Succession Theory: Reassessing a Neglected Meta-narrative about Environment and Development

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Abstract

During the 1960s ecologists outlined how the human treatment of the natural environment changed as places underwent economic development. The theoretical point of departure for this work, succession theory, then came under theoretical attack in ecology and the work on the human ecology of economic development stopped. Here I examine the theoretical predictions derived from this initial work against the empirical record. A wide range of historical trends, often endogenous in nature, seem consistent with the theory, but important trans-community phenomena like globalization, the spread of invasive species, and climate change do not fit easily into the community oriented focus of succession theory. On balance, the historical record confirms enough of the theory's predictions to make a case for the heuristic value of succession theory. It may even provide a new metaphor for sustainable development.

Keywords: *succession theory, sustainability, sustainable development, punctuated equilibrium, environment-society relations*

Introduction

For most of the 20th century, as human economies expanded, buoyed by ample supplies of oil, human ingenuity seemed sufficient to exempt us from the environmental degradation that typically besets so many other animals when they increase in number. In the last two decades this belief in human exceptionalism (Dunlap 1983) has begun to erode under the pressure of events. Our slow response to global warming, either through conservation or the development of cleaner energy sources, makes it clear that many people in future generations will have to endure less hospitable climates than we presently enjoy. In a quite different way the genetic revolution, with the increasing evidence for the human biological bases of diseases and some behaviors, reinforces the sense that humans are, after all of the discussions about our cognitive capacities and practices, still animals.

In this context it might be useful to re-examine selected bodies of ecological theory to see what they say about prevalent patterns of change over time among other species. With allowances for our obvious differences from the species discussed in these theories, there may still be patterns and theories about patterns that would have heuristic value when we examine the human prospect. More specifically, succession theory, a venerable body of ecological theory about historical changes in plant and animal communities, may offer insights into sequences of historical changes in human communities. By pointing out prevalent patterns of change in communities of other organisms and parallel patterns of change in human communities, we may gain new insights into patterns of change in environment-society relations, some of which might be co-evolutionary, involving humans and non-humans. More ambitiously, these patterns, both through their prevalence and their persistence, may point us in a normative direction, towards a plausible and politically feasible pattern of sustainable development. This intellectual agenda extends far beyond the confines of a single paper, but it can be advanced in an exploratory way here. To that end, this paper outlines succession theory and assesses the degree to which it explains or does not explain contemporary trends in environment-society relations.

Succession Theory: Intellectual Currents in the Late 20th Century

For the past 20 years natural scientists (Botkin 1990) and social scientists (Thornton 2005) have routinely disparaged the grand theories of development in the natural and the social sciences. These approaches have been characterized as 'ahistorical' and 'teleological' in their emphases (Thornton 2005, 232). Developmentalism is probably best exemplified in human ecology by Eugene Odum's (1969) "The Strategy of Ecosystem Development." Odum's theoretical scheme had its origins in the early 20th century work of Frederic Clements, an ecologist, who conceived of change in ecological communities as an endogenously driven process in which a 'developmental' stage gives way to a 'mature' stage of vegetation. Clements (1916) referred to this process as 'succession.' His depiction of the process became 'succession theory.'

Despite its currency as a grand theoretical construct in ecology, succession theory did not figure centrally in the ef-

forts of social scientists to build a comprehensive human ecology during the 20th century (Hawley 1950, 1986). Only biological ecologists like Odum made any attempt to use succession theory to model the relationship between economic development and environmental change, and these efforts offered no more than a sketch about how one might use succession theory to understand interrelated changes in plant and animal communities (Odum 1969).

