarckism' article.

<sup>3</sup> Nelson also adds another meaning of Lamarckism, namely the idea that change is purposeful rather than strictly random. As we explained in our article, in the obvious and general sense that 'most living organisms anticipate, choose, and strive for prefigured goals', this meaning of Lamarckism is uncontroversial and does not exclude Darwinism.



**Fig. 1** Regular articles among the 27 economics journals in JSTOR that contain either the term ‘Lamarckism’ or ‘Lamarckian’. The results for a similar search for either of the terms ‘Darwinism’ or ‘Darwinian’ are also shown

understand why the Lamarckian label should be invoked to capture these phenomena. What is gained by using a term that is often vaguely defined and generally invested with other meanings?

Despite vital differences in the phenomena and mechanisms involved, some concepts from biology have turned out to be very useful in economics. Nelson and Winter (1982, p. 9) famously acknowledged this. For us, the most important are Darwinian evolution and its tripartite principles of variation, selection and inheritance. As can be seen from our search of the JSTOR database, the notion of Darwinism is now well-established in the economics literature.<sup>4</sup>

## 2 What empirical phenomena are captured by the Lamarckian notion?

Since the idea of Lamarckism appears more in discussions of cultural evolution outside economics, it may be useful to consider the commonly held definitions of this idea and the actual cultural processes that correspond to it. Even though Lamarckism is a biological term, we can abstract from the biological particulars and assess the claim that social processes are Lamarckian.

The candidate processes include simple random walks as well as more sophisticated dynamics. A critical distinction can be made between those processes

<sup>4</sup> Over the last 100 years, 255 articles in the 27 journals representing the economics literature in JSTOR have used the terms Darwinism or Darwinian. In contrast, only 11 articles in these journals have used the terms Lamarckism or Lamarckian in the same period.

that are grounded in a two-level explanation and those processes which only admit a single level. Our article made the fundamental point that a definition of Lamarckism requires a two-layer scheme. Acquiring traits through learning and adaptation is a necessary condition of Lamarckism, but it is insufficient. If learning or adaptation were sufficient to qualify, then a huge number and variety of developmental processes, in both nature and human society, could be described as Lamarckian. Sensibly, such a labelling practice is rare. In order to qualify as meaningful Lamarckism, the acquired traits must also be encoded in an instruction set that is passed on to the next generation. In biology, the instruction set is called a gene. A more general concept that abstracts from the biological context is the replicator.

Two distinctive processes are captured in the commonly held definition of Lamarckism as the ‘inheritance of acquired characters’. First, traits can be acquired through social learning associated with imitation, diffusion of technology, reinforcement and the like. Learning is here constrained by the individual’s capacity to learn. Second, what is acquired must then be inherited. Our article clarified that inheritance concerns the transmission of encoded information. With Lamarckian inheritance, the encoded information is modified before transmission.

When defined in terms of inheritance of acquired characteristics, Lamarckism offers a testable hypothesis as regards the nature of evolutionary processes. The instruction set contained in the replicator/genotype is modified when the individual entity adapts to environmental conditions and is then transmitted. Darwinian explanations do not in principle exclude this Lamarckian possibility. But within a Darwinian framework there are other alternatives, such as the anti-Lamarckian proposition that the instruction set contained in the replicator/genotype is *not* modified before it is transmitted. These are largely empirical questions, in both natural and human socio-economic evolution.

### 3 The force of Darwinian theorizing comes from a two-layered explanation

In a Darwinian process, the traits of an entity develop according to the instructions in its genotype and the influence of environmental conditions. Through its development, the individual entity may adapt to its environmental conditions within the possibilities given by its instruction set. It is therefore important to understand how the instruction set (genotype) maps onto traits (phenotype). Moreover, the instructions for a character may be quite open-ended, allowing multiple conditional responses or a gradual fixation through learning. The fundamental point is that evolutionary theory, both in economics and biology, spans two levels: that of an instruction set and that of the realization of the instruction set. In biology, these two levels are referred to as genotype/ phenotype. We do not shy away from using the terms genotype/phenotype in the abstract, but prefer the more general terms replicator/interactor. The core of the evolutionary explanation causally connects these two levels in a definition of selection processes. Becker et al. (2006, p. 363) recently provided a description of these ideas:

The original core ideas of evolutionary models in biology and economics emphasized adaptation to an exogenous environment through differences in the

survival rate of genes (routines) and through differences in the replication rate of genes (routines) that reproduce precisely except for rare, random mutations. Variation in survival and birth rates are described as fitness components that reflect differences in the adaptiveness of traits to the environment, and traits are thought to reflect genetic variation reliably. Variation among genes is produced by mutations, and variation among genetic combinations is produced by reproductive combinatorics. Selection among genes is produced by selection among genetic combinations. Selection feeds on variation in trait differences to produce genetic distributions that better reflect the requirements of the environment. Insofar as the selection process involves reproductive combinatorics, it also reproduces the variation it feeds on. The process is imagined to be relatively efficient in matching gene pools to environments.

