THE ECOLOGY OF MACROSTRUCTURE

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ABSTRACT

Since the work of Herbert Spencer and Émile Durkheim, selection as a mechanism of social differentiation has been a prominent feature of ecological theories, especially with respect to urban and organizational processes. In these approaches, Darwinian metaphors are introduced—for example, resource niches, niche density, competition, and selection among social units—to account for patterns of differentiation, or "social speciation." Less noticed have been more organicist selection arguments which also emanate from Spencer's and Durkheim's works. In these arguments, the potential for systemic disintegration is viewed as creating selection pressures for the creation of new and differentiated structural forms; while these kinds of arguments are often mixed in problematic notions of functional needs and requisites, they are nonetheless an implicit theme in much macrosociology. In this paper, the works of Spencer, Durkheim, and several prominent ecological theorists are examined with an eye to developing a general ecological model of macrostructural differentiation that incorporates both types of selection arguments.

Advances in Human Ecology, Volume 3, pages 113-137.
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ISBN: 1-55938-760-2

INTRODUCTION

Several lines of sociological theorizing emerged from 19th century analogies to biological processes. Two of the most prominent and persistent have been (1) functionalism, where organismic analogies have produced an emphasis on those processes determining the differentiation and integration of systemic wholes; and (2) human ecology, where Darwinian analogies[1] have led to a concern with competition, selection, and differentiation of social units. Although these two traditions remain distinctive, their initial founders—Herbert Spencer (1874-1898) and Émile Durkheim ([1893] 1933)—used both in developing their macrostructural theories. More recent work by Hawley (1986) has once again blended these two traditions. But in this 100 year period since the seminal analyses of Spencer and Durkheim, functional-organicist theorizing has maintained its emphasis on the integrative forces holding differentiating populations together (e.g., Parsons 1966; Alexander 1985; Alexander and Colomy 1990; Colomy 1990). In contrast, both urban ecology (Park and Burgess 1925; Burgess 1925; Mckenzie 1933; Park 1936; Hawley 1971, 1981; Berry and Kasarda 1977; Kasarda 1972; Castells 1985, 1988; Frisbie 1980; Frisbie and Kasarda 1988)—and organizational ecology (Hannan and Freeman 1977, 1984, 1986, 1987, 1988, 1989; McPherson 1981, 1983a, 1983b, 1988, 1990; Bidwell and Kasarda 1985, 1987) have sustained a focus on competition and selection as a driving force behind differentiation of the structures organizing a population. In this paper, I explore how theories on the ecology of organizations can be reconciled with the more macrolevel theories of Herbert Spencer, Émile Durkheim, and Amos Hawley. I have chosen organizational ecology because its focus—that is, the differentiation of subpopulations of organizations—should have implications for macrostructural theories of societal differentiation; and I have selected the macrolevel analyses of Spencer, Durkheim, and Hawley because they provide the necessary conceptual leads for connecting ecological and organismic theories. Obviously, this will not be a comprehensive approach, but it will initiate a way to theorize about the ecology of macrostructural differentiation.

THE EARLY CONVERGENCE OF ECOLOGICAL AND ORGANISMIC ANALYSES

Spencer's Demographic-geopolitical Model

Even though the Darwinian sounding phrase "survival of the fittest" can be found in early philosophical works by Spencer ([1851] 1888), his sociology (Spencer [1874-1896] 1898) is mostly devoid of such metaphors. Instead, as is modeled in Figure 1,[2] Spencer's approach is demographic and geopolitical,

revealing a highly robust model on the ecology of macrostructure. Several potential leads in developing an even more robust theory are suggested by Spencer's approach. (1) The differentiation of distinctive types of organizational units is a positive function of population size, as the latter escalates the logistical loads for maintaining a population in an environment; and this differentiation will occur with respect to (a) the production of goods and services, (b) the distribution of such goods and services, and (c) the regulation, coordination, and control of internal activities through concentrations of power. (2) If logistical loads are exceeded, dissolution of the population occurs. (3) Segmentation rather than differentiation occurs in response to initial increases in population size and logistical loads, but as a population continues to grow, logistical loads increase and cause either differentiation or disintegration. (4) The differentiation of organizational units has effects on the creation of various types of social categories (class, ethnic, regional, occupational, etc.). (5) The differentiation of centers of power, coupled with the concentration of such power under the influence of external and/or internal threats, escalates the level of inequality which, in turn, produces more differentiation of social categories. (6) Concentrated power under conditions of external threat often leads to success in war and conquest which, in turn, increases the size and diversity of a population (and thereby escalates logistical loads directly or via effects on internal threat). (7) Differentiation is the result of several intersecting and, at times, countervailing processes: The number of distinctive strata and categories is increased with the differentiation of productive and distributive organizational units, whereas ever higher degrees of concentrated power and inequality will initially increase the number of strata (and associated social categories) but eventually polarize a population into a smaller number of strata (the "haves" and "have nots") and corresponding social categories. Each of these conceptual leads will prove, I believe, useful in developing a more general model on the ecology of macrostructure, but by themselves they lacked an explicitly Darwinian focus—a focus that Émile Durkheim was to supply.

Durkheim's Ecological Model

Unlike Spencer's model, which is demographic and geopolitical, Durkheim's ([1893] 1933) macrostructural theory is clearly ecological because structural differentiation is viewed as a function of the competition and selection processes (delineated in the middle portion of the model in Figure 2). As with Spencer's model, there are important conceptual leads for a more general theory on the ecology of macrostructure. (1) Differentiation occurs when material and moral densities are high, because concentration in physical or moral "space" reduces the capacity for segmentation and forces competition for resources and, hence, selection. (2) Communication and transportation technologies are a force behind sociocultural differentiation, via their direct effects on increasing

