

Why Organizational Ecology Is Not a Darwinian Research Program

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Organizational ecology is commonly seen as a Darwinian research program that seeks to explain the diversity of organizational structures, properties and behaviors as the product of selection in past social environments in a similar manner as evolutionary biology seeks to explain the forms, properties and behaviors of organisms as consequences of selection in past natural environments. We argue that this explanatory strategy does not succeed because organizational ecology theory lacks an evolutionary mechanism that could be identified as the principal cause of organizational diversity. The “evolution” of organizational populations by means of selection, which organizational ecologists put forward as the mechanism responsible for the extant diversity of organizational forms, is not evolution in any proper sense, because organizational populations do not have what it takes to participate in evolutionary processes. This implies that organizational ecology is not a Darwinian research program and that it cannot explain organizational diversity.

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1. Introduction

Darwinian evolutionary theory is often viewed as a theory the explanatory scope of which extends far beyond the domain of application for which it was

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originally conceived. In a well-known article, the biologist Richard Dawkins (1983) argued that Darwinian evolution is not a phenomenon unique to life on Earth. According to Dawkins, any instance of life that were found anywhere in the universe should be expected to exhibit Darwinian evolution—a view that he called “Universal Darwinism.” After Dawkins’ proposal, various authors have extended the original claim of Universal Darwinism, suggesting that there is not only no reason to believe that Darwinian evolution occurs exclusively in living systems on planet Earth, but in addition there is no reason to assume that Darwinian evolution occurs exclusively in *biological* systems (Dennett 1995, especially pp. 63–64, 82). According to present-day Universal Darwinism, the use of Darwinian evolutionary theory, or its core elements, or of models based on it is not restricted to the life sciences; in principle these can also be applied to nonbiological entities and phenomena, provided that particular conditions are met. Accordingly, Darwinian research programs are abundant in scientific domains outside of biology, in particular in the social sciences (see Hodgson 2002; Nicholson and White 2006; Nelson 2007).

However, that Darwinian evolutionary theory can be used to describe and explain phenomena outside the biological domain is not self-evident. Before applying theories, models, etc. imported from biological science to describe and explain the properties and behaviors of nonbiological entities such as organizations or markets, it needs to be made plausible that the phenomena under study in the different domains actually are instances of the same general phenomenon, so that they would be covered by the same theory or at least by highly similar models. That is, it must be shown that the entities under consideration in a particular research program actually meet the requirements for Darwinian evolution to occur.

Putative Darwinian research programs in social science often fail to establish that the phenomena under study are indeed susceptible to a Darwinian approach. Rather, the use of evolutionary theory (or core elements thereof, or models based on it) is often legitimized only by drawing analogies between the entities and phenomena under study in the two involved domains. Claims like the following are typical for such moves:

There is reason to believe organizations have much in common with biological organisms. Both organizations and organisms are animate. Organizations and many advanced organisms are choiceful. . . . Both are seen to adapt responsively to their environmental habitat, and both can bring about changes in their environments. (McKelvey 1978, 1429)

But merely drawing analogies between different sorts of phenomena or between different kinds of entities is insufficient legitimization for applying

a successful theory or model from one domain of investigation to the phenomena under study in another domain.

Recently, Nelson (2007) argued that in the case of Darwinian research programs in social science no additional legitimization is required, because most such programs do not in fact involve the application of specifically *biological* theories to nonbiological entities. According to Nelson, theory development in social science proceeded largely independently from theory development in biology. Notwithstanding some cross-fertilization between biology and evolutionary social science, Nelson argued, social scientists have developed their *own* evolutionary accounts of the phenomena under study instead of importing theories, models, etc. from biological evolutionary theory into their domains of investigation. As a wholesale argument for legitimizing evolutionary thinking in social science, however, Nelson's argument is flawed. Research programs have their own specific developmental histories during which they were influenced to different degrees and in different ways by theory development in other domains of science. Whether or not, and if so to which degree, a particular research program involves application of theories, models, etc. imported from a different domain of investigation must therefore be assessed on a case-by-case basis. Moreover, even if Nelson were correct that evolutionary theorizing in social science stands squarely on its own foundations, the question still remains to what extent so-called "Darwinian" or "evolutionary" research programs in the social sciences are truly Darwinian/evolutionary programs, that is, programs that study phenomena of the same kind as evolutionary biology studies. Subsuming a variety of research programs that do not have much to do with one another under the overarching category of Darwinian/evolutionary approaches would, after all, amount to severely misunderstanding the explanatory nature and scope of the programs involved.

In the present article, we examine a research program from the domain of organizational science that is commonly viewed as an evolutionary program, namely organizational ecology.¹ While we do not take issue with

1. Within the community of social and organizational scientists, the organizational ecology program is widely viewed as a Darwinian research program, resting on a core of biological evolutionary theory. Organizational ecology is presented as such both in handbooks, textbooks, and reviews (e.g., Romanelli 1991; Van Witteloostuijn 2000; Lewin and Volberda 2003, 568-69; Schreyögg 2003, 89; Becker 2004; Carroll and Barnett 2004, 1; Kieser and Woywode 2006; Nicholson and White 2006, 112), and in theoretical and empirical research articles (e.g., Hannan et al. 1995; Lowery and Gray 1995, 5; Usher and Evans 1996; Pólos, Hannan, and Carroll 2002, 104, 106, 112; Van Witteloostuijn, Boone, and Van Lier 2003; Dobrev and Kim 2006, 230, 255; Menhart et al. 2006, 108).

the basic claim of Universal Darwinism that Darwinian evolution can and will occur in any system that meets the applicable requirements (a claim which we believe to be correct), we argue that in the specific case of organizational ecology these requirements are not met.

Our central claim is that the “evolution” of organizational “populations” is not like evolution in the biological sense—in particular, there is no concrete entity that undergoes evolutionary processes in the organizational case. *The crucial point is that not every selection process is necessarily an instantiation of Darwinian evolution.* In biology, the term “evolution” has a very specific meaning (e.g., Futuyma 2005, 2ff.) and talk of “evolution” in organizational ecology, we argue, does not involve this precise meaning. Both in Darwin’s original theory and in the later versions of biological evolutionary theory, evolution is conceived of as a process of change that populations of organisms undergo (Futuyma 2005, 8-11). Evolution, simply speaking, is the change of genotype frequencies within organismal populations because of the differential reproduction of organisms with different genotypes. Such change processes, however, require populations to exhibit at least minimal levels of closure and isolation from other populations—requirements that are not met in the case of “populations” of organizations (hence the scare quotes) that consequently do not have what it takes to participate in Darwinian evolutionary processes. So, irrespective of whether the organizational ecologists’ particular model of the evolution of organizational populations by way of selection was indeed borrowed from biology or developed independently, it cannot be called a Darwinian evolutionary model in any proper sense.²

We proceed as follows. In section 2, we briefly sketch the explanatory aims and structure of the organizational ecology program. In section 3, we examine to what extent contemporary organizational ecology is indeed conceived of as a Darwinian research program. In section 4, we present our arguments for our claim that organizational “populations” do not evolve in the Darwinian sense and that organizational ecology is not a Darwinian research program. We conclude in section 5 with an assessment of what this claim implies for the status and explanatory scope of organizational ecology as a research program in organizational science.

