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## Biological Metaphors, Socio-Economic Theory and Reductionism

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### Abstract

*A number of economists and social theorists refrain from the use of biological metaphors in the substantive sense out of fear of reductionism. Reductionism is understood here as the explanation of properties of one phenomenon in terms of the properties of the components that make up that phenomenon. The paper shows that the fear of biological metaphors is misplaced. Firstly, it distinguishes between methodological individualism in general and biological reductionism in particular. Secondly, it is argued that even when biological metaphors are used in the substantive sense, they need not entail biological reductionism. Social scientists may rather benefit from the employment of biological metaphors insofar as they are used to reveal the unity of phenomena at hand. The exposed similarity between biological and social processes does not necessarily promote a reductionist mode of analysis.*

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### 1. Introduction

Metaphors are powerful images which facilitate the cognizance of an obscure phenomenon by appealing to a relatively more understood one. The paper focuses on a particular brand of metaphors - metaphors imported from biology in order to explain human behaviour and social organization. Such an importation has given rise to many

problems, one of which is reductionism as epitomized in sociobiology (Wilson, 1975; Dawkins, 1976). The practice of reductionism is understood here as the claim of the full recovery of the basic features of the organization by describing the features of the members that make it up (Elster, 1983, pp. 20-23; Khalil, 1995b, 1997a).

The paper argues that the use of biological metaphors to explain human phenomena does not necessarily lead to reductionist socio-economic theory. The paper proceeds in section two by defining methodological individualism. Section three considers whether biological metaphors necessarily involve methodological individualism. Section four analyzes whether methodological individualism imperatively leads to biological reductionism and section five questions whether the scientific method is synonymous with reductionism.

### 2. What is methodological individualism?

The term 'methodological individualism' is used throughout the paper in the conventional sense, viz., as about reductionism (e.g., Lukes, 1973). In the conventional usage, the term signifies two major meanings. First, the mode of analysis pertains to substantial questions rather than merely to procedures of inquiry. That is, the issue is not simply the idea that social theory should start with elementary units of social organization without any implication about the relation of such

constitutive units to the whole. The issue is not about the search for the best procedure of explanation: Should we start with the whole or, better, commence with the parts in order to explain the specified macro phenomenon? The term 'methodological individualism' as used conventionally is rather associated with the theoretical proposition that the starting point of study, the level of components, are the primary factors which determine the preferences, capabilities, and traits of social organization. Thus, the features of the organization are basically recovered by the analysis of its constitutive units.

To caution, however, one should not assume that by simply starting the analysis with persons necessarily implies methodological individualism. The micro starting point may already embody the assumption that the social organization and its norms are more primary. For instance, while George Herbert Mead (1959, pp. 189-190) starts at the micro level, his analysis is not reductionist. He shows how through station switching - putting oneself in the shoes of others - individuals conform to the expectations of others. Such expectations are informed by social norms, which he takes as given. Mead succeeds in providing a micro account of how social norms are assimilated and adapted by persons, while still adhering to the theoretical primacy of social organization.

Second, methodological individualism is concerned with social organizations rather than with institutions which characterize such organizations. I cannot elaborate here on the difference between organizations and institutions (Khalil, 1995a). It is sufficient to state briefly that while organizations are agents with utility functions, institutions are merely rules and paradigms which restrict and inform the constraint functions. The issue at hand is the existence of agents such as organizations rather than the nature of the the

agents' particular constraints.

The issue of reductionism raises the question of whether the utility function of an organization is ultimately the aggregation of the utility functions of its members. The issue here is not whether institutions, characterizing an agent, are the product of optimization and, hence, subject to change with circumstance; or whether they are ingrained features of the identity of the agent and, hence, are not subject to change even when transaction costs are zero. The question of the nature of institutions is commonly confused with reductionism (e.g., Hodgson, 1991; see Khalil, 1997a). The nature of institutions is applicable to any agent irrespective of its level of hierarchy and, hence, does not invoke the issue of the relationship of the whole to its component members. Therefore, this essay ignores the problem of the nature of institutions.

### ***3. Do Biological Metaphors Lead to Methodological Individualism?***

Does the import of biological metaphors, such as altruism among organisms or social cooperation among nonhuman animals, imply that human behaviour is determined by lower-level, biological imperatives? To answer the question, one needs to distinguish carefully between naturalism and reductionism. As James Murphy (1993) argues, social theorists usually confuse these two modes of conception. Naturalism entails that human and nonhuman phenomena lie along a continuum; i.e., there is no need to appeal to extra-natural variables in order to explain human behaviour and organization (passim Khalil and Boulding, 1996). In contrast, reductionist analysis would explain the behaviour of the state, firm, or the family in terms of the needs (some of which are biological) of its constitutive members.