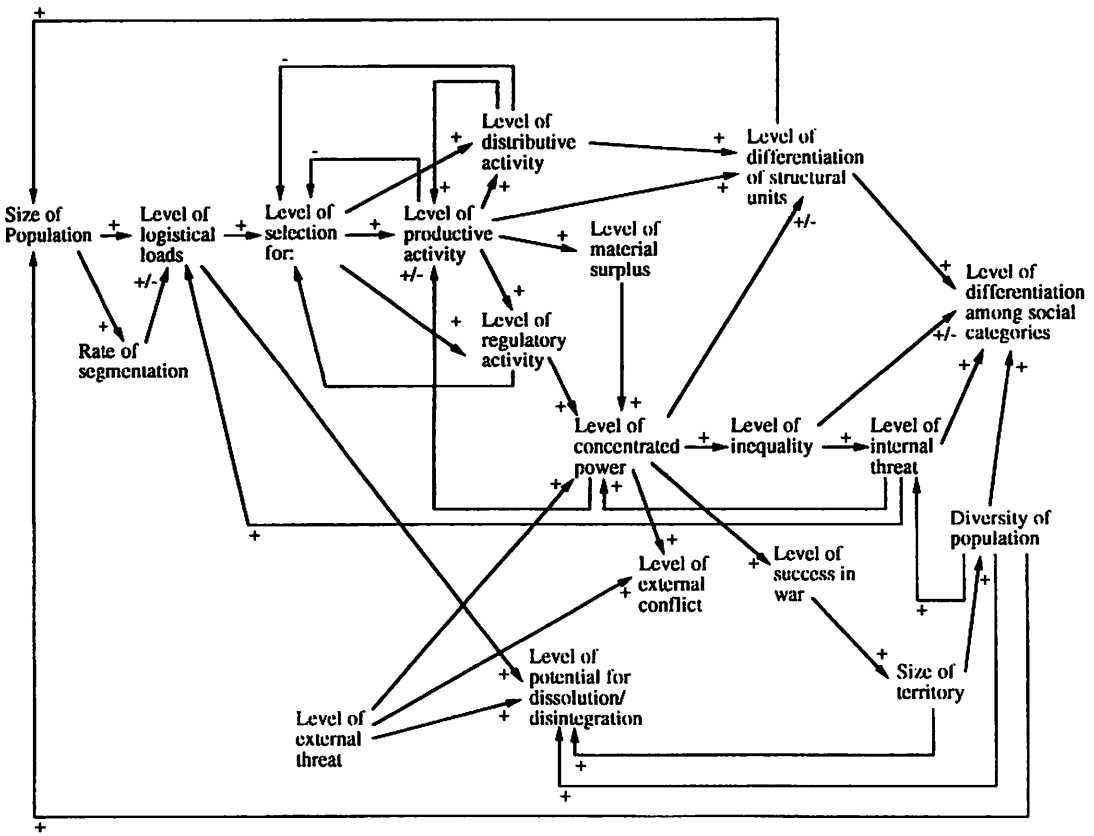

Figure 1. Spencer's Demographic-geopolitical Model of Differentiation

material and moral density which, in turn, fuel competition for resources and selection. (3) Differentiation of positions and subgroupings is causally related to both a corresponding differentiation of symbol systems with respect to (a) regulation (by specifying, normatively, relations within and between differentiated units), and (b) evaluation (by generalizing values and thereby providing common moral force for diverse structural units). (4) As Durkheim hoped in his "Preface" to the second edition of *The Division of Labor* ([1902] 1933), organizational units engaged in common domains of activity will form networks (a) mediated by sets of regulatory symbols, and (b) unified by applications of generalized evaluative symbols. Also, (5) selection and its effects on differentiation involve a series of reverse causal chains: Social differentiation reduces selection pressures by decreasing competition among social units in a particular resource niche (Durkheim [1893] 1933, p. 270); symbolic generalization, which itself is the result of selection pressures for some degree of symbolic unification under pressures for social differentiation, facilitates further differentiation by providing a repertoire of common abstract symbols among differentiating units; and networks of differentiated subgroups regulated by sets of domain-specific as well as by highly generalized evaluative symbols reduce selection pressures and competition for resources.

Functional and Ecological Views on Selection Processes

In looking back at Spencer's and Durkheim's models, many of the key elements of a macrolevel ecological theory can be found. What makes their theories ecological is the notion of "selection," but this concept denotes somewhat different processes in Spencer's and Durkheim's theories. One type of selection is Darwinian: Differentiation is related to the number of resource niches, the scarcity of resources in niches, and the level of competition and selection *among* social units or idea systems in these niches. Another type of selection is functional or organicist: Differentiation is related to disintegrative pressures in social wholes and selection *for* certain types of integrative social units and symbol systems. In the Darwinian view, selection operates under conditions of high density in a niche; in the more organismic approach, selection operates when there is low density, or even an absence of structures and symbols that can promote integration in the face of increased logistical loads and pressures for disintegration. For Spencer, there are non-Darwinian selection processes operating in the differentiation of a societal population; these involve selection for structural units that can resolve escalating logistical loads for regulation, production, and distribution. For Durkheim, there are also non-Darwinian processes revolving around selection for networks of subgroups and for layers of regulatory and evaluative symbol systems.

This distinction makes a great deal of difference in how macrolevel analysis is conducted. If one emphasizes Darwinian selection, then the key processes