Critics of this approach assert that, contrary to the central tenet of succession theory, history has no discernible direction (Worster 1994, 424), that its course reflects irreproducible conjunctures of historical conditions and events. Certainly, the critics' contentions are correct in some basic respects. The idea (Clements 1916; Odum 1969) that ecological or human ecological communities represent organisms that guide themselves through 'stages' of succession, an idea that anticipates 'the gaia hypothesis,' seems difficult to substantiate. While the critics' argument has to be correct at a high level of detail, it takes on some of the characteristics of the approach that it means to criticize. Like 'anti-essentialism' in women's studies which becomes 'essentialist' in its assertions about the primacy of subjective ways of knowing (Fuss 1989), this argument verges on becoming essentialist through its denials of the possibility that empirical conjunctures of events could occur through a gradual unfolding of endogenously driven processes.[2]

Some ecologists have not rejected succession theory so much as they have reformulated it. While some, like Botkin (1990), see random, externally determined disturbances as the predominant pattern of change, other ecologists have argued that the source of change is an empirical question. For them, the endogenously driven trajectories of change outlined in succession theory may characterize places and peoples for limited periods of time which follow or precede reorienting, externally driven disturbances (Pickett et al. 1987; Odum et al. 1995). This 'stop and start' understanding of succession allows for disturbances to influence or redirect succession without stopping it. During the periods of relative stasis in ecological communities it might be appropriate to think that largely endogenous processes would, as outlined in succession theory, govern change in ecological communities. Scale would certainly matter in the applicability of these conceptions of ecological change. A segment of an ecological community could experience a devastating change, a fire or a flood for example, while the surrounding community in which it is embedded might proceed to change much as it did before the disaster.

This understanding of successional processes is consistent with 'punctuated equilibrium' theories in evolutionary biology. These theories, as articulated by Niles Eldredge and Steven Jay Gould make the case that genetic change in species occurs unevenly during the course of their existences on earth (Eldredge and Gould 1972). Long periods of relative stasis in the make-up of species alternate with relatively short periods of sharp genetic change in the species. Can these ideas be applied to human societies? Some political scientists think so. They have begun to use the 'punctuated equilibrium' idea to characterize changes in environmental policy (Repetto 2006). Policy goes through periods of relative stasis followed by shorter periods of significant policy change.

Observers of the theoretical turn against succession theory have argued that it reflected more than anything else a change in culture among ecologists (Barbour 1995). The change in culture may have reflected changed empirical realities in the plant communities studied by ecologists. Some trends in 20th century ecological communities do seem difficult to square with succession theory. Beginning in the late 19th century and continuing in the 20th century, growing volumes of international trade, coupled with human disturbances from deforestation and fire, spurred invasions across large areas by exotic species of plants. These invasions do not have an obvious place in succession theory, and they disrupt any endogenously determined patterns of change in plant communities. In so doing, these events would have undermined belief in the explanatory power of succession theory. In this sense the theory seems 'out of step' with its times. These criticisms do not so much invalidate the theory as make it applicable to a smaller set of communities. The same conclusion might apply to human applications of the theory.

Could we use modified versions of succession theory, supplemented by punctuated equilibrium theory, to characterize large scale changes in human influenced environmental processes? To do so, we would have to accept that in human affairs there are periods of relative stasis between periods of chaotic change. If endogenous forces drive processes of change during periods of stasis, then succession theory may begin to explain some processes of human ecological change. I explore this idea here, using Odum's (1969) "Strategy of Ecosystem Development," a modified form of succession theory, to interpret changes in human societies as they have experienced urbanization, industrialization, and economic development.

Assessing Succession Theory: Theoretical Predictions and Empirical Trends

Odum (1969) charts change in spatially defined communities along a series of structural dimensions. Table 1 identifies these dimensions in the structure of communities and describes the nature of the changes along each dimension. To show how these changes might apply to human communities, I have partitioned each cell in the table with the ecological change described on top and the analogous human change