The idea of naturalism amounts to the

inclusion of human phenomena within the realm of nature. The naturalist agenda postulates that social phenomena can be fully modeled by the same tools used to analyze natural phenomena. As Arthur Danto expresses it:

Naturalism, in recent usage, is a species of philosophical monism according to which whatever exists or happens is natural in the sense of being susceptible to explanation through methods which, although paradigmatically exemplified in the natural sciences, are continuous from domain to domain of objects and events. Hence, naturalism is polemically defined as repudiating the view that there exists or could exist any entities or events which lie, in principle, beyond the scope of scientific explanation (Danto, 1967, p. 448).

Such a postulate means that the realm of the social should not be juxtaposed to the natural. The social is simply a variety of the natural. The social/natural continuum does not mean that social phenomena are caused by lower-level components such as the genetic endowment. It is possible to advocate the continuum without committing one's self to a specific stand on how higher-level organizations relate to lower-level ones. To illustrate, H. Thoben (1982) shows that one can advocate a naturalist discourse and equally subscribe to either what he calls 'mechanistic' analysis (i.e., reductionism or methodological individualism) or to 'organismic' analysis (i.e., functionalism or methodological holism) for economic discourse.<sup>2</sup> One may, along with Alfred Marshall (1920, pp. 200-201), liken the firm to an organism. However, such a metaphor is not clear. Does it entail that the firm is a

mere vehicle for the expression of the preferences of the constitutive members; or does it entail that the firm is an organic whole with its own course of development not specified by the preferences of the members?

Practitioners as well as critics of the use of biological metaphors confuse, to the detriment of social theory, the naturalist postulate with reductionism. Consequently, as Martin O'Connor (1988, p. 33) observes: 'the exploratory, experimental, indeed enigmatic character of social life is denied by the dominant naturalistic discourses of our day.' The denial of the enigmatic character of social life has been blamed on the naturalist agenda *per se*, rather than on specific reductionist practice. As a result, the naturalist agenda has been assumed to involve trans-historical reasoning, where novelty is reduced to supposed immutable facts of nature. Such an assumption would be undermined once the use of biological metaphors is not identified with the reductionist agenda.

The conflation of reductionism with the naturalist postulate may have arisen from the fact that both have been explicitly combined in the practice of some social theorists, notably neoclassical economists and behavioural psychologists. In the hands of such theorists, human action came to be viewed as mechanistic responses to stimuli as humans try to maximize satisfaction (e.g., Becker, 1976a), and human organization came to be regarded as basically a club whose goals can be fully reduced to the independent goals of its patrons (e.g., Alchian and Demsetz, 1972). Such views imply that human action lacks intentionality and, furthermore, human organization lacks individuality. Theorists, who want to assert intentionality and, further, a non-reductionist view of organization, have usually resorted to anti-naturalist stands which separate humans from the realm of nature

(e.g., Winch, 1958). Such theorists have erected a dichotomy between natural and human phenomena on the supposed grounds that a mechanistic view of behaviour and a reductionist view of organization should be restricted to nonhuman organisms. Similar to vitalism, i.e., the postulate of discontinuity between animate and inanimate matter,<sup>3</sup> such anti-naturalist researchers have appealed to some extra-natural variables, such as free will and the role of interpretation, in order to establish the uniqueness of human behaviour and organization.

The question of the relation between social and natural sciences winds in dark alleys of metaphysical character. The metaphysical question, which is different from epistemological and other concerns, asks whether human behaviour and organization are unique and, hence, separate from nature. In effect, it asks whether the world is made of one kind of entity, which would substantiate the naturalist agenda, or made of different kinds of entities, which would support anti-naturalism (Khalil, 1997a). For the anti-naturalists, one has to appeal to non-natural beings such as gods, angels, ancestral spirits, souls, and radical will in order to explain intentionality and, additionally, the individual-like character of organizations (Khalil, 1997b). Such an appeal amounts to the introduction of *deus ex machina* concepts in addition to the perceived concepts used in the investigation of atoms, cells, rocks, planets, and nonhuman organisms.