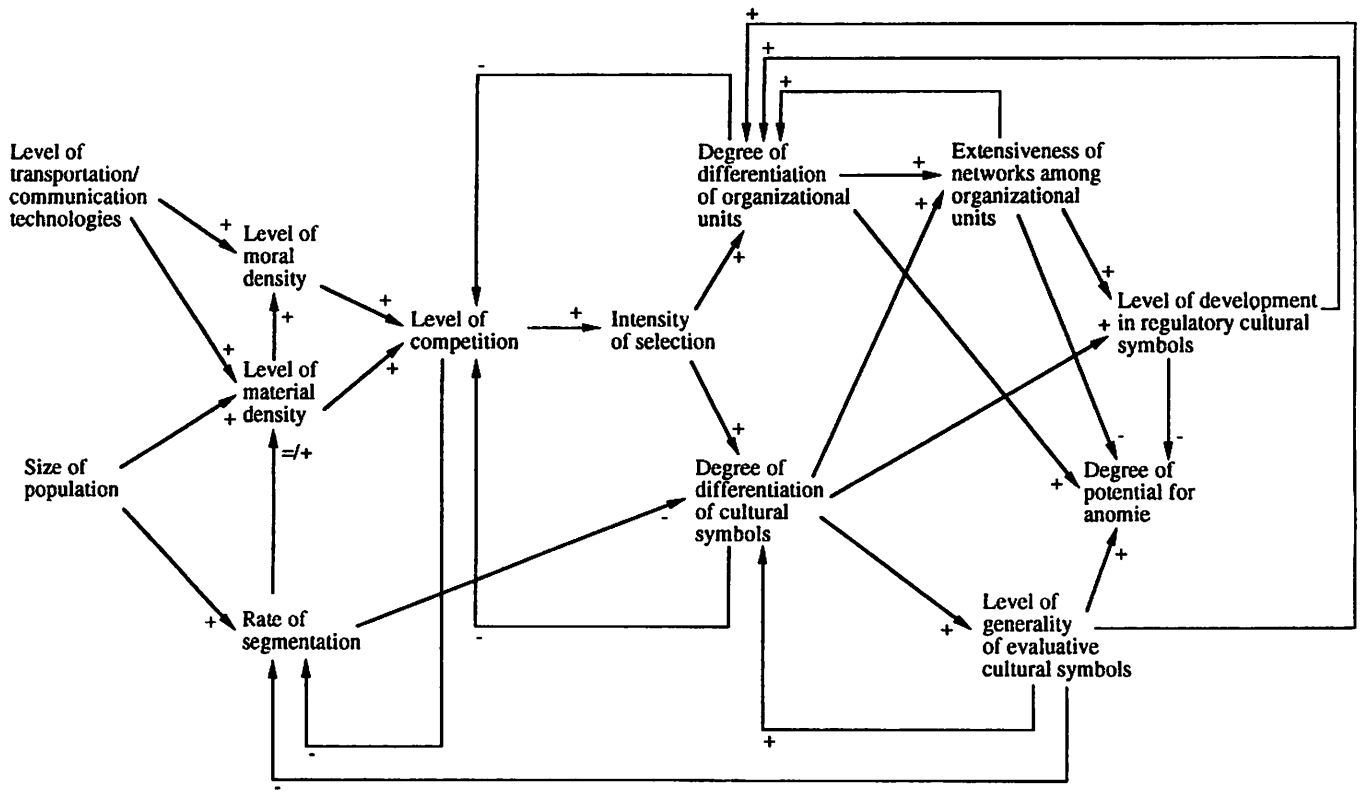

Figure 2. Durkheim's Ecological Model of Differentiation

are resource levels, resource niches, niche density, competition for resources, and selection *among* units; as a consequence, other macrolevel elements, such as population, production, distribution, power, war, territory, symbol systems, inequalities, and technology are viewed in terms of how they affect resource levels, niches, density, and competition. In contrast, if one stresses functional-organicist selection, the key processes are those disintegrative forces that generate selection *for* structures and symbols that can overcome these disintegrative forces; as a result, ecological processes revolving around niches, density, and competition are given less emphasis. Although present-day human ecology was initiated by the macrolevel functional theories of Spencer and Durkheim, it has developed on its own independently of the functional concerns of early theorists; over time, ecological theory has emphasized its affinities to bioecology (e.g., Hawley 1944, 1950, 1971/1981; Hannan and Freeman 1977). This divergence of ecological and macrofunctional theories has been useful in that the metaphorical and vague Darwinian arguments articulated by Durkheim and implied by Spencer have been made considerably more precise; therefore, it is useful to explore in detail prominent approaches in organizational ecology before initiating the task of reuniting them with selection arguments from macrofunctional theories.

THE DIVERGENCE OF ECOLOGICAL AND FUNCTIONAL THEORIZING

Hannan's and Freeman's Ecological Model

In Figure 3, Michael Hannan and John Freeman's theory on the differentiation of populations of organizations is reformulated at a more macrolevel.[3] In this model, the level of material and nonmaterial resources of a particular kind ultimately determines the number of organizational units in a resource niche. As organizational forms proliferate in a niche, a series of cycles revolving around rates of founding, legitimation, and structural inertia are initiated and sustained, providing selection something to work on once levels of organizational density and competition increase.

As niche density increases, competition within populations of organizational units is initiated, though if resource levels increase this competition will be mitigated. Increased production and political regulation can increase resources in a niche, but Hannan and Freeman do not elaborate upon these macrolevel forces in the same way as Spencer, Durkheim, or other contemporary macrolevel theorists. Markets can also increase resource levels, but their effects are somewhat contradictory. On the one hand, they increase resources and thereby lower competition but, on the other hand, they provide a mechanism for increased competition among organizational units in various niches.

The level of competition is also influenced by the rate and degree of variability (i.e., fluctuations and oscillations) in resources, both of which directly increase competition while having indirect effects on selection pressures. The rate of variation in level of resources has a direct negative effect on the size and generality of organizational units (conversely, slower rates will encourage these structural forms), but as this rate of variation is coupled with a high degree (or range) of variation, competition is heightened; as a result, larger and more generalized organizational units emerge (these processes were initially conceptualized by Hannan and Freeman [1977] as "niche width," a notion that now appears less central in their work than the older Durkheimian/Darwinian notion of "density"). Also, under heightened competition, organizations in a population often work to form networks and confederations of various kinds in order to reduce competition, at least initially. Yet, such networks of organizational units ratchet up the size of organizational units to a higher level, potentially increasing competition and selection among organizational networks which invade, or overlap, each other's resource niches. At the macrolevel, however, organizational size, generality, and confederation into networks directly decrease the rate and level of differentiation by filling niches and, perhaps, invading and outcompeting additional organizational forms in other niches; at the same time, there is an indirect effect of these processes on reducing the competitive processes that encourage selection and differentiation of organizational forms.

When competition can increase, however, it escalates selection, especially when legitimating processes have created a high proportion of inertial to adaptive capacities in organizational units. Selection will increase rates of organizational failure which, in turn, will initially decrease the rate and degree of differentiation until failings reach a level where the niche becomes underutilized and, thereby, encourages new organizational forms to seek its resources. The degree of specialization of organizational units increases differentiation among such units, and degree of specialization is a positive function of the rate of variation in resources and a negative function of the extent of variation and fluctuation in resource levels. In sum, then, Hannan and Freeman provide many conceptual leads for a macrolevel ecological theory because their model fills in details on density, competition, and selection that neither Durkheim or Spencer were able to provide.

McPherson's Ecological Model

J. Miller McPherson and a number of his colleagues (see, e.g., McPherson 1981, 1983a, 1983b, 1988, 1990; McPherson and Ranger-Moore in press; McPherson and Smith-Lovin 1988; McPherson, Popielarz, and Drobnic 1992) have extended ecological analysis in an interesting direction, one implied by Spencer's discussion of social categories and, as I will examine shortly,