2. Throughout this article we use “Darwinian” as an umbrella term without distinguishing between the various historical versions of Darwinian evolutionary theory, such as Darwin’s own theory, later neo-Darwinism and the currently accepted Modern Synthesis theory of evolution. While we focus on Darwinian evolutionary theory, as this is evolutionary theory in the proper, biological sense, our arguments also hold for non-Darwinian evolutionary theories such as Lamarck’s theory or neo-Lamarckism.

2. Aims and Structure of the Organizational Ecology Program

Organizational ecology encompasses three main lines of work that focus on different levels of analysis: the level of the individual organization, the population level, and the community level.³ In the present article, we only consider work that studies the population level, as this is where organizational ecology originated and where most of the empirical work in the program is being done. We examine the two main representatives of population-level organizational ecology: the “population ecology of organizations” developed by Hannan, Freeman, and others (e.g., Carroll and Hannan 2000; Freeman 1982; Freeman and Hannan, 1983; Hannan 2005; Hannan and Freeman 1977; 1984; 1989; Hannan, Pólos, and Carroll 1995; 2007; Pólos, Hannan, and Carroll 2002) and the “organizational systematics” of McKelvey, Aldrich, and others (e.g., Aldrich 1979; 1999; Aldrich and Pfeffer 1976; McKelvey 1978; 1982; McKelvey and Aldrich 1983). The latter line of work today plays only a very minor role and the population ecology of organizations has become the dominant approach in organizational ecology. Nevertheless, we find it important not to limit our considerations to the work of Hannan and collaborators because we wish to point out that our criticisms do not pertain to particular idiosyncratic features of Hannan et al.’s theory but to all varieties of organizational ecology that take organizational populations as their principal objects of study.

Hannan and Freeman proposed their research program in the 1970s as an alternative to what they called the “adaptation perspective,” at the time the dominant approach in explaining organizational diversity. According to the adaptation perspective, *individual* organizations are able to adapt in a goal-directed way to changes in their environments. Organizations—or rather, the people that constitute them—continuously scan the organization’s environment for potential problems and opportunities and can, when a problem or opportunity is identified, change the organization’s structure, behavior, etc. accordingly (Hannan and Freeman 1977, 930; Hannan 2005, 59). If this view were correct, the particular forms that organizations exhibit could be explained as direct responses of organizations to the environments that organizations find themselves in.

3. See Carroll (1984), Astley (1985), Singh and Lumsden (1990, 188ff.), Amburgey and Rao (1996, 1270), and Carroll and Hannan (2000, xx). Baum and Shipilov (2006) distinguish four lines of investigation, two of which focus on the population level.

Against the adaptation perspective, Hannan and collaborators argued that organizational forms cannot generally be understood as direct responses to current environmental factors because various factors, internal as well as external to organizations, inhibit the goal-directed adaptation of organizations in the way the adaptation perspective assumes. Important internal factors in this context include sunk costs (e.g., past investments in a particular type of machinery) that oppose rapid switching to the production of a different type of product, specialization of employees in methods and craft skills specific for certain types of jobs, management methods particular to certain workspace technologies, internal political conflicts and established political balances, etc. External factors include legal constraints, difficulties in obtaining a good overview of all the relevant problems and opportunities in the organization's current environment, difficulties with respect to evaluating the risks entailed for an organization if it changes its identity as perceived by the outside world or its way of operating, etc. These various factors are subsumed under the notion of "structural inertia": they make organizations so inert that they are unable to respond rapidly and adequately to emerging changes in their social environments (Hannan and Freeman 1977, 930-32, 957; 1984; Hannan 2005, 59-60; Hannan, Pólos, and Carroll 2004; 2007, 222-34). Organizational forms, then, generally lag behind the organizations' current environments in that they tend to reflect the requirements of past rather than present social circumstances.

Accordingly, Hannan and collaborators suggested that the present diversity of organizational forms is to be explained as being foremost the product of past selection processes in which organizations that were not well adapted to their particular environments have gone out of existence and better adapted organizations have been able to survive. The suggestion was that, just as in biology organismal traits and forms are explained as consequences of the gradual evolution of *populations* of organisms—not changes of *individual* organisms—in particular environmental conditions by means of natural selection, organizational properties and structures can be explained as consequences of the gradual evolution of populations of organizations in their particular environments by way of selection processes. The crucial element in this explanatory strategy is a shift in focus to a different level of analysis. Whereas the adaptation perspective studies how *individual* organizations change in response to environmental changes, for Hannan and collaborators the appropriate units of change are *populations* of organizations that evolve through time as old organizations are eliminated from the population in response to changing environmental factors and new

organizations come into being (Hannan and Freeman 1986, 51ff.; 1989, 9, 45; Hannan, Pólos, and Carroll 2007, 18).⁴

Independently of the aforementioned authors, Aldrich and McKelvey developed a similar account of organizational form in terms of what they called “comps” (brief for “competences” or “competence elements”). Comps, that is, units of organizational know-how pertaining to particular routines, management practices, etc., “play the same genotypic role as the genetic material of biological organisms” (McKelvey 1982, 197; see also Romanelli 1991, 85). These authors conceived of organizational populations as constituting so-called “tech-pools” or “comp-pools,” the organizational analogue of gene pools in biological theory (McKelvey 1978, 1432; also Hannan and Freeman 1986, 55-57). Comps are passed on to new generations of employees within the same organization and move between organizations as documents, employees, etc. migrate from one organization to another. In a similar way as advantageous genes can spread through biological populations by means of organismal reproduction, displacing less advantageous genes as the bearers of these latter genes are selected against, advantageous comps can spread through organizational populations and displace less advantageous comps (McKelvey 1982, 256; McKelvey and Aldrich, 1983, 112-13). For instance, employees of successful companies are more often poached away by competing organizations than employees of less effective companies, successful companies are more often victims of industrial espionage, successful companies are more often studied by organization scientists, etc. In addition, organizations that make use of advantageous comps are in a better position to solve economic and social problems than organizations with less useful comps. Consequently, organizations with advantageous comps will prevail over less effective organizations in the struggle for existence in a particular environment, thus leading to the spreading of advantageous comps and the gradual disappearance of less advantageous and disadvantageous comps—that is, to evolution of the organizational population as a whole.

In both these lines of work, a Darwinian model of organizational populations as evolving because of selection is intended to form the core of a strong research program in organization science that is able to address at least four

4. It should be noted that Hannan and Freeman (1977, 930; cf. Singh and Lumsden 1990, 185; Baum and Shipilov 2006) saw individual-level adaptation and population-level evolution as complementary, so that any *full* account of organizational form should encompass both aspects. However, they considered population-level evolution as the dominant factor in explanations of organizational form.

explananda. Besides explaining the *diversity* of organizational structures that are actually found in the world (i.e., why do we find precisely those organizational forms in the world that we do, rather than different possible forms or a larger or smaller diversity of forms?), organizational ecology also aims to explain the *distributions* of organizations across different social and economic environments; the *limitations* that environments impose on possible organizational structures (e.g., Hannan and Freeman 1977, 936); and the *rates* at which new organizations come into being, become legitimized, change their structures, and cease to exist (e.g., Hannan and Freeman 1989, 7).⁵

Before arguing that the Darwinian evolutionary model that forms one of the core elements of the organizational ecology program in fact does not apply in the case of organizational phenomena because organizational populations do not have what it takes to function as units in evolutionary processes, we have to clarify to which extent the organizational ecology program *actually* rests on Darwinian evolutionary theory.