Austrian economists, especially of the subjectivist tradition (Lachmann, 1976), generally appeal to extra-natural concepts of radical will in order to explain innovative action and entrepreneurship (Witt, 1989; O'Driscoll and Rizzo, 1985). Institutional economists of the Veblenian tradition also entreat such concepts in order to account for purposeful, interpretive action (Waller and

Robertson, 1991). Likewise, economists working within the classical/Marxian tradition use such concepts in order to provide social determination of the accumulation of capital (e.g., Levine, 1978, 1981). These diverse attempts assume that nonhuman entities lack will, imagination, and purposefulness. Whether this assumption is plausible is outside the scope here. It is sufficient to state, however, that there are enormous data which show that everything which the anti-naturalists have assumed to be uniquely human are characteristic, in one degree or another, of nonhuman animals.<sup>4</sup> Given this data, the advocacy of naturalism does not entail robbing human action from free will, imagination, and intention. Nonhuman agents, after all, may not be as mechanistic in their action and organization as neo-Darwinian scientists have come to believe (Rosen, 1991; Eldredge, 1996).

In this light, whether the naturalist postulate of nature/human continuity implies methodological individualism depends greatly on one's implicit understanding of how natural organisms behave and function. The naturalist, continuity postulate can accommodate diverse modes of understanding. This diversity is to be expected given that the continuity thesis is about metaphysical concerns - i.e., whether the world is made of one kind of things. In contrast, methodological individualism pertains to the character of organization - i.e., how higher-levels relate to lower-levels of hierarchy. In short, the naturalist postulate and the biological metaphors justified on the basis of such a postulate do not necessarily entail reductionism.

#### **4. Does Methodological Individualism Lead to Biological Reductionism?**

If one advances, à la Armen Alchian and Harold Demsetz (1972), the position that the

firm is merely a team - i.e., ultimately explainable in terms of the goals of the members - does it mean that one is also advocating biological reductionism? Likewise, if one postulates, à la James Buchanan and Gordon Tullock (1962), that the state is merely a club, i.e. ultimately the product of social contract, does it mean that one is also promoting biological reductionism? That is, does methodological individualism with regard to social organization entail biological reductionism with respect to biological organization?

Evidently, theorists who explain the state or the firm as a nexus of contracts among equals do not push their methodological individualism further. They do not analyze the preferences of the persons who enter the contracts in terms of biological imperatives. In fact, they do not need to. There is no necessary link between reductionism at the social level and reductionism at the biological level. An illustration of the lack of such a link is how traditional neoclassical theorists model preferences of persons. They usually consider them as data in two senses. They usually conceive preferences as independent of social interaction as well as independent of biological variables. If individual traits are not the product of higher-level determinants (socio-cultural context), they are not necessarily the product of lower-level determinants (the genome).

Even when Gary Becker (1976b) uses the inclusive fitness hypothesis from sociobiology, he does not resort to biological reductionism. Becker (*ibid.* p. 818) regards the sociobiological model 'as unnecessary, since altruistic behaviour can be selected as a consequence of individual rationality.' For Becker, the inclusive fitness hypothesis serves as a homologous metaphor. It is homologous in the sense that while Becker retains the

sociobiological conceptual machinery, he relegates it to the level of social interaction. That is, he employs the inclusive fitness hypothesis as an instructive way to write the altruist's utility model so that it includes the recipient's function, which he metaphorically calls the recipient's fitness function. In Becker's model, the altruist acts out of 'egocentric' taste; i.e., the altruist cares about the other only insofar as it enhances his satisfaction. While such an egocentric utility function parallels the inclusive fitness idea, one can advance it without ever referring to genetic fitness.

In addition, experimental economists who use laboratory animals (e.g., Battalio et al., 1981) in order to demonstrate the theory of rationality of neoclassical economics do not usually resort to biological reductionism. They simply try to show the universality of the neoclassical hypothesis that behaviour is a series of solutions to constrained optimization problems. Along these lines one may interpret the work of some neoclassical theorists such as Gordon Tullock (1971, 1978, 1994) and Jack Hirshleifer (1977, 1978) who attempt to export the neoclassical notion of optimization to biology (see also Landa, 1986; Landa and Wallis, 1988; Boulier and Goldfarb, 1991). For instance, Tullock explicitly avoids genetic explanation of the social organization of termites and other nonhuman societies. He models strategic actions of insects on the basis of game theoretic techniques which locate the explaining items (*explanantia*) at the same level as the explained items (*explananda*). On the other hand, Hirshleifer argues - and is supported by biologists such as Edward Wilson (1978) and Michael Ghiselin (1992) - that biology, or 'natural economy,' and economics, or 'political economy,' are two branches of knowledge called 'general

economics'. The basic principle of general economics, according to Hirshleifer, is rational action in the sense of optimization.