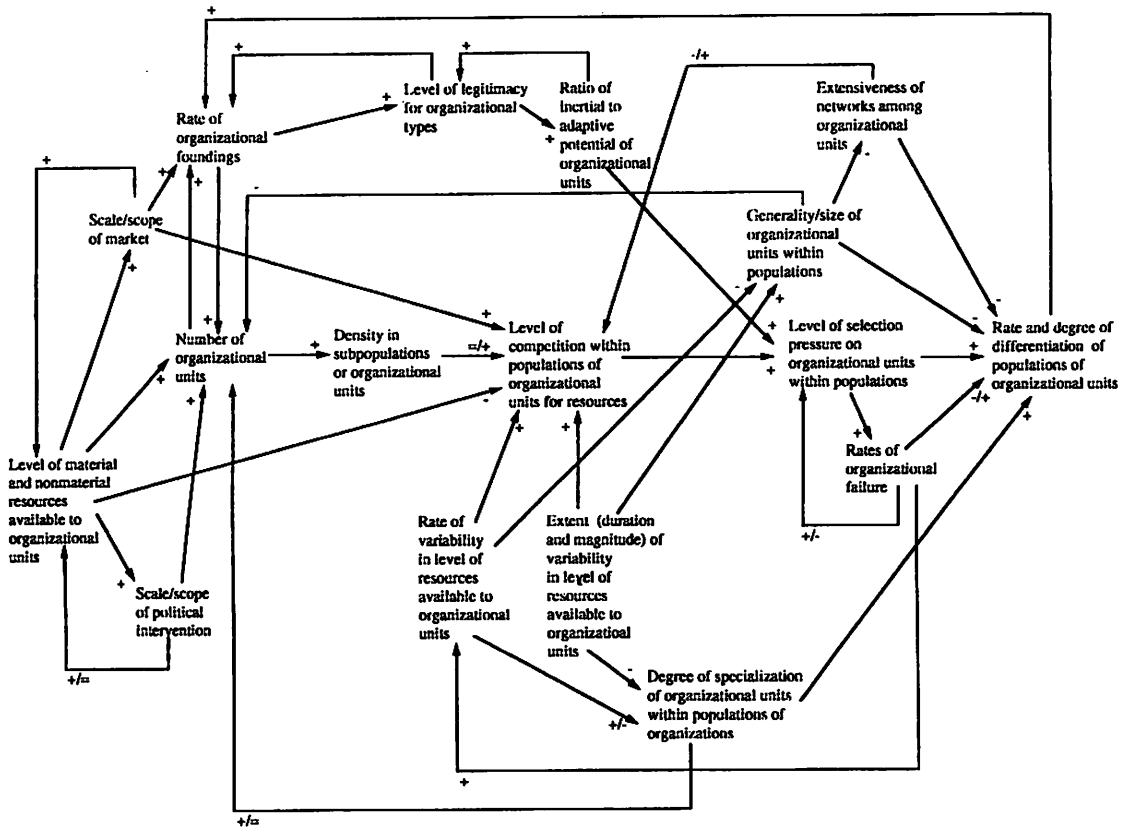

Figure 3. Hannan's and Freeman's Ecological Model of Differentiating Processes

Hawley's (1986) analysis of categoric units. His underlying model is delineated in Figure 4. McPherson introduces the notion of "Blau-space," named after Peter Blau's (1977) analysis of macrostructure. In McPherson's vision, system complexity creates individuals who can be distinguished in terms of many different attributes—age, sex, education, income, class, occupation, race/ethnicity, residence, religion, and so on. What makes the conceptualization of Blau-space ecological is that the distribution of individuals with respect to some distinguishing characteristic can become a resource niche for organizational units, or what Hannan and Freeman term nonmaterial resources. The level of resources in Blau-space is a joint function of the total number of individuals in a population, the diversity of their characteristics, and the number of individuals in each diverse niche, whereas the number of niches is an inverse function of overall network density among members of a population and a positive function of the degree of diversity in the characteristics of individuals. When a niche is underexploited, there are many more individuals with particular characteristics than there are units organizing them. Under this condition of underexploitation, organizations will increasingly move into this niche, selectively recruiting members and clients in the niche. As more organizations move into a niche, however, the niche becomes overexploited—that is, the number of individuals in the niche is now less than that which can support all organizational units. The result is competition and selection in favor of those units that can successfully recruit and retain members and clients over those which cannot. Under competition and selection, the more "fit" organizations stay in a niche, while the less fit die; or, as is the more likely scenario for the voluntary organizations that McPherson studies, they can move to a new niche in Blau-space. Such movement is facilitated when there are adjacent niches in Blau-space that are underexploited and that do not require massive restructuring of the organizational unit. Thus, McPherson's model fills in details on the ecological dynamics generated by social categories, a task which Spencer left implicit and Durkheim ignored.

Strengths and Weaknesses of Organizational Ecology

These two theories of organizational ecology provide a number of important leads for developing an ecological theory of macrostructure: (1) Differentiation of structural units is related to resource levels and the diversity of niches composed of (a) material resources (e.g., members, clients, money) and (b) symbolic resources (e.g., cultural distinctions, social categories). (2) Density is a central dynamic because it sets into motion competition for resources and selection processes that force organizational units to adjust and adapt to available resources in a niche, move to a new niche, or die. And (3) out of competition and selection, social "speciation" or differentiation occurs.

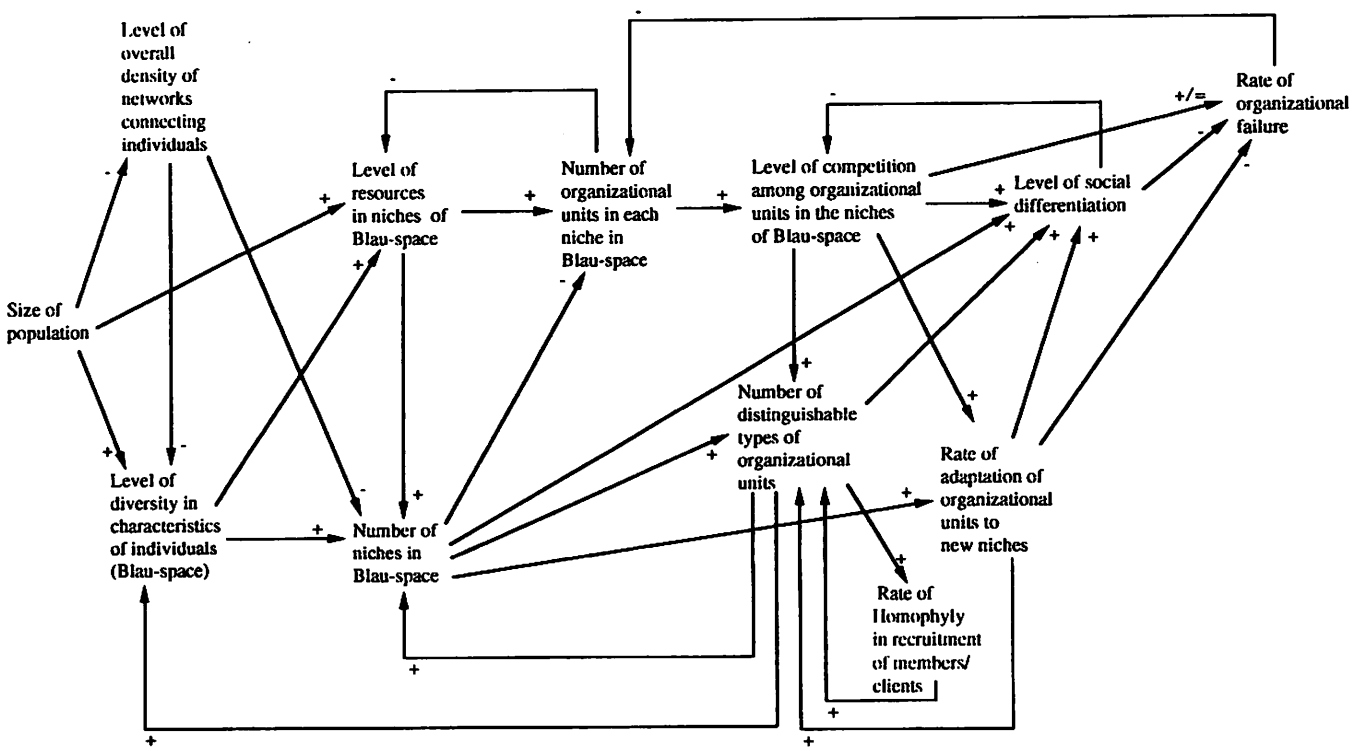

Figure 4. McPherson's Ecological Model of Differentiating Process

Yet, for all of the necessary detail that they add to a theory of ecology, these theories do not seek to explain all of those forces creating resource niches in the first place. In order to develop a more macrolevel theory, therefore, it is necessary to reconnect organizational ecology with more macrofunctional theories. Amos Hawley (1986) has initiated this theoretical project; I propose to take it a step further.