3. Organizational Ecology as a Self-Described Darwinian Research Program

The founders of organizational ecology explicitly based their research program on imported elements from bioecological and Darwinian evolutionary theory. As Hannan, Pólos, and Carroll asserted in the most recent formulation of their program: “Organizational ecology initially borrowed ideas from neo-classical population bioecology, which analyzes numerical aspects of population interactions from an *evolutionary* perspective” (2007, 18; emphasis added). In the early writings on the program, there is an abundance of statements that clearly show how central the import of theoretical elements from biology was in the construction of the organizational ecology program. In their seminal article, Hannan and Freeman asserted they were aiming “to move toward an application of modern population ecology theory to the study of organization-environment relations” (1977, 956). A decade later, they explicitly named their approach a Darwinian approach (Hannan and Freeman 1989, 20) and described it as follows: “The ecology of organizations is an approach . . . that builds on general ecological and evolutionary models of change. . . . We have adapted ecological models to sociological uses and changed them in the process” (Freeman and Hannan 1989, 426-28; see also Hannan and Freeman 1986, 52;

5. For updated overviews of the population ecology program see Carroll and Hannan (2000) and Hannan, Pólos, and Carroll (2007, 18-20).

1989, xiii). Similarly, in his *Organizational Systematics*, McKelvey asserted that evolutionary theory was one of the

four main subcomponents of the population view. . . . The principal need for evolutionary theory is to explain how there come to be so many kinds of organizations. . . . [T]his is a question calling for systematic and evolutionist analysis. (1982, 437-38)

In a later article, McKelvey stated that organizational populations undergo Darwinian evolution (1994, 316, 325). And in an early review of the state of affairs in organizational ecology, Carroll explicitly stated that “[e]volutionary theory is integrated with ecology at this [i.e., the population] level through the use of a *selection approach*” (1984, 72).

To be sure, in the decades that have passed since the first formulations of organizational ecology appeared, the research program has developed further. Much empirical work has been done (mostly within the population ecology line of work) to test the applicability of the principles of organizational ecology to actual cases. In addition, several authors have voiced criticisms of the principles of organizational ecology. These empirical findings and criticisms have led to modifications in the research program, including the deterioration of the organizational systematics line of work (and the associated achievement of dominance of Hannan et al.’s population ecology) and a trend to move away from using analogies with biological ecology. Thus, with the development of the program emphasis has come to lie more on the use of elements from evolutionary theory than on the use of elements from ecology (Singh and Lumsden 1990, 162; Amburgey and Rao 1996, 1268; Kieser and Woywode 2006, 340-41).

This use of elements from evolutionary theory has, however, also been criticized. In their rebuttal to early criticisms of their research program (most importantly Young 1988), Hannan and Freeman followed the same strategy as Nelson (2007; discussed above), claiming not to have proposed to apply elements of biological theory to organizational phenomena or to map the organizational domain onto the biological domain to identify where the same sorts of processes operate. Rather, they claimed, their suggestion was that models that are commonly used in biology without being *specifically biological* models could perhaps also be fruitfully applied to organizational phenomena (Freeman and Hannan 1989; Hannan and Freeman 1989, xiii). McKelvey (1979, 491) and other organizational ecologists (e.g., Brittain and Wholey 1989) defended their research program in a similar manner. But such claims flatly contradict the self-descriptions of the early development

of the research program given by these authors and quoted above. Admittedly, read charitably many of these assertions could still be interpreted as involving a different notion of “evolution” than biological science features. However, on such a reading it is unclear why the evolution that organizational ecologists talk about would deserve to be called “evolution” at all. The crucial point in Nelson’s defense of evolutionary social science is that even if the evolutionary models and theories used by social scientists are not built by way of transferring originally biological theories and models to social science, they still are *properly evolutionary* theories and models. That is, they describe processes sufficiently similar to those that occur in biological evolution to be subsumed under the same umbrella category.

Regardless of how one interprets this controversy, it remains unclear exactly how much of *present-day* organizational ecology involves the use of elements from Darwinian evolutionary theory. Kieser (2002, 70) and Kieser and Woywode (2006, 340-41), for example, noted that because of various criticisms the organizational ecology program has in recent years also moved away somewhat from using elements from evolutionary theory. Indeed, there is little mention of evolution or Darwinism in the most recent formulations of the organizational ecology program (Carroll and Hannan 2000; Hannan, Pólos, and Carroll 2007). Nevertheless, there are clear indications that in its contemporary incarnation too, organizational ecology is seen as a sociological research program that has elements of Darwinian evolutionary theory at its core.

One such indication is the repeated statement of Hannan and collaborators (Hannan and Freeman 1977, 956; Carroll 1984, 74; Hannan 2005, 51; Hannan, Pólos, and Carroll 2007, 18) as well as McKelvey (1978, 1437; 1982, 438, quoted above) that the central orienting question for organizational ecology was, “Why are there so many kinds of organizations?” The underlying thought was that the primary explanandum of organizational ecology should be why we find precisely those organizational forms in the world that we do, rather than different forms or a much larger or much smaller diversity of forms. In biology, this question is an *evolutionary*, not an ecological one: whereas bioecology is concerned with explaining the abundances and distributions of organisms of various organismal forms in different environments (e.g., Krebs 2001, 7; De Laplante 2004, 264ff.), the *origin* of forms is the province of evolutionary biology (although, of course, ecological issues also play important roles here). Addressing this question from an ecological perspective shifts the inquiry into the domain of *evolutionary* ecology, as the founders of organizational ecology realized. The abovementioned central question of organizational ecology is an intended

paraphrase of the central question of evolutionary ecology posed by ecologist G. Evelyn Hutchinson in a famous article: “Why are there so many kinds of animals?” (1959). Both Hannan, Pólos, and Carroll and McKelvey referred to Hutchinson’s article (which is on *evolutionary* ecology, not on ecology generally) with the intention to indicate that organizational ecology should address the same question in the organizational domain as evolutionary ecology addressed in the organismal domain (cf. Hannan, Pólos, and Carroll 2007, 18). Today, this and related evolutionary questions still guide organizational ecological research. In their recent logical formalization of their theory, for example, Hannan, Pólos, and Carroll consider the implications of the occurrence of structural inertia for the evolution of organizational populations and explain increases in the structural inertia in a population as the result of evolutionary processes in which inertia is selectively favorable (2007, 19, 237; for other examples, see Hannan et al. 1995; Carroll and Hannan 2000, 28, 439).