Table 1. Using Succession Theory to Understand Environment-Development Dynamics

	Types of Biological Communities/Human Societies	
Ecological Attributes / *Human Attributes*	*Developmental* / *Industrializing*	*Mature* / *Industrialized*
#1 ***Volume of Matter***		
Organic / *Capital: Physical & Human*	Low	High
#2 ***Stratification/Spatial Order***		
Spatial Heterogeneity/niche Specialization	Poorly organized, little specialization	Highly organized, more specialization
Classes/occupations/zones	Mixed uses, less environmental injustice, less stratification	More zones, more environmental injustice, more stratification
#3 ***Energy Efficiency***	Low	High
#4 ***Food Chains***		
Predator - Prey relationships	Simple, linear	Complex, more detritus cycles
Commodity Chains	Subsistence, Raw Materials	Long commodity chains, recycling
#5 ***Growth Rates***		
Biomass increments	Higher rates, more fluctuation	Lower rates, less fluctuation
Economic growth: Profit rates, Business Cycles	Higher profit rates, boom-bust cycles	Lower profit rates, less dramatic economic cycles
#6 ***Emphasis in Production***		
Non-humans	Quantity of offspring/goods	Quality of offspring/goods
People & goods		
#7 ***Growth Forms: Role of Information Processing***		
Non-human	Few feedback controls, little nutrient conservation	Feedback controls, nutrient conservation
People	Rapid growth, little information processing	Slow growth, extensive information processing
#8 ***Resistance to External Perturbations***		
Ecological	Poor	Better
Human	Weak states, organizations	Stronger states, organizations

below.[3] In the text that follows, I describe the structural changes in ecological communities in more detail and then how these changes might appear in human communities.

Amounts of Biomass

One of the most obvious markers between earlier and later stages of succession is the amount of biomass. It grows from the early to the later stages of succession. In a humid zone opportunistic grasses quickly colonize recently abandoned fields, but overall amounts of biomass remain relatively small. Over time larger, slower growing plants (trees) shade out the early colonizers and the overall amount of biomass increases. A tropical rain forest with more than 100 trees, 30 to 40 meters tall, per hectare exemplifies a biomass rich, old growth ecological community. An analogous set of changes occurs in industrializing societies as they grow. Populations increase with the increased longevity of individuals, and life cycles lengthen. To accommodate the increased numbers of people, developers build up and out, creating skylines in cities and covering extensive areas in the surrounding suburbs with low buildings.[4]

Stratification and Spatial Heterogeneity

This dimension refers to the changing social and spatial organization of communities as they age. Ecologists have theorized extensively about patch dynamics in ecosystems (Pickett and White 1985). As aggregations of plants age, some decay and fall, creating patches or gaps in the canopy (Shugart 2003). Under these circumstances the spatial heterogeneity of an ecosystem becomes increasingly evident. Patches colonized by fast growing plants grow up next to 200 year old trees.

As human societies industrialize and become more built-up, a process of resource partitioning takes place. First, individuals and corporations lay claim to natural resources. This process of resource partitioning moves into a second stage when, in response to the increasing intensity and scale of commercial land uses, governments begin to zone regions for specific types of human uses (Rudel 1989). Some lands become parks dedicated to recreation while other lands become zones reserved for industrial enterprises. Especially in major metropolitan areas, some zones become the exclusive preserves of the upper classes who work to exclude noxious land uses from the zones in which they live and work. In this sense land use patterns become 'patchy.' Not surprisingly, environmentally abusive land uses accumulate in places where the poor reside, and environmental inequalities begin to follow the same geographical dividing lines as social inequalities (Bullard et al. 2000; Szasz and Meuser 1997). In this way increasing spatial heterogeneity contributes over time to increases in social stratification and environmental injustice.

Energy Efficiency

It increases in aging biological communities. The total amount of biomass increases in small increments in older plant communities without a commensurate increase in energy flows, so the efficiency of the energy flows increases (Odum 1969, 263). In other words the stock/flow ratio between stocks of biomass and flows of energy increases over time. A comparable change has occurred in advanced industrial societies. The OECD countries have achieved a 49% increase in energy efficiency during the past three decades (Geller et al. 2006). While the dramatic increases in the price of oil during the 1970s prompted the efforts that led to these increases in energy efficiency, the relatively stable, iterative nature of already industrialized economies also contributes to the same economizing drive. The repetitive nature of the production process without dramatic new opportunities for growth gradually focuses peoples' attention on the ways that they can accomplish the same tasks with less effort. This type of energy efficiency does not imply that we use less energy. As Jevons noted regarding the 19th century use of coal, the more efficient use of a unit of energy provides an incentive to use it in a wider array of activities (York 2006). This dynamic has led to an increase in the total consumption of energy in industrialized countries even as they made more efficient use of each unit of energy.