The fusion of neoclassical economics and neo-Darwinian biology should not be surprising (Khalil, 1993). To recall, the choice of the most efficient decision, as stipulated by the neoclassical theory, does not require conscious deliberation. For standard choice theory, humans act optimally not because of free will, imagination, and interpretation. Humans rather act out of the necessary logic of the situation. Experiments with animals and the generalization of the maximization axiom do not explain human action by referring to genes, but rather attempt to show how all organisms, including humans, follow the same rules of efficiency. Thus, the extension of neoclassical economics to biology amounts to practising the naturalist agenda in reverse.

In short, social reductionist theory does not entail biological reductionism, even when such a theory uses biological metaphors à la Becker. The use of such metaphors has, in fact, inspired a research agenda which exports the maximization notion current in standard economics to the field of study of nonhuman organisms and societies. The fear of biological metaphors in these cases is greatly misplaced. It is economists who are trying to reshape the thinking of biologists. In this effort, the economists use biological metaphors only to generalize economic concepts. The economists in these instances are not even closely advocating biological reductionism.

##### **5. Is Scientific Explanation Synonymous with Reductionism?**

In his defense of the extension of sociobiology into the human sciences, Joseph Lopreato (1993) argues that scientific explanation is synonymous with individualist

or reductionist reasoning. He finds the misgivings of many social scientists with respect to the reductionist core of sociobiology to be 'ill-founded' (*ibid.* p. 80). Lopreato maintains that the scientific search for a systemic mode of reasoning must enthusiastically embrace, although carefully, reductionist explanations:

[A]ll science is by definition reductionist because one of its fundamental goals is parsimony of explanation, namely, the search for ever more comprehensive or informative laws (Lopreato, 1993, p. 80).<sup>5</sup>

Lopreato makes careful qualifications. Nonetheless, there is a problem with his basic thesis, viz., that the adherence to Ockham's razor necessarily involves reductionism. Lopreato employs the Newtonian law of gravity as an example of reductionism when it explains the motion of the moon as well as the fall of apples from the tree and the flight of birds. This seems a peculiar illustration of the problem of reductionism in social and biological sciences. The bird does not, at a lower-level of hierarchy, contain the apple, and the apple, likewise, does not contain the moon in the same manner in which a social group, such as the firm, contains persons who each, in turn, include organs, tissues, cells, organelles, atoms and quarks. Aside from what appears to be an inappropriate example, Lopreato continues and qualifies the reductionist function of the law of gravitation: It should not exclude the possibility of other variables in explaining the flight of birds.

If the law of gravity explains, even partially, the flight of birds, it should equally explain the flight of bats. In fact, the gravitational force explains both phenomena by showing that the two kinds of wings perform similar functions. The danger is that, given the

universality of the law of gravity, observers would conclude that the flight function of the wings of birds and the flight function of the 'wings' of bats amount to a unificational similarity. The similarity at hand is not even homologous because the forelimbs of the bat have evolved originally from mammalian forelimbs. Thus, what is the importance of the gravitational law if it shows only that the flights of birds and bats express only an analogous, non-substantial similarity?

The reductionist practice can easily invite identification slips. It attracts the practice of conceiving a non-substantial similarity as more fundamental simply because the phenomena at hand are related to universal laws such as gravity. Such an identificational slip can be avoided only if the reductionist tendency is checked and instead more attention is paid to processes taking place at the same level of the phenomenon, which is in this case the different contextual anatomy of the wings of birds and 'wings' of bats.

One can achieve a generalized theory - i.e. satisfy Ockham's razor - without resorting to reductionism. Such a procedure is possible if one tries to explain the phenomenon at hand by appealing to interactions and processes present at the same level of the said phenomenon. While one may have reservations about Becker's theory of altruism, his approach attains generality without resorting to biological reductionism. To illustrate, let us reexamine Lopreato's sociobiological explanation with regard to some social phenomena. He mentions the elderly Eskimos who stay behind in order to enhance the chances of success of the group when it takes dangerous, extended voyages. Lopreato maintains that such altruistic behaviour can be explained in term of kin selection following William Hamilton (1964).