Moreover, although Hannan and collaborators are not clear about whether they themselves still want to see their research program as a Darwinian program and some of their recent writings suggest that they do not (an early suggestion in this direction is Hannan and Freeman 1986, 65-66; a late suggestion to the contrary is Pólos, Hannan, and Carroll 2002, 104, 106, 112), the wider community of social scientists still widely sees the evolutionary core as one of the hallmarks of contemporary organizational ecology. Van Witteloostuijn, for example, recently characterized organizational ecology as a research program that rests “[o]n the solid foundation of a well-communicated and well-established theoretical core—basically an organizational translation and extension of Darwinian biology” (2000, vi). Current handbooks and textbooks on organization theory commonly treat organizational ecology under the heading of “evolutionary paradigms” (see footnote 1). Jovanovic, in a review of Carroll and Hannan’s (2000) update of organizational ecology, judged that “[t]he book does more than merely present facts. The Darwinian type of theory brings a coherence to it . . .” (2001, 118). And as a final example, consider Carroll and Barnett’s introduction to a special issue of the journal *Industrial and Corporate Change*, containing the proceedings of a conference on organizational ecology held at Stanford University in 2002. The conference was explicitly intended to celebrate the twenty-fifth anniversary of Hannan and Freeman’s seminal 1977 article and aimed “[t]o bring together a diverse group of scholars with interests in evolutionary approaches to organizations, to assess evolutionary theory and research on organizations [and to] solicit and discuss some new contributions to evolutionary theory and research on organizations” (Carroll and Barnett 2004, 1). It is unlikely

that a conference on organizational ecology could realize these aims if the participants would not conceive of organizational ecology as a research program that at least to an important extent is grounded in evolutionary theory. As we shall argue, however, this conception of organizational ecology as a Darwinian research program misunderstands the actual nature of the program.

4. Does Anything Evolve in the Case of Organizations?

4.1. The Nature of Populations

We now turn to the role of populations as the principal units of change in organizational ecological theory. Organizational ecologists define populations of organizations by means of properties and behaviors typically found with members of a particular population and not usually found with members of other populations. In general, an organizational population is a group of organizations of the same form operating in the same time period at the same location (a town, large city, region, nation state, etc.). Organizational forms are conceived of as particular “blueprint[s] for organizational action for transforming inputs into outputs” (Hannan and Freeman 1977, 935; 1986, 53ff.; also Hannan 2005, 61). On Hannan et al.’s account, for example, a population is “defined as a *set* of organizations with a *common form* (or template for organizing) at a particular place and time” (Hannan 2005, 52; emphasis added). According to Hannan and Freeman, populations are “*aggregates* of organizations” (1977, 934; emphasis added) and “a population of organizations consists of all the organizations within a particular boundary that have a *common form*” (1977, 936; emphasis added; also Carroll and Hannan 2000, 59-76; Pólos, Hannan, and Carroll 2002; Hannan, Pólos, and Carroll 2007, 86).

Hannan et al. did not treat all aspects of an organization’s form on an equal level, but picked out particular features as theoretically relevant. Of primary importance, given organizational ecology’s emphasis on selection of organizations, are those features that affect an organization’s performance in its particular environment. Thus, Hannan and Freeman conceived of populations as “*classes* of organizations which are relatively homogeneous in terms of *environmental vulnerability*” (1977, 934, emphasis added; see also Amburgey and Rao 1996, 1275-76; Hannan 2005, 56), asserting that to some extent populations are determined by the particular theoretical interests of the researchers that study them: “Populations of organizations are not immutable objects in nature but are *abstractions useful for theoretical purposes*” (1977, 934, emphasis added; see also Romanelli 1991, 82).

A similar view lies at the basis of McKelvey and Aldrich's research program, although here the focus is on the comps underlying an organization's form and lies more on species than populations (McKelvey 1978; 1982). McKelvey and Aldrich aimed to develop a classification of organizational forms with organizational species as its basic elements, similar to the biological classification of organismal diversity into species and higher taxa. Here, an organizational species was somewhat vaguely "defined as a *set* of highly probable combinations of dominant competence elements [i.e., comps] that are temporarily housed at any given time among the members of an organizational population" (McKelvey 1982, 195-96; our emphasis). On this account, organizational populations are conceived of as sets consisting of all the organizations of one species that operate at a particular location and time. Organizational form is understood in a similar manner as Hannan et al. do, as encompassing "the appearance, condition, and nature of an organization and its subunits as well as the configuration, interrelationship, and manner of coordinating its subunits" (McKelvey 1978, 1431; cf. Romanelli 1991). However, what defines organizational species and populations is not the overall form that organizations exhibit (in a biological analogy, the "phenotype" of the organizations), but rather the underlying set of comps that cause organizational form and that all organizations of a species share (the organizations' "genotype").

In the classic formulations of organizational ecology (in both versions discussed here) organizational species and populations are thus defined typologically, that is, as *sets* or *classes* of organizations that belong together because they typically exhibit similar properties (they instantiate the same type). The main difference is that whereas McKelvey and Aldrich define organizational types "genotypically" (by way of shared comps) and conceive of organizational species and populations as real entities in the world, Hannan et al. define organizational types "phenotypically" (by way of shared organizational form) and understand them as theoretical constructs.⁶

This latter aspect is more pronounced in Hannan, Pólos, and Carroll's (2007) most recent formulation of organizational ecology in terms of formal logic and set theory, that they presented in an attempt to remove ambiguities from organizational ecology. At the heart of this formalization lies the realization that sociology often studies groups that are not perfectly sharply delimited. That is, membership of sociological kinds (such as organizational populations) usually is not a matter of a simple yes or no, but comes in degrees. Hannan et al. attempted to accommodate this matter by formalizing organizational populations as fuzzy sets, i.e., sets the members of which are to different degrees

6. Accordingly, Carroll (1984, 78-80) sees them as two opposing camps.

members of the set. On this view, a particular organization can be a member of multiple populations and has a particular degree of membership in each population that can lie between 0 (*not a member*) and 1 (*fully a member*).⁷ Moreover, an organization's degree of membership in a particular population is not an intrinsic property of the organization, but is attributed to the organization by audiences that construct similarity clusters: organizational populations are social categories that are constructed by the members of a society. That is, a particular audience (e.g., the consumers of particular goods in a particular location) identifies a particular type of organization (a particular type of producer) and assigns individual organizations to this type to varying degrees. Organizational populations, then, are identifiable social objects by virtue of an audience that recognizes their existence (Hannan, Pólos, and Carroll 2007, 86-87, 311; also Carroll and Hannan 2000, 68-70, 75; Pólos, Hannan, and Carroll 2002).

The same conceptualization of the nature of organizational populations is found in recent empirical work in organizational ecology. In a recently published study, for example:

[A] population emerges when a set of organizations becomes recognized by external constituents as performing an activity *in a sufficiently similar manner* so that they can be grouped into a distinctive cognitive category that bears a symbolic distinction (name) from other social actors. Simply stated, organizations must succeed in attracting the audience's attention to the similarity among them. If they do, an organizational population is born. (Dobrev, Ozdemir, and Teo 2006, 594; emphasis added)

Present-day organizational ecology, then, conceives of organizational populations as sets of organizations that not only share some theoretically important features, but in addition actually occupy similar positions in their environments because of the fact that the members of these environments accept them as performing the same roles.