Food Chains

The ways in which food ties together organisims undergoes patterned sets of changes as biological communities age. In the early stages of succession the simple, linear food chains embodied in plant-herbivore-carnivore relationships predominate. In the later stages of succession, food chains become more complex with more links and circuits between consumers and producers. The analogous shift in the food chains of human societies would be the shift during the 20th century from simple chains in which farmers produced for themselves and for local markets patronized by non-farmers to complex chains in which producers provide raw materials that pass through many hands as they are processed and readied for eventual sale to consumers. Sociologists have begun to elaborate methods for the analysis of these newly created commodity chains (Gereffi and Korzeniewicz 1994).

Because the overall amounts of biomass increase in older communities, the number of organisms that live off of other organisms' waste in detritus cycles also increases. Recycling and waste disposal in human societies resembles detritus cycles in biological communities in that the livelihoods of the people who work in these enterprises depend on the processing of other people's waste. Organized recycling and recirculation of goods has also increased tremendously in affluent, industrialized societies during the past 30 years (Weinberg et al. 2000). This change means that in important respects the commodity chain does not end with the consumption of the good.

Growth Rates

The ratio of gross production to standing biomass rises rapidly in the initial phases of occupation when the invading plants take full advantage of the nutrients available in a site. Production rates then decline over time as the amount of biomass increases, and the competition for nutrients from other plants grows. In this phase other organisms living in close proximity to a plant limit its potential for growth, so the plant grows slowly. The analogous statistic in human societies would be growth rates in national economies. Over time economic growth changes the composition of sectors in an economy. More and more sectors in an economy enter a 'mature' phase with relatively slow rates of expansion and relatively slow rates of increase in per capita consumption of goods. European economics, the Japanese economy, and the US's economy, to a lesser extent, exemplify this situation. Rates of expansion tend to fall in established industries and in already industrialized societies where established industries predominate because, among other things, significant innovations require large amounts of start up capital, thereby lowering the rate of profit attributable to innovation. Managers remain just as committed to generating profits and rapid growth (Schnaiberg and Gould 1994), but they find it more difficult to do so. The most rapid economic growth rates occur in a relatively small number of semi-peripheral places where cheap labor produces products for affluent consumers outside of the country. India and China currently exemplify this pattern.

Indicators of long term changes in average growth rates fail to capture important cyclical changes in growth rates. Measures of gross production/community respiration track the life and death of organisms over limited time periods. Ecological communities in early stages of succession tend to oscillate from 'blooms' to 'die offs' while communities in the later stages of succession do not exhibit such marked variations in birth and death rates. Business cycles, which chart short term fluctuations in the value of economic enterprises, are the analogous units in societies undergoing industrialization. Frontier and industrializing societies exhibit boom-bust cycles in large part because they frequently do not have diversified economies and depend economically on the fortunes of a single commodity (Black 1999). In the more diversified economies of already industrialized regions short term fluctuations in economies are not so severe, so growth rates do not fluctuate as much over time.

Quantity and Quality in Production and Reproduction

The emphasis in production and reproduction shifts from the quantity to the quality of offspring in biological communities as they grow older. The increasing level of organization in these communities compels more extensive niche fitting among organisms. The analogous trend among humans in reproduction involves a reduction in the number of children induced in part by declines in infant mortality and by increases in the costs of educating children for highly specialized roles in labor markets (Caldwell 1984). In this respect there is a shift from an emphasis on producing large numbers of children who will provide for and protect family elders to an emphasis on producing smaller numbers of more highly educated children who will provide for themselves and their children.

Extending this same line of argument to industrial goods, one could conceivably make the case that there has been a gradual shift in emphasis from producing large quantities of goods to producing high quality goods. The 'flying geese' metaphor captures this idea (McMichael 1996). People in already industrialized countries, the leaders in the 'flock,' introduce new, technologically advanced products that over time people in industrializing countries learn how to produce in large numbers more cheaply. The long industrialized peoples then either create new products, beginning the cycle over again, or they try to distinguish themselves from their less expensive imitators by producing a higher quality version of the older product. The German automobile industry exemplifies this last pattern. To the extent to which this pattern of economic competition characterizes markets, one could make the case that the long industrialized societies focus more on the quality than the quantity of products.