Our perspective concurs with the above description. The force of Darwinian theorizing comes from a set of principles spanning a two-layered explanation. In consequence, we must carefully examine the empirical processes that we are trying to capture in our theories. Rather than black-boxing the way information is transmitted among entities and then expressed in processes of learning and reinforcement, we find that these issues deserve detailed analytical study and empirical tests.

#### 4 Evolutionary theorizing beyond simple random walks

Evolution is a broad and inclusive term, and some evolutionary processes can be quite simple. Nelson's commentary offers a useful example about the changing distribution of seed types used by farmers in a community:

Initially all farmers use the same kind of seed. Then one farmer finds and switches to another kind which turns out to be more productive. Other farmers observe this, and they gradually switch over. Then another farmer discovers still another new kind of seed, which is still more productive. Etc.

The dynamics here are clearly evolutionary. However, a number of critical assumptions are implicit. Apparently, farmers have some ability to discriminate between seed quality on the basis of what they observe. It would not be unreasonable to assume that a farmer actually becomes a better judge of seed quality as he samples both personal and vicarious experience. As well as adopting grain that appears profitable, farmers can inherit by cultural transmission a learned ability to discriminate seed quality. The way farmers and other social agents inherit cultural information is therefore of importance and interest. In some cases, the assumption of given preferences and given abilities to evaluate alternatives may be appropriate, as suggested by Nelson's example, but we find also that changes of preferences and abilities are important phenomena that deserve explanation. Not only are we interested in the evolution of seed quality, we are also interested in the evolution of knowledge among farmers.

In our article, we broadly consider proclivities or dispositions to engage in a particular behavior in a particular situation as distinct from the behavior itself. Even

though a farmer has a propensity to choose high quality grain with probability 0.9, he may end up with a low quality grade. The clean distinction between disposition and behavior that we propose is similar to the well-known distinction between a probability of the occurrence of an event and the actual realization of an event. The distinction between dispositions and outcomes is also prominent in modern philosophy of science (Harré and Madden 1975; Popper 1990). It arises because what a thing *is* cannot merely be what it *does*. Otherwise professors would cease to exist as professors when they were engaged in non-academic activities, and firms would cease to be firms when their workers were on holiday. It is therefore clear to us that there is a sharp conceptual distinction between proclivity and behavior, with the former generative and the latter generated.

Obviously some dispositions arise from repeated behaviors, which in turn give rise to a reinforcement of these dispositions. Even though empirical distinctions between behavior and dispositions may appear blurry in such cases, there is an important reason why they should feature as distinctive concepts in evolutionary theories of economic and cultural change. Dispositions can be regarded as conditional probabilities that may be summarized in rules. By way of written or spoken language, it is possible to communicate rules. We find that it is critical to get a better understanding of the ways information is transmitted in processes of cultural and economic change, as distinct from the behavior (and other properties) such information stimulates. This motivates our emphasis on processes that are grounded in a two-level explanation, rather than focusing on simple random walks as suggested by Nelson.

For us, a theory that can explain the emergence and evolution of language, law and economic institutions must admit a two-layered explanation with information sets at one level and their actual expressions at another. We refer to information sets that can be transmitted as replicators and use the term interactor to capture the actual expression of replicating information sets. An example of this two-level distinction would be the information contained in a firm's generic and functional strategies and the way this information is expressed in daily activities. The information set is a replicator. It contains a number of useful conditional expressions, which in part may be transmitted from colleagues, consultants, and MBA courses. The firm is an interactor (Hodgson and Knudsen 2004). It interacts as a cohesive whole in a way that makes replication of its information set differential. Its partners and peers may try to get access to its secrets if the firm does very well and they are likely to shy away if it flounders.

Following Nelson and Winter, we are prepared to exploit any appropriate idea from biology that helps us to explain socio-economic reality.<sup>5</sup> We find that the concepts of replicators and interactors suit our purposes in advancing evolutionary theory that can explain important puzzles relating to the emergence and evolution of language, law and economic institutions. To us, one of the most important features

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<sup>5</sup> Nelson and Winter (1982, p. 11; emphasis in original) wrote: 'We are pleased to exploit any idea from biology that seems helpful in the understanding of economic problems, but we are equally prepared to pass over anything that seems awkward, or to modify accepted biological theories radically in the interest of getting better *economic* theory.'

of cultural selection processes is the way in which interaction among individuals and organizations causes differential replication of cultural information. Rather than developing ad hoc theories on the basis of empirical observation, we would argue that it is a much sounder and more promising position to develop testable hypotheses from a theory that adequately captures the stylized features of the processes we wish to understand.

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