Notwithstanding the differences in how researchers conceive of the nature of organizational populations and species (as real entities or social constructs), all lines of work in organizational ecology conceive of organizational populations and species as *sets* of organizations.⁸ Organizations

7. For classical sets degrees of membership are either 0 or 1 but no value in between.

8. Metaphysically sets can be seen as real entities in nature (in a similar manner as many philosophers defend realist interpretations of natural kinds) or as abstract units constructed by humans for various epistemological reasons. While organizational systematists think of sets of organizations as real entities, in the program of Hannan and collaborators such sets are interpreted as social constructs.

belong to a particular population or species on the basis of particular shared properties and behaviors (albeit in Hannan et al.'s latest version as fuzzy sets instead of classical sets).

This conception of populations as sets profoundly differs from how biologists conceive of the nature of populations and species. In biology and the philosophy of biology, there is an ongoing debate on the nature of species and, to a lesser extent, on the nature of populations.⁹ Although these debates are far from resolved, there is a large amount of agreement among biologists and philosophers that from an evolutionary perspective, species and populations are not to be understood as sets, classes, or aggregates of organisms that belong to the same population because of shared properties. Biological populations are usually conceived of as organized *systems* of organisms (e.g., Hull 1980, 322-24; Ghiselin 1997, 15) that interact with each other in various ways and are held together in the population by way of various mechanisms, such as reproduction, gene flow, social interactions, division of labor, mutual protection, intra- and inter-population competition for mates and resources, reproductive isolation from other populations, etc. With respect to the occurrence of evolution, reproductive mechanisms are most important: the occurrence of breeding between the organisms within a population, interbreeding between different populations of the same species, and mechanisms that prevent hybridization between populations of different species cause populations of organisms to be sufficiently closed and cohesive entities to be able to participate as units in evolutionary processes.¹⁰

The crucial difference is this: whereas the members of a set or class are members *only* by virtue of having been placed in the same set or (for

9. The "species problem" has been a topic of heavy debate in biology and its philosophy for over 150 years. Accordingly, the literature on the topic is immense. For comprehensive overviews of the current state of affairs, see Wilson (1999) or Stamos (2003). Thus far, much less attention has been devoted to clarifying the population concept, a topic which seems only now to have come into the focus of biologists and philosophers. A discussion on this issue in the context of ecology can be found in recent issues of the journal *Oikos*: Berryman (2002), Camus and Lima (2002), Bagueette and Stevens (2003); see also Krebs (2001, 130). Gannett (2003) recently discussed the population concept in the context of population genetics.

10. Accordingly, biologists commonly conceive of populations as real entities in nature. As philosopher of biology Elliott Sober (1980, 370) put it: "Darwin . . . focused on the population as a unit of organization. The population is an entity, subject to its own forces, and obeying its own laws." While metaphysically the possibility exists to conceive of sets as real entities, these would not be entities of the same sort as populations in biology: even when interpreted in a realist manner, sets are not the sorts of things that are subject to forces or obey laws of nature.

classes) sharing some properties, the members (or more accurately, parts) of a system are parts of that system *only* by virtue of their interactions with other parts of the system. While the members of a class resemble one another in some way but do not interact with each other, the parts of a system interact but do not need to be similar in any way. Accordingly, in biology population membership is determined by the reproductive interactions that obtain between organisms and the ensuing common descent. The form that organisms of a population may or may not share does not *determine* population membership—at most, it can *indicate* the membership of a particular population. Defining populations in this way rather than by shared traits does justice to the fact that for evolution to occur, there needs to be variation among the organisms within a population with respect to selectively important traits. That is,

The relevant organismal units in evolution are not sets of organisms defined in terms of structural similarity but lineages formed by the imperfect copying processes of reproduction. Organisms can belong to the same lineage even though they are structurally different from other organisms in that lineage. What is more, continued changes in structure can take place indefinitely. If evolution is to occur, not only can such indefinite structural variation take place but also it must. (Hull 1978, 341)

It is important to see that in populations that are defined by means of common form, such *indefinite* structural variation is impossible: any organism whose form diverges too much from the norm cannot be counted as a member of the population (any organism with a different form must, after all, be a member of a different population). Even though the members of a typologically defined population can vary among themselves, the degree of variation cannot be too large and certainly not indefinite. The point, then, is that defining populations in terms of structural similarities cannot allow for *evolutionarily significant variation* in populations. Typologically defined populations can change to a limited extent and new varieties of existing basic forms can come into being, but no entirely novel forms can come into being in the population. Once an entirely novel form comes into being, it falls by definition outside the population, so the population has not evolved. Thus, the origin of entirely novel forms cannot be understood in terms of the population undergoing a Darwinian evolutionary process, but must be understood differently.

The same holds for the notion of species. Biological species have long been understood as classes of organisms that all share a particular set of essential properties (basic organismal form or *Bauplan*, genetic makeup,

etc.). This view was, however, found to be fundamentally incompatible with the role of species in Darwinian evolutionary theory. Consequently, a heated debate emerged among biologists and philosophers of biology on the nature of species. Meanwhile, a consensus view has emerged that, like populations, species should not be conceived of as sets or classes of organisms but as concrete *individuals*, i.e., organized, real entities that have organisms as their basic parts.¹¹ One of the main proponents of this view illustrated it as follows:

Species are to evolutionary theory as firms are to economic theory. . . . Species are individuals, and they are real. They are as real as American Motors, Chrysler, Ford, and General Motors. . . . A firm is a firm because it forms a *closed system* of a given kind. It can compete with craftsmen and firms outside itself, and is characterized by a particular kind of *internal organization*. (Ghiselin 1974, 538; our emphasis)

On this view, species are similar to populations in being organized systems of organisms that exhibit an internal structuring into smaller local populations and subpopulations and interact with their environments and other species therein (see also Mayr 1987; 1988; 1996; 2004, 187).

What organizational ecologists seem to have had in mind when talking about populations and species of organizations were not the technical terms of evolutionary theory but something closer to the colloquial notions of “species” and “population.”¹² Philosopher of biology David Hull already pointed out the difference 30 years ago, emphasizing genetic and reproductive cohesion as the binding factor underlying biological populations:

In its broadest sense, a population is merely a collection of individuals of any sort. . . . [T]he populations which function in the evolutionary process are

11. The seminal texts are Ghiselin (1966; 1974) and Hull (1976; 1977; 1978). See Ghiselin (1997) for a recent overview of the discussion and the current state of affairs. There still is some discussion about the precise nature of species among biologists and philosophers of biology (see, e.g., Stamos 2003 and Reydon 2005). One point of discussion is what exactly the nature of species *as individuals* is, e.g., whether species are entities that participate in evolutionary processes or rather are the products of evolutionary processes in which other entities (populations and other groups of organisms) participate. This discussion notwithstanding, there is broad consensus that species *cannot* be understood as typologically defined sets, classes or aggregates of organisms.

12. Hannan, Pólos, and Carroll, however, recently asserted that “[organizational ecology] examines *interactions* within and *between* populations of organizations” (Hannan, Pólos, and Carroll 2007, 287; emphasis added).