However, such a sociobiological

explanation is problematic when we witness people volunteering to help unrelated others in single-spot transactions (where the agent does not calculate with respect to reciprocation). It is true that sociobiologists can explain such anomalies and many others, such as the readiness of soldiers to die for their country, on the basis that religions and ideologies portray the 'nation' as a fictional kinship group. For instance, Timothy Crippen and Richard Machalek (1989, p. 62) argue that religion, which confers fictive kin relation, emerges because 'humans have an extraordinary capacity for mistaking unrelated 'conspecifics' (other members of their species) for kin.' Likewise, when sociobiologists are confronted with altruistic acts among nonhuman animals who are unrelated and non-involved in a reciprocal relation, they maintain that it must be the outcome of mistaken identity. However, if humans have the capacity to make errors when they consider non-kin as kin, they must also have the capacity to commit errors in reverse, i.e., when they take kin as significant in itself. That is, the whole system of kinship, which is the focus of much of cultural anthropology, might be the outcome of the reification of 'blood' connection in order to ground why the degree of closeness is higher towards people among whom one has grown up than towards unfamiliar people.

In fact, the role of familiarity, or what Adam Smith (1976) calls 'sympathy,' is a more direct way to account for altruism than the appeal to lower-level variables à la sociobiology. To start with, the idea of familiarity can directly explain why agents are kinder to their kin-related persons than to unfamiliar others. Familiarity makes it easier for actors to put themselves in the shoes of recipients and sympathize with their pain or utility. One can explain why altruism is more

common among kin-related agents on the basis of social proximity. If one appeals to variables which occur at the same level as the phenomenon, there would be no need to take the more twisted approach, viz., appeal to lower-level variables, à la sociobiology. In this manner, a wider range of phenomena can be illuminated with the least resort to imported principles.

The idea of sympathy, and in specific Smith's theory, affords a more general and consistent approach (see Khalil, 1990b). Smith reasons that altruism springs from sympathy which amounts to the capacity of putting one's self in the shoes of the potential beneficiary. Altruistic action is taken in light of the actor's familiarity with the beneficiary and the actor's cost relative to the benefit of the beneficiary. The idea of station switching prompted by sympathy, suggested also by George Herbert Mead (1959), accords a primary role to the level or context in which the actors are assessing benefits and costs. The adherence to the same level allows for the unity of scientific explanation without resorting to reductionism. In addition, sympathy can account for altruism among genetically unrelated agents who are involved in single-spot exchanges. In this manner, anomalies facing inclusive fitness theory are not explained in an ad hoc manner such as the appeal to a fictive kinship system.

Another social phenomenon which Lopreato uses as an illustration of the superiority of the reductionist explanation concerns the higher incidence of child abuse by stepparents than by biological parents. It is true that the statistics marshalled by Margo Wilson and Martin Daly (1987; also, Daly and Wilson, 1988) show such difference in the frequency of violence against children of the same age category. Wilson and Daly also appeal to the theory of genetic inclusive fitness as an explanation. The sociobiological explanation

should predict that child abuse by non-biological parents should be very high. However, the data they marshal, drawn from the 1976 report of the America Humane Association, show that six out of every one thousand children under two years of age reared by one stepparent is abused, in comparison to one out of every one thousand when reared by the two biological parents (Wilson and Daly, 1987, p. 222). In fact, as the age of the children becomes higher, the frequency of abuse by the stepparent drops by almost six times, while the abuse by the biological parents is almost steady. The theory of genetic inclusive fitness cannot predict such a dramatic decline, while theories which give a greater role to social interaction and familiarity can.

Opponents of the inclusive fitness explanation of child abuse raise the issue that families with stepparents already suffer from stress generated by poverty which breeds violence in general. However, Wilson and Daly offer data which are adjusted to socioeconomic factors. A more serious critique is voiced by many social psychologists such as Richard Gelles (1983). Gelles does not dispute the data. He instead argues that step-parenting usually involves an ambiguous role for the stepparent. The stepparent may not take an equal, disciplining role as the biological parent. Such a disciplining role enhances bonding, which may explain the lack of bonding and, hence, greater frequency of child abuse towards stepchildren.

The ideas of station switching, social interaction, bonding, and sympathy involve variables which occur at the same level of the phenomenon which is under focus. The sharing of the same household allows greater sympathetic identification, which might explain the low incidence of abuse by stepparents. Such sympathetic identification



increases with the period of time that the stepparent spends in the household. In fact, social proximity which affords a greater degree of station switching can afford an easier explanation of why the biological parents also commit child abuse and why such abuse increases with the rise of environmental stresses.