RECONCILING ECOLOGICAL AND ORGANISMIC ANALYSES

Hawley's Macrolevel Theory

In Figure 5, Amos Hawley's core ideas on the dynamics of macrostructural differentiation are modeled.[4] Hawley (1986) introduces what is an essential distinction in macrostructural analysis between "corporate units" and "categoric units"—one pursued by McPherson in his discussion of Blau-space and anticipated by Spencer in his brief portrayal of social categories. Differentiation of corporate units involves creating distinctive types of organizational structures, whereas differentiation of categoric units revolves around the emergence of social distinctions that classify individuals.

Technology, as it influences transportation, communication, and production, is one of the driving forces behind differentiation. Building on Durkheim's initial insight, Hawley sees mobility costs as a critical consideration because they set limits on how much differentiation and specialization of organizational units can occur; for without the capacity to move information, material, and actors, differentiation is not possible (a line of argument anticipated by Spencer's emphasis on distribution). The process of production directly increases differentiation of corporate or organizational units because of the increased efficiency of specialization; and this process is accelerated by the existence of markets, competition, and selection among specialized units which seek to find a stable and predictable resource niche. Population size, as it encourages expanded production and as it provides a larger social mass which can be divided up in more ways, also works to increase in the number and size of diverse units. Indeed, like Spencer, Hawley recognizes that larger populations must be divided into a greater number of organizational units if they are to be sustained. Yet, if population growth raises mobility costs in the absence of new technologies and increased production, then it works against differentiation of corporate units. Differentiation of corporate units and growing size of a population, along with the competition and threat generated by production and markets, increases the number and size of categoric units. In a manner reminiscent of Spencer's and Durkheim's functional arguments, the existence of many diverse types of corporate and categoric units creates selection pressures for their control through the differentiation of regulatory

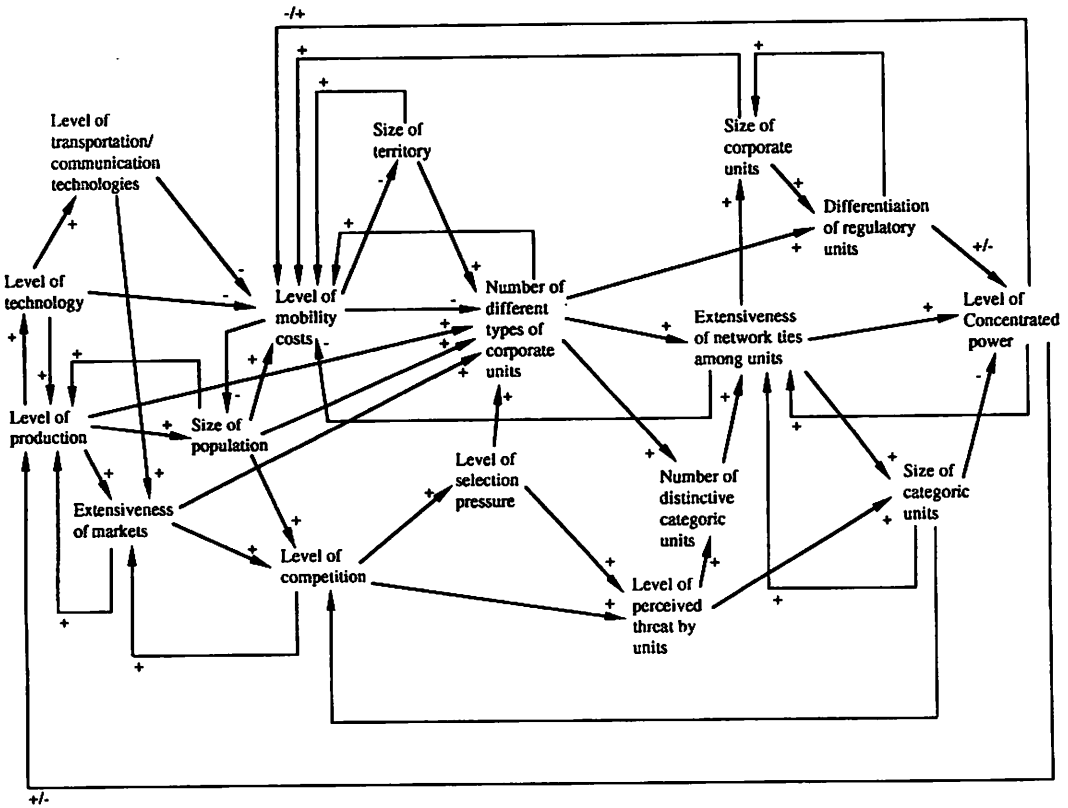

Figure 5. Hawley's Ecological Model of Differentiating Processes

units (i.e., concentrations of power) and through the consolidation of units in increasingly extensive networks. The concentration of power at moderate levels encourages further differentiation through its effects on capital formation in the productive sector. In turn, increased production causes further differentiation of corporate and categoric units, expanded numbers of network ties, and increased efforts at regulation and increased concentration of power (which eventually will work against increased production).

These theoretical leads in Hawley's (1986) scheme consolidate, to some degree, the ideas in Spencer's and Durkheim's functional approaches, while adding refinements. Yet, surprisingly, this more recent work moves more toward functional than ecological theory, analyzing differentiated units in terms of functions and key functions (Hawley 1986) for each other and for the maintenance of a system in its environment; as such, the scheme downplays somewhat Hawley's earlier emphasis on resource niches, competition, and selection (e.g., Hawley 1944, 1950, 1973). Indeed, it moves toward technology as the driving force behind differentiation, along the lines of Lenski (1966) and other evolutionary theories, but it does so by stressing transportation and communication technologies and their effects on mobility costs. Thus, once the unit of the analysis shifts from the meso level (i.e., communities and organizations) to the macro level (i.e., societal populations), ecological and organismic analyses begin to converge.