'populations' in a much more restricted sense of the term. Descent is required. But descent presupposes replication and reproduction. . . . [A] certain degree of *genetic continuity is required for a population to function as a population in the evolutionary process*. To be sure, new organisms can migrate into a population and others leave, changing the genetic composition of the population. New genes can be introduced by means of mutation. But such changes cannot be too massive or too sudden without disrupting the evolutionary process. (Hull 1977, 98-99; emphasis added)

More recent expressions of this received view of the nature of populations are found with various philosophers of biology; for example:

The Darwinist approach explains both resemblance and variation at the population level. Organisms resemble one another not because of something inside each of them, but because of something outside each of them: *the genealogical and ecological factors that make these organisms a population or a group of related populations* (Griffiths 1999, 209; emphasis added)

The basic notion that characterizes these [i.e., biological] populations is that organisms that belong to the same population are more likely to mate and share genealogical ties with one another than they are to mate and share genealogical ties with organisms that belong to other populations. *Biological populations are distinct from other populations* that may be found in biomedical research—especially groups constituted in virtue of properties that individuals share. . . . This is because *they are conceived of as ontological individuals, and not classes of individuals*. . . . Ultimately, relations among organisms . . . provide the glue, the spatial and temporal cohesion, to bind individual organisms together into population wholes. (Gannett 2003, 990, 992; emphasis added)¹³

The upshot is that populations in biology are determined by reproductive and genealogical relations that obtain between their member organisms, not by similarities that exist between them (see also Mayr 1987, 159-63; 1997, 211).

13. Gannett (2003) challenged this received view of biological populations, arguing that because reproductive and genealogical relations between organisms do not usually break off discretely at objectively given barriers, populations are *made* by researchers on the basis of their investigative interests. That is, population boundaries are not given by nature, but are drawn by researchers on various grounds. (This comes close to the organizational ecologists' view of populations.) While this is basically correct, it is also the case that researchers are not completely free to draw population boundaries any way they like: population boundaries are drawn where the network of reproductive relations is thin as compared to surrounding locations. Moreover, even on full acceptance of Gannett's view, populations remain based on reproductive and genealogical relations between organisms, *not* similarities.

To be sure, biological ecologists oftentimes use a loosely defined population notion, defining a population as “a group of organisms of the same species occupying a particular space at a particular time” (Krebs 2001, 116; cf. Kingsland 1995, 1; Mayr 1997, 211). But it is essential to understand that this is merely an *instrumental* notion for practical research purposes, not a view that populations really *are* sets of organisms. That is, while ecologists know that populations *are* cohesive entities built from organisms, for many practical purposes in ecological research the actual nature of populations can be ignored as a simpler and *purely instrumental* view of populations as sets of organisms of the same species in the same location suffices. Hence, understanding organizational populations and species as sets, classes, or aggregates of organizations that exhibit a common basic organizational form, “organizational genotype,” or *Bauplan* amounts to conceptualizing populations and species in a way that does not fit evolutionary theory. In the words of biologist Ernst Mayr: “To call a species a set . . . would *completely destroy the usefulness* and unique characterization of the species in biological science” (1987, 145; emphasis added)—and the same holds for populations.

4.2. Populations as Evolving Entities

The mismatch between the organizational and evolutionary notions of “population” that we pointed out above has profound consequences for the explanatory content of the organizational ecology program. As the quotation by Hull (1977) suggests, it robs organizational ecology of its units of evolution (that is, the entities that *actually evolve*), because the populations and species that organizational ecology studies do not have what it takes to function as evolving entities.

To illustrate this, consider the closure, cohesion, and isolation of biological populations. Populations of organisms are largely closed gene pools that experience only a very low degree of influx of “foreign” genes. This exchange of genetic material in reproductive events or by way of horizontal gene transfer (in microbes) is what defines a population. As genes are mainly passed on to organisms within the population but not to outside organisms, later-generation organisms tend to resemble successful earlier-generation organisms (that in general tend to leave more offspring than comparatively unsuccessful organisms) and selectively advantageous properties can spread through the population and displace maladaptive and selectively neutral ones (Hull 1977; Mayr 1987; 1988; 1996). Although real organismal populations are never completely closed and isolated from other populations (as some gene flow to and from other populations will occur

through hybridization, virus-mediated horizontal gene transfer, etc.), the important point is that the population remains an independently evolving system *only* as long as this level of gene flow in and out of the population is sufficiently low.

Already in the *Origin of Species*, Darwin pointed out that isolation constitutes a favorable condition for natural selection (Darwin 1859, 102-08). But cohesion, closure, and isolation are more than just favorable factors: without sufficient degrees of cohesion within and isolation between populations, evolutionary innovations will generally not be able to establish themselves within the population and displace less successful traits. If cohesion is lacking, i.e., if genetic material is not passed on between the subsequent generations of a population, there will be no reason to assume that in later generations there will be a larger percentage of organisms that resemble the successful organisms of earlier generations. If closure and isolation are lacking, the population suffers from a continuous influx of variations that dilutes the gene pool:

What would be the consequence of the continuous uninterrupted gene flow through such a large system? In each generation individuals would have a selective advantage because they have a gene complex that is specially adapted to a particular ecological situation. However, most of these favorable combinations would be broken up by pairing with individuals with a gene complex adapted to a slightly different environment. (Mayr 1996, 263-64; see also 2004, 178-79, and the quotation by Hull 1977, 98-99, given in the previous section)

Or, as the authors of a recent introduction to evolutionary biology phrased the same point:

If migrant individuals can interbreed with members of the population in which they arrive, they will contribute their genetic makeup to this population. Migration is therefore a homogenizing force, opposing the tendency for local populations to diverge genetically by selection or genetic drift. (Charlesworth and Charlesworth 2003, 93)

The upshot is that sufficient degrees of cohesion between the organisms within a population, closure of the population and isolation from organisms outside the population are required for evolutionary innovations to spread and eventually become fixated in the population in which they arose. Lack of these prevents adaptive evolution from actually occurring in that population.

What does this mean for the role of populations in organizational ecology? Here the distinction, noted above (see footnotes 8 and 10), between

the views of organizational populations as real entities in the world (as held by McKelvey and Aldrich) and of organizational populations as theoretical constructs useful for research purposes (as Hannan and collaborators hold) becomes relevant.

Although some organizational ecologists claim that organizational populations are closed pools of organizational blueprints, comps, etc. that are exchanged between organizations within the population but not between populations (e.g., McKelvey 1982, 152, 194), the required cohesion, closure, and isolation are in fact largely lacking. One reason is that organizations do not reproduce their overall forms. Clonally reproducing organisms transmit all their genetic information to their offspring and sexually reproducing organisms half of it, so that offspring tend to resemble their parents to a large extent. Organizations, in contrast, do not reproduce in this sense: they do not have offspring that inherit large parts of their “genetic” information in such a way that the organizations in later generations will tend to resemble the successful organizations in “ancestor” generations of the same population.¹⁴ Most organizations do not produce any offspring organizations and those that do (e.g., by means of divesting subunits or splitting up into multiple new independent companies), transmit at most a very small percentage of their “genetic” information to their offspring. At most, an offspring organization will resemble its ancestor in a few traits. When, say, a new bakery opens in a particular town, it will exhibit some traits that are copied from existing bakeries (e.g., because the owners of the new bakery have “spied on” some of their future competitors), but it will not be a descendant of any of the existing bakeries: it will not resemble a particular “parent” bakery in the way that offspring organisms resemble their parents.¹⁵

So, another mechanism would be required to ensure that later-generation organizations resemble successful earlier-generation organizations, since heritability of traits is a necessary requirement for evolution to occur. The most straightforward such mechanism would be that managers actively (re)shape existing and newly founded organizations according to the example of other organizations that already successfully operate in the same

14. Donaldson (1995, 71-76) also pointed out that organizations do not reproduce, but did not connect this fact to the lack of a unit of evolution in organizational ecology theory.