The suggested possibility of station switching illustrates how a systematic theory can be constructed without resorting to reductionism. The suggested possibility can be systemic because station switching is not restricted to one level of interaction. Station switching can be shown to be isomorphic, i.e. a level-free kind of interaction (Khalil, 1990a; Khalil and Boulding, 1996). To note, level-free analysis does not mean that evolutionary optimization, i.e. natural selection, does not play a role. Such a role, however, may be limited to the explanation of the degree of exaggeration of the sharpness of a trait. In any case, natural selection, which is the basis of sociobiology, cannot explain the origin of traits. At best, it can stipulate that if a trait persists it must not have a negative net effect on reproductive success.<sup>6</sup>

## **6. Conclusion**

The employment of metaphors in scientific discourse can be fruitful if not exhilarating. The most famous example is the likening of the force which keeps the planets in orbit around the Sun to the force which pulls objects to the surface of the Earth. Metaphors may open new avenues of research, if not shape fundamental paradigms of thought. For instance, the view of altruism in human society as similar to altruism in nonhuman societies has basic implications with regard to the origin of morality. Also, the likening of the function of governments to the function of brains in organisms or to the alpha male in

baboon tribes may re-orient the way we conceive political power.

The paper argued that the employment of biological metaphors need not invite reductionism. The traditional resistance of social scientists to biological metaphors and insights is largely based on the confusion of the naturalist agenda with reductionism. Furthermore, when neoclassical economists employ biological metaphors, it is to extend and generalize optimization concepts current in economics. In other words, biological metaphors do not necessarily advance reductionism in social theory and, moreover, reductionism in social theory does not entail biological reductionism.

If we fail to notice these intricacies, and reject out-of-hand the importation of biological metaphors, we would be advancing a dichotomy between human and nonhuman phenomena which is hard to defend. Such a dichotomy is nominal in the same sense as the kilogram is. The familiar juxtaposition of humans and nonhumans entails that gorillas are closer to fungi than they are to humans. It is reminiscent of the Nineteenth Century, Eurocentric practice by many social theorists, ranging from Auguste Comte, Karl Marx, Herbert Spencer, Émile Durkheim, and Max Weber, who contrasted modern Europeans with all human societies (distant in time and place) grouped under a single umbrella, as non-modern or as pre-capitalist. As much as such a Eurocentric dichotomy has been found to be nominal, the inhibition against the employment of biological metaphors on the basis of human/nonhuman dichotomy is questionable.

While the rejection of anti-reductionist analysis is an understandable objective, the paper's main purpose has been to show that one does not need to throw out the baby with the bath water. One does not need to deny

the insights afforded by biological metaphors in order to distance oneself from reductionist understanding of human organization.

### Endnotes

1. Ohio State University, Mansfield Campus. The paper was supported in part by research fellowships from the Alexander von Humboldt Foundation and the Earhart Foundation. Earlier drafts greatly benefited from the comments of Ulrich Witt, Jack Hirshleifer, Geoffrey M Hodgson, Stanley Salthe, Mika Pantzar, Martin O'Connor, Paul Ekins, F Eugene Yates, James Barham, Gabriel Lozada and two anonymous referees. But no one should be implicated in any remaining errors.
2. To caution, Thoben erroneously identifies the holistic approach with cybernetics. The latter is merely an engineering device best seen as mechanics turned upside down.
3. To caution, one does not have to be a radical vitalist in order to argue for the autonomy-of-biological-sciences from the principles of chemistry and physics (see Ayala, 1987).
4. For example, consult the work of Donald Griffin on the minds and thinking processes of animals (see Khalil, 1996).
5. Likewise, Jon Elster regards reductionism as the 'omnipresent feature of science': The basic building block in the social sciences, the elementary unit of explanation, is the individual action guided by some intention. ... Generally speaking, the scientific practice is to seek an explanation at a lower level than the

explanandum. ... The search for micro-foundations, to use a fashionable term from recent controversies in economics, is in reality a pervasive and omnipresent feature of science (Elster, 1983,p. 20-23).

6. The other two examples deployed by Lopreato, viz. the attraction of wealthy males and the greater tendency of husbands to lose sexual interest in partners (anisogamy), can probably be explained à la sociobiology. But these examples involve sexual selection rather than natural selection. In sexual selection, the purposeful agent occupies the main stage: the agent can partially determine the traits which the offspring possess. Sexual selection has little implications concerning reductionism.

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