The Ecology of Macrostructure: A Synthetic Model

How, then, are we to take advantage of the conceptual leads provided by the theories modeled in Figures 1 through 5? In Figure 6, I have tried to pull these leads together in a model which reconciles the organicist selection arguments of functionalism with the Darwinian selection portrayals of human ecology. In the figure, three sets of selection processes are highlighted: those on the left pertain to first-order functional selection, those in the middle revolve around Darwinian selection, and those on the right pertain to second-order functional selection. These three blocks of selection processes will organize my discussion of the model in Figure 6.

First-order Functional Selection Processes

At the left of the model are a series of forces that set into motion what I term *first-order selection processes.* These processes involve selection for certain structures in the face of potential dissolution. Perhaps this emphasis is only a rewording of old functional arguments with all of their problems, but they are nonetheless fundamental to understanding the social organization of societal populations. Moreover, functional theories always implied a more ecological argument: Those societal populations that could meet requisites or

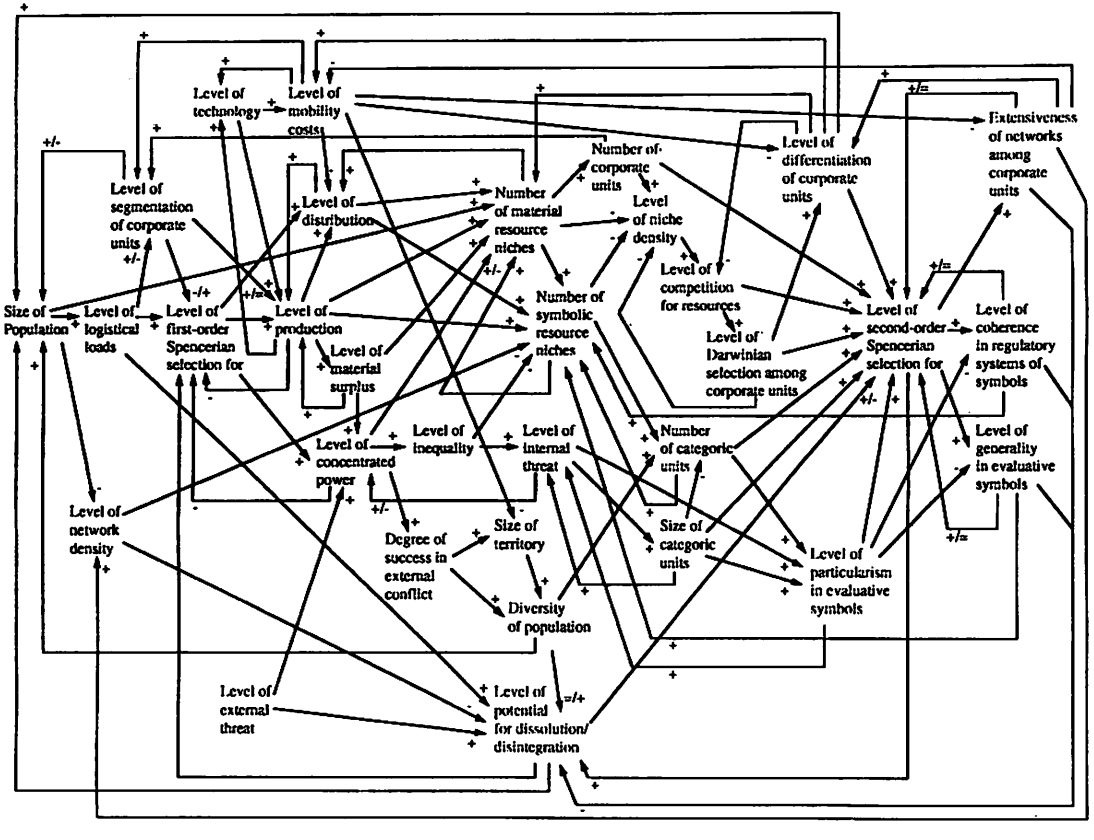

Figure 6. A General Ecological Model of Macrostructural Differentiation

needs were more likely to survive in an environment than those which could not do so. The model in Figure 6 simply makes this ecological portion of functionalism explicit by indicating that there are fundamental or first-order activities that, by intent or chance, must become structured if a population is to persist in an environment.

Most of these first-order selection processes were delineated by Spencer in *The Principles of Sociology* ([1874-1896] 1898), but I have added refinements suggested by others. With Spencer, I argue that first-order selection is ultimately caused by population growth. When a population grows, several forces are set into motion as a consequence of the increasing logistical loads for sustaining the population: (1) As Durkheim stressed, segmentation of like structural units is one response to growth; and as Hawley would argue, I think, such is particularly likely to be the case under conditions of low technology and high mobility costs (as denoted by the reverse causal arrow from mobility costs to segmentation). (2) As McPherson and various coauthors assert, population growth decreases network density among members of a population, thereby decreasing capacities for social control and, as Spencer (1862, [1874-1896] 1898) believed, setting into motion forces for movement and localization of subunits and subpopulations in new resource environments which cause either their differentiation from each other or their dissolution as a coherent system (such is possible, Durkheim averred, when there are few ecological constraints maintaining material density). As Mann (1986) and others (e.g., Maryanski and Turner 1992) have more recently argued, the "caging" of populations creates pressures for internal conflict and competition leading to differentiation, but the capacity of subpopulations to escape ecological and political cages also leads to differentiation by virtue of their localization in diverse environments. (3) Segmentation under conditions of population growth eventually becomes an inadequate response to mounting logistical loads, as both Spencer and Durkheim emphasized; as a consequence logistical loads escalate and the potential for dissolution increases.

Together, as is denoted by all of the direct, indirect, and reverse causal arrows into the level of first-order selection, these forces generate selection *for* expanded activity along the three principle axes suggested by Spencer: production, distribution, and regulation. The level of production must increase to support a larger population; distribution processes must expand to sustain the movement of goods and services among members of a population; and regulation through the concentration of power must increase in order to coordinate and control the increased volume of activities among a larger population. If these outcomes are not forthcoming, then mounting logistical loads cause the dissolution of the population.

Once increased production, distribution, and regulation (via concentrations of power) are set into motion, a series of interrelated processes delineated in the left-middle portion of the model in Figure 6 are initiated: (1) As Hawley

recognized and Durkheim implied, increased production is both the result and cause of technological development which, in turn, causes mobility costs to decrease as new transportation and communication technologies are developed. (2) Lowered mobility costs facilitate expanded distribution, which then stimulates more production and technological development. (3) Expanded production increases material surplus which can be used as capital to expand production further, but as Spencer and more recent scholars like Lenski (1966) have emphasized, it is also usurped by centers of power and used to increase the concentration of power. (4) As power becomes concentrated, inequality escalates as Spencer and modern-day evolutionary-conflict theorists document (e.g., Lenski 1966; Turner 1984); as a consequence, internal threats increase and, ironically, lead to greater concentration of power in order to control such threats (up to the point where internal threats are so high as to create viable centers of counter-power). (5) As Spencer and more contemporary theorists like Lenski (1966) and Collins (1986) have recognized, the concentration of power is often related to geopolitical processes, because external threat increases concentration of power in order to mobilize, control, and channel resources to deal with the threat. In the long run, these processes aggravate the cycles that increase internal threat. Moreover, if external conflict ensues and society is successful in war, then the growing amount of territory, size of population, and diversity of this population all escalate logistical loads and first-order selection for increased power, production, and distribution.