15. A possible exception could be franchise businesses. Are not all McDonald’s restaurants, for example, “clones” of one common ancestor? While franchise businesses could indeed be interpreted in this way, it is, however, still the case that a population of franchises of the same parent organization cannot undergo evolution. This is because in such cases, there is only one parent organization with a single offspring generation that does not produce any further offspring. But for evolution to occur sequences of very many generations are required.

environment. However, since managers generally strive to outcompete competing organizations, they will try to give their own organizations advantages over the competition rather than attempting to turn them into copies of their competitors.¹⁶ As organizational ecologists recognize, managers constitute a cause of *variation* rather than of organizational “heredity.”

In addition, in contrast to genetic information organizational know-how can move quite freely between populations and species. It spreads when organizations sell off divisions to other organizations, merge with other companies, transform divisions into independent companies, employ business consultants with know-how of other firms and business sectors, or hire and fire employees. In none of these processes is there much reason to assume that know-how will remain within the population or even the species. When a firm divests one of its divisions that continues as an independent company, the new company will often belong to a very different species than its parent. And, contra McKelvey’s (1978, 1432-33; McKelvey and Aldrich 1983, 113) assumption, it is not the case that employees usually migrate between organizations within one specific population/species but not between organizations of different species. People are increasingly expected to respond flexibly to changing employment situations by being able to switch to different jobs in their own organization or completely different organizations, or by being open to be retrained to perform completely different jobs than those for which they were originally educated. While organisms cannot freely acquire novel genes from organisms of other populations and species, organizations are comparatively free to obtain know-how from a variety of sources.

Moreover, contrary to one of the central assumptions of organizational ecology, structural inertia does not generally prevent individual organizations from rapidly changing their basic form, i.e., from migrating from one population or species to another. Whereas organisms cannot change the species to which they belong, organizations can in principle move between species by initiating new types of operation and terminating old core businesses. The life history of Nokia illustrates this: founded in 1865 as a paper mill that later merged with a rubber company and a cable factory, Nokia repeatedly switched its core businesses from paper products, via multiple core businesses simultaneously (rubber shoes and toys, car tires, paper tissues, telephone cables, etc.), to its present exclusive focus on the telecommunications industry. Another example is the InterContinental Hotels

16. Benchmarking is a common practice, but does not amount to copying successful competitors, as managers have only very limited information about the organizations that they are trying to copy.

Group: the company started out in 1777 as the Bass brewery (brewer of Bass Pale Ale), acquired several other businesses including pubs and hotel chains, sold off the last part of its brewery division in 2000, and since then has focused exclusively on the hotel business.¹⁷

Organizational populations and species thus are very far from being closed “comp pools” or cohesive populations in the way that biological populations and species are (largely) closed gene pools. Thus, it is difficult to maintain that organizational populations are entities that constitute units of organizational evolution: organizational populations and species are not internally cohesive, closed, and externally isolated to sufficient degrees to be able to function as well-delimited entities in evolutionary processes. Thus, it seems more appropriate to view them as sets or classes of organizations and as such interpret them as theoretical constructs useful for particular research purposes, as Hannan and collaborators do, rather than as real entities.¹⁸

But on taking this view of organizational populations, organizational ecology cannot be considered a Darwinian research program that studies real processes occurring at the population level. If organizational populations are not real entities that can function in evolutionary processes, biological models that describe the evolutionary dynamics of populations are inapplicable to organizational “populations.” Consequently, organizational ecology lacks an explanatory mechanism that can be cited as the cause of the observed diversity of organizational forms. Whereas organizational ecologists assume that the diversity of organizational forms is the outcome of some sort of evolutionary process that in important respects resembles biological evolution, the ontology of organizational ecology theory does not include any entities that actually evolve. That is, the diversity of organizational forms that we find in the world is not the result of the same sort of causal process as the diversity of organismal forms.

17. See *About Nokia* (Nokia company brochure 2006), 5, *Story of Nokia* (<http://www.nokia.com/A4303001>, accessed July 11, 2008) and <http://www.ihgplc.com> (under “about us,” “our history;” accessed July 11, 2008).

18. As we have noted in footnotes 8 and 10, for those who wish to retain a realist interpretation of organizational populations the possibility remains to adopt a realist metaphysics of sets. But whatever the metaphysical advantages and problems of such a view of sets might be, this would in any case not resolve the problem. It would, after all, still boil down to a view of organizational populations that conflicts with the idea that populations are entities that participate in evolutionary processes, as sets are just not the sort of things that feature in natural processes.

We emphasize that this is not merely an epistemological matter, i.e., that organizational ecology lacks a proper unit of *analysis*. Organizational ecology has already been criticized on this count by other authors, e.g., Betton and Dess (1985), Young (1988), Kieser (1994, 612), Donaldson (1995, 42-78); cf. Singh and Lumsden (1990, 184-88), Kieser and Woywode (2006, 337-43). These authors have argued that the *delimitation* of populations in the real world is difficult and crucially dependent on the researchers' good judgment, so that organizational ecology lacks a well-defined and to some extent objectively given unit of analysis. One way of delimiting organizational populations is about as good as any other, so the criticism goes. Hannan, Pólos, and Carroll (2007, 85-89, 110-11) attempted to remedy this problem by formalizing the notion of "population" in terms of fuzzy sets and making population membership dependent on the recognition by an audience, so that population membership becomes more a matter of objectively existing matters of fact in a particular society and less a matter of researchers' judgments. Our criticism, however, goes beyond this epistemological point and hinges on an ontological matter: the entities that organizational ecologists claim participate in organizational evolutionary processes (i.e., organizational populations) are not sufficiently similar to the entities that participate in biological evolutionary processes, hence the two processes are not sufficiently similar to be described by the same model or similar models.

In sum: organizational populations do not evolve, at least not in any sense of "evolution" that resembles the biological meaning of the term; hence, conceiving of organizational ecology as a Darwinian research program amounts to severely misconceiving its nature.¹⁹

19. This conclusion is not merely a matter of pushing a rather uncharitable reading of the Darwinian nature of organizational ecology, as an anonymous reviewer interpreted it. According to this reviewer, organizational ecologists could accept that there are significant disanalogies between biological evolution and organizational evolution, while still rightfully thinking of their research program as providing "a kind of Darwinian account of organizational diversity." We believe, however, that from the perspective of philosophy of science such a charitable attitude would be severely misleading. Calling a particular research program a Darwinian program implies that it studies instances of a *very specific* sort of process, Darwinian evolution, and that consequently the same concepts, models, equations, etc. that are used to study Darwinian evolution in the biological domain also apply to the phenomena that research program studies. But, we have argued, changes of organizational "populations" through time do not constitute the same sort of process as the evolution of organismal populations. To be sure, organizational change can be understood as involving selection and "survival" of the better-equipped organizations—the point is, however, that not every selection process automatically instantiates Darwinian evolution. Calling organizational ecology a Darwinian program amounts to conceiving of it as something that it is not.

5. What Organizational Ecology Is (Not)

Organizational ecology claims to distinguish itself from other research programs in organizational studies by its focus on the organizational population as the unit of analysis. Hannan, Pólos, and Carroll (2007, 18) once again emphasized this in their most recent formulation of the program: “The approach differs from other sociological research on organizations by focusing on the population level. . . .” In addition, organizational ecology is widely perceived as a research program that rests on a theoretical core that contains elements of Darwinian evolutionary theory.

The preceding considerations, however, show that this view of the nature of organizational ecology is not correct. Organizational ecology uses a notion of “population” that is fundamentally different from the notion that is featured in evolutionary biology; instead, it uses a notion that is common in everyday language and features in biological ecology only instrumentally (cf. Mayr 1997, 211). While in biological ecology evolution always is present in the background, this is not the case in organizational ecology, as the populations that organizational ecology studies are not entities of the sort that can take part in evolutionary processes. Organizational ecology, then, is a research program of a different nature than biological ecology.

It might be suggested in response to our (and related) criticisms that individual organizations rather than populations are the units of evolution in organizational ecology, so that there is “proper” evolution in the organizational realm after all (see Kieser 2002, 70). This, however, conflicts directly with the fact that from the organizational ecology perspective evolution occurs by way of elimination of *entire* organizations, so that the proper units of evolution must be collectives of organizations that evolve as old organizations are eliminated and new ones that resemble their successful “parents” come into being. Moreover, understanding individual organizations as the units of evolution would make organizational ecology into a research program that looks at processes occurring at the level of individual organizations, which would conflict with the self-understanding of organizational ecology as a population-level research program. We suggest that the problem here lies with organizational ecology’s self-understanding: the actual objects of study of organizational ecology are not populations of organizations after all, but individual organizations—and in this respect organizational ecology is not different from most other research programs in organizational studies.²⁰

Where does this leave organizational ecology as a research program in organization science? As Scherer (2003) pointed out, organization theories always perform two roles: an explanatory/descriptive role in academic organization science and a normative role in management practice. We have discussed the normative consequences for management practice of the issues raised in the preceding sections elsewhere (Scholz and Reydon, 2008) and shall not repeat them here; we shall conclude by considering organizational ecology's explanatory/descriptive role.

Organizational ecology was originally intended to address at least four explananda: (1) the various organizational forms that actually exist, (2) their distribution through different environments, (3) the limitations that environments impose on organizational forms, and (4) the rates of change of organizations. While the first of these is addressed by taking a Darwinian approach, explananda (2)–(4) are more properly ecological than evolutionary questions. Biological ecology, after all, is not in the first place concerned with the *origins* of the various species of organisms that exist (*evolutionary* ecology is, though), but with the distribution and abundance of organisms of various species (e.g., Krebs 2001, 2, 7; De Laplante 2004, 264ff.). These questions can in principle be addressed without presupposing an evolutionary theory about the origins of the various kinds of organisms. Thus, models from biological ecology that do not depend on the precise ontology of the populations involved, i.e., models that describe changes in *any* groups of organisms without these collections necessarily being units of evolution, may be expected to apply in the organizational case.

This is, in fact, the direction in which organizational ecology has further developed itself in the past decades, limiting itself to addressing only strictly ecological issues (distribution and abundance) and refraining from trying to explain the *origins* of the different kinds of organizations that exist. One major contribution of organizational ecology to organization science and management practice is the sensitization of researchers and

20. On this view, organizational ecology is an individual-level research program in the following sense. While organizational ecologists study, say, the change of the composition of the "population" of bakeries in a particular major city, the *processes* underlying this change all take place on the level of individual organizations. There are no population-level processes to analyze and, therefore, the *real* level of study is the individual level, not the population level. As pointed out above, adopting a realist view of sets will not remedy this. Sets of organizations cannot evolve, as organizations with novel forms (evolutionary novelties) will have to be discarded as members of the typologically defined set. Hence, there are no processes on the level of sets of organizations for organizational scientists to study.

managers to the importance of environmental pressures on and inertial factors in organizations. Relevant theoretical and empirical research has been done since Hannan and Freeman's seminal article. Research concerning *structural inertia and change* has addressed the rigidity of organizational structures and has shown that adaptation to environmental changes is not as simple as the adaptation perspective assumes (e.g., Hannan and Freeman 1984; Hannan, Pólos, and Carroll 2004). A similar line of work is concerned with the *age dependence* of organizations and asks how the age of organizations influences their ability to adapt to changing environments (e.g., Carroll 1983). Other research focuses on the *dynamics of social movements* (e.g., Hannan and Freeman 1987) and emphasizes "the organizational basis of collective action, especially that related to the completion and mutualism of movement organizations" (Hannan, Pólos, and Carroll 2007, 19). Another important field of organizational ecology is engaged with *niche structure* (e.g., Hannan and Freeman 1977; Freeman and Hannan 1983; Barnett and Woywode 2004) and its subfield *resource partitioning* (Carroll 1985). According to this research,

an organization's niche summarizes its adaptive capacity over the various possible states of its environment . . . a broad niche comes at the expense of viability in a stable, competitive environment, but that environmental uncertainty and variability affect the trade-off between niche width and variability. (Hannan, Pólos, and Carroll 2007, 19-20)

Lastly, the most developed part of the organizational ecology program is concerned with population dynamics under the model of *density dependence*. Research in this area shifted the main focus of organizational ecology: while the initial question was "Why are there so many different kinds of organizations?" (a question which presupposes an answer in terms of *evolutionary ecology*), the question now has become "Why does the number of organizations of a certain kind vary over time?" (Carroll and Swaminathan 1991, 155). This latter question does not necessarily beg for an evolutionary answer. While early contributions to density dependence research were often based on the original theory of organizational evolution (Carroll and Swaminathan 1991, 155), more recent research seems to follow a purely ecological and more pragmatic path. According to the recent description of the program,

the core theory posits relationships between density, the number of organizations in a population, and legitimation of the form of organization and competition among the population's members. Its main empirical implications

are nonmonotonic relationships between density, on the one hand, and population vital rates on the other hand. (Hannan, Pólos, and Carroll 2007, 19)

This version of density dependence theory has no need for elements of evolutionary theory, but constitutes an approach that uses the stochastic bases of bioecology.

As such, organizational ecology is a useful branch of organizational science, provided that it is not misunderstood as an evolutionary approach to organizational questions and that it limits itself to applying strictly nonevolutionary models, concepts, etc. to organizational phenomena. As much of contemporary bioecology is grounded in evolutionary theory, organizational ecologists should exercise caution when using elements from bioecology in their research.²¹ They should look at the appropriate (i.e., nonevolutionary) parts of bioecology for inspiration, and be aware at all times that talk of “evolution” in the organizational realm is *nothing but* a metaphor and that metaphors can cause confusion as easily as they can yield illumination.

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