Darwinian Selection Processes

The forces set into motion by first-order functional selection processes generate the resource niches within which Darwinian selection *among* corporate and categoric units takes place. That is, functional selection *for* increased production, distribution, power, and their effects on technology, mobility costs, inequality, and geopolitics determine the level and varieties of resources available for Darwinian selection among structural units organizing members of a population.

This outcome is the result of the obvious fact that to increase the levels of these functional processes involves growth and differentiation of structures and categories which, in turn, become resource niches for the Darwinian selection processes emphasized by ecological theories. These Darwinian dynamics are delineated in the middle-right portion of Figure 6. Increases in production, distribution and concentrations of power directly cause the number of resource niches to expand, although highly concentrated power will begin to decrease the political resources available to organizational units and, via the feedback loop to material resources, the material resources as well. These same forces will also expand the number of symbolic resource niches via the paths delineated in the model.

There is, however, a clear tautology in these generalizations: Increased levels of productive, distributive, and political activity involve the very differentiation that is to be explained by these levels. For most organizational ecologists, this tautology is not apparent because resource levels as generated by production, distribution, and power are, for the most part, exogenous variables or unexplained constants. But, when we seek to account for why resources exist at a given level and variety, creating resource niches that allow for differentiation of corporate and categoric units, we come face to face with the argument that differentiation of resource-generating processes produces differentiation.

In a real sense, this tautology is part of reality: Initial differentiation creates niches for further differentiation; in turn, this further differentiation increases the levels of those forces—production, distribution, and power—that generate more resources in existing niches while increasing the number of niches. Thus, differentiation is a self-escalating process, up to the levels that technology allows and up to the point where overly concentrated power works directly and indirectly (via causal processes delineated in the model) to decrease both the diversity and levels of resources. This is why Hawley (1986) argues that system complexity escalates to the maximum possible in terms of the levels of technology and environmental constraints. In the model in Figure 6, this self-escalating nature of differentiation is delineated by numerous reverse causal processes that directly and indirectly lead back to affect the number of material and symbolic resource niches, which then set into motion the Darwinian selection processes outlined by organizational ecology.

Turning first to the key causal processes revolving around material resources that are used by corporate units, several processes can be highlighted: (1) As the arrows flowing into this variable emphasize, material resources include human bodies (as members, clients, participants), money, products, goods, and other units of value that can be used to sustain a structure, physical objects and space, and coercive capacities, although these are almost always mingled together in some combination to produce a variety of resource niches. (2) As McPherson emphasizes, symbolic resources defining attributes of individuals in Blau-space also interact with material resources in creating niches for corporate units; also, as Spencer and Hawley recognized, inequalities and internal threats create categoric units that can become highly volatile and dynamic resources for corporate group formation (e.g., as a social movement or organized revolt). (3) As all ecological theory stresses, the number of corporate units expands to fill underexploited material resource niches, a process which is a form of segmentation that fuels, via the long feedback loop to segmentation and logistical loads, selection for those processes that increase the level and diversity of resources. Thus, segmentation is essential to differentiation by virtue of its effects on increasing niche density. (4) As the level of density increases, the degree of competition for resources escalates,

leading to Darwinian selection among corporate units whose inertial tendencies give selection something to work on and whose adaptive abilities may allow them to readjust to an existing resource niche, or to find a new niche. (5) As competition and selection escalate, the level of differentiation among corporate units increases, feeding back to increase the number of resource niches. For as the differentiation of units occurs, the units often find or create new sources of resources, up to the limits of technology, concentrated power and, as Hawley stressed, rising mobility costs (and the effects of this force on distribution, production, material surplus, and power).

Let me offer a note on a particularly important process that accelerates the diversity of material resources and, I also argue, symbolic resources: distribution by markets. Markets are the critical mediating structure between technology, production, and material surplus, on the one hand, and the creation of resource niches on the other. Because markets connect individual preferences and demand to production, they can differentiate to meet the virtually unlimited preferences of individuals; in so doing, they can create "markets for" virtually any good, service, or symbol which, in turn, become resource niches for corporate units. As a result, markets can dramatically expand the number of niches, often without increases in aggregate production or material surplus (White 1981). For if markets are relatively open, their existence encourages sellers to seek "new markets," including the marketing of the terms of exchange (e.g., money, futures, options, etc.) in lower-level markets; in so doing, new resource niches are generated (Collins 1990). As a consequence, once markets reach a threshold of differentiation and evidence fiscal mechanisms (money, credit, insurance, etc.) that lower the mobility costs of transactions, they tend to expand and differentiate rapidly, up to the point where (a) the resource niches created by such differentiation become overexploited, (b) the level of speculation in such niches has produced goods and services beyond the level of demand, thereby setting into motion a market collapse, or (c) the level of demand for goods and services levels off, or declines. Capitalist markets take these dynamic qualities to the extreme, but they are inherent tendencies in all market systems that reach a certain level of differentiation. As the limits of (a), (b), and (c) above are reached, markets often collapse, thereby dramatically reducing the level of resources and the diversity of resource niches available to structural units.

Turning now to the key causal processes revolving around symbolic resources, several can be highlighted: (1) The number of symbolic resource niches is potentially greater than material resource niches, up to the limits of the number of individuals in a population and their imaginative capacities to create niches in Blau-space. (2) Production, distribution, and power all directly increase symbolic niches by virtue of the division of labor's partitioning effects on incumbents' experiences, a process that is expanded indirectly by the creation of material resource niches. (3) Lowered network density directly

increases the number of symbolic niches by virtue of its effects on lowering interconnections among actors (both their "moral" and "material" density in Durkheim's terms), thereby reducing the effects of social control to enforce conformity to common symbols. (4) Concentrated power as it affects inequality and ethnic diversity (through geopolitics) is also a driving force behind the formation of symbolic niches. (5) The number of categoric units is related not only to the number of symbolic niches but also to the level of material resources (at a minimum, human bodies who are categorized but typically other material resources such as money, power, place in division of labor, etc.) necessary to sustain a category in Blau-space. (6) The size of categoric units expands as a result of internal threats which are fueled by inequality and ethnic diversity. (7) Categoric units, in turn, increase the symbolic resources available for corporate units. And (8) the ecological dynamics of competition and selection among categoric units are, I argue, related to the density of corporate units in symbolic resource niches; therefore, selection among categoric units occurs primarily when they have become wholly, or partially, imbedded in corporate units within densely populated symbolic resource niches.

In sum, then, Darwinian selection among corporate units and, indirectly, categoric units connected to corporate units, is circumscribed by first-order functional selection processes but, via a number of reverse causal effects delineated in the model in Figure 6, such Darwinian selection alters the course of these functional selection processes. One major reverse causal effect emerging from Darwinian selection is, as Spencer was most apt to emphasize, the capacity of a more differentiated set of corporate units to support a larger population and to organize this population in ways that respond to first-order functional selection pressures, thereby avoiding disintegration of the population. Another related causal effect occurs via what I term in the model in Figure 6, *second-order functional selection processes.*

Second-order Functional Selection

The processes delineated on the right of Figure 6 are second-order functional selection in this sense: The consequences of Darwinian selection within a population create a new level of escalated logistical loads revolving around how the differentiated corporate units are, themselves, to be integrated so as to avoid dissolution. This problem was initially given its most forceful expression by Adam Smith ([1776] 1805), but it was soon incorporated into the French lineage culminating in Durkheim ([1893] 1933).

We could argue, of course, that the process of differentiation creates resource niches for integrative structural units and symbol systems, but as with first-order functional selection, we can go only so far because we are addressing selection for sociocultural processes under conditions of low (or lack of) density among such integrative structural units. In broad contours, I think that

Durkheim ([1893] 1933, pp. 329-389, [1902] 1933) understood these processes best as a series of simultaneous processes for (1) the formation of larger networks of interdependence among corporate units which, as Hawley (1986) also recognized, is related to mobility costs; (2) the generalization of evaluational systems, or what Parsons (1966) later termed "value generalization;" and (3) the development of coherent regulatory symbols for (a) specifying generalized values and (b) articulating rights, duties, and obligations among corporate units. All of these processes are self-reinforcing because each generates selection for the other: Generalized systems select for regulatory symbols to fill in the relevant details (in order, in Durkheim's eye, to avoid "anomie"); regulatory symbols select for value premises to give them meaning and moral force; similarly, networks of organizational interdependency select for both specific and generalized symbols to regulate exchanges among units.

Yet, the level of inequality, the number of categoric units, and the size of such units (as fueled by internal threats) create particularistic evaluational symbols which work against generalized symbols and coherent sets of regulatory symbols. For inequality always creates structural divisions and symbols reflecting these divisions, and these more particularistic symbols (for classes, ethnic groups, religious groups, regional subpopulations, and the like) work as a counterforce to consensus over either regulatory or generalized symbols. At the same time, however, these particularistic symbols escalate second-order selection pressures for regulatory and generalized symbols—often without result, however. For particularistic symbols can overwhelm a population, subverting second-order selection and setting into motion dissolution and disintegration of a population.

All symbol systems become, as the reverse causal arrows emanating from them emphasize, symbolic resources for the formation of corporate units, such as administrative agencies in government, courts, law professions, political parties, religious sects, social movements, and other structures which make appeals to, or are organized around, particularistic, generalized, and regulatory symbols. Robert Wuthnow's (1987) ecological analysis of religious denominations is a good example of how these second-order functional selection processes become implicated in Darwinian selection processes among corporate units using symbolic resources to secure material resources.

CONCLUSION

In this paper, I have sought to reconnect functional and ecological theory in a way that produces a model suggesting the lines along which a more precise and robust theory could be developed. Analytical models like the one presented in Figure 6 are incredibly complex, but they offer a sense for the causal

processes involved in the organization of societal populations. Such model can be decomposed into simpler submodels, reducing the sense of bein overwhelmed by direct, indirect, and reverse causal arrows among so man forces (in a sense, I have done this by talking in terms of three blocks o processes—first-order, second-order, and Darwinian selection). These model can also be used to generate propositions that highlight important causal path and that can serve as orienting ideas for constructing more specific hypotheses For, any set of causal paths in the model can be viewed as a potential set o propositions that can guide research, but since these propositions are extracte from a more robust set of causal configurations, they remain tied to mor inclusive social processes. Thus, the model in Figure 6 represents a strateg for examining macrostructural processes in their most robust form, while a the same time suggesting ways to extract more delimited generalizations.

Figure 6 also emphasizes that the ecological analysis of macrostructur requires a reunification of the selection arguments in both analogies– organismic and Darwinian—from biology. As long as human ecology operate at the meso level of analysis, such reunification is not necessary, but as Hawley (1986) more macroscopic turn suggests, functional ideas need to b reintroduced when larger-scale societal processes are examined from a ecological perspective. In broad strokes, the specifics of ecological analysis– the level of material and nonmaterial resources, the number of niches, th density of niches, the competition for resources, and the intensity of Darwinia selection—are variables whose values are determined not only by th indigenous dynamics of Darwinian selection itself but also by the outcome of organismic selection for certain structures and symbols; conversely, th outcomes of first- and second-order organismic selection are circumscribed b the Darwinian selection processes that they set into motion. At the first-orde level, organismic selection sets into motion forces—population growtl expanded production, concentration of power, market distribution, improve technologies—that, via their effects on each other and on stratification an geopolitics, influence the levels and kinds of resources in niches wher Darwinian selection among corporate units operates. At the second-order leve differentiation of corporate units generates an additional set of forces– subnetworks, regulatory symbols, and generalized evaluative symbols—tha through complex reverse causal chains, feed back to exert further influenc on both first-order functional selection and Darwinian selection amon corporate units. It is time, therefore, that modern ecological theory as emerged from the old functionalism of Spencer and Durkheim be reintegrate with neofunctionalism; the result will be, I argue in Figure 6, a more complet conceptualization of macrostructural dynamics.

NOTES

1. In recent years, there have been numerous extensions of the synthetic theory of evolution to sociological work, including sociobiology (e.g., van den Berghe 1978; Lopreato 1984), dual inheritance (e.g., Boyd and Richerson 1985), and coevolution (e.g., Durham 1991).
2. The model in Figure 1, as well as subsequent models to be presented, visualize time and processes as moving from left to right. The proximity of forces to each other and the configurations of the causal arrows indicate the intensity of the effects of these forces on each other. Of particular importance are reverse causal effects (Stinchcombe 1968), because most social processes are recursive. The signs on the arrows denote the form of the causal relationship: + (positive), − (negative), +/− (positively curvilinear), −/+ (negatively curvilinear), =/+ or =/− (lagged positive or lagged negative effect), +/= or −/= (positive or negative effect that levels off).
3. This model is a composite constructed from a number of works by Hannan and Freeman (1977, 1984, 1986, 1987, 1988, 1989).
4. This model is constructed from Hawley (1944, 1950, 1973, 1978, 1981, 1986).

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