Growth Forms

Growth forms, what humans might call 'skill sets', also change as communities age. MacArthur and Wilson (1967) found, for example, that species with high rates of reproduction and growth are more likely to survive in the early, uncrowded phases of an island's occupation while in the later, more crowded phases of an island's occupation other species with less growth potential do well. In the denser situations of more established communities' information may play a more important role because it can guide mid-course corrections by organisms.

The analogous developments in industrialized and industrializing societies would be the growing importance of information processing through computers. Given the iterative nature of many economic tasks, information on past performance provides a guide for improving future performance, so organizations and executives use this information to enforce accountability and pursue efficiencies (National Research Council 1999). In theory this growing emphasis on feedback controls should increase the overall efficiency of organizations and the accountability of less powerful workers in advanced industrial societies.

Resistance to External Perturbations

Resistance to external perturbations increases with the age of biological communities. Odum (1969) contends that instances of symbiosis increase in communities as they age. Presumably, the increased examples of interdependence would increase resistance to external perturbations. Odum (1969, 266) goes on to argue that the stability of these more complex ecosystems increases as they mature. In later analyses of model ecosystems, May (2001) showed that more complex ecosystems did not demonstrate more stability. More recent empirical work tends to support Odum (1969), indicating that more diverse ecological communities tend to resist invasions better (Ives and Carpenter 2007).

Arguments analogous to Odum's, but applied to humans, would probably focus on the emergence over time of strong states. States and NGOs have, for example, led recovery efforts after both natural and human induced disasters. States in industrialized societies tend to be strong (Migdal 1988). They collect taxes, enforce laws, and mobilize their populations for collective efforts more easily than states in the early stages of industrialization. For this reason these societies are better able to resist external perturbations than societies with weaker states that are just beginning to industrialize.

The strength of succession theory lies not in its superiority, relative to other theories, in explaining any of these individual trends. Social theories specific to these domains will always provide more convincing explanations for individual patterns of change. The strength of succession theory lies in

a range of observed trends with which it is consistent, from increases in population, to the shift from quantity to quality in children, to the rise of the strong state. If we can specify the model that drives these disparate trends, we will have made significant progress in our understanding of environment-society relations.

Upending the Developmental Trajectory: Globalization, Invasive Species, and Climate Change

The trends noted above provide some support for the idea that sequences of events, outlined in succession theory, characterize human and non-human societies as they grow older. The theory can only take us so far. Its shortcomings become most evident when we try to incorporate capitalist dynamics, as expressed in globalization, into the theory. Capitalists, as Schumpeter (1942) famously observed, engage in 'creative destruction.' In this capacity, capitalists undermine old social orders with new businesses and look for economic opportunities throughout the world, inducing a 'globalization' of commodity markets. In so doing, capitalists break down the boundaries of communities and, in the parlance of biology, introduce 'disturbances' into the social order of places. Succession theory acknowledges these kinds of influences in frontier settings where invasions by plants and animals occur frequently, but in theory these disturbances should become less common in older, established communities. There is little evidence for this effect in human societies. Global trade brings with it invasive species that become dominant plants in both new and old landscapes. Globalization destroys jobs in one place (older, more affluent communities) while it creates them elsewhere (newer, less affluent communities).

Because globalization creates a world system that links together discrete communities and disrupts succession within each community, analysts have had difficulty incorporating globalizing processes into community focused analyses that feature succession theory. The theory leads one to believe that every place will progress from a developmental to a mature stage and undergo the transformations outlined above. This assumption, as numerous critics have noted (Thornton 2005), seems highly questionable. The extension of the world system to the far corners of the globe over the past two centuries has created an international system of stratification and exploitation that makes it particularly difficult for developing societies to transform themselves into affluent, advanced industrial societies as other societies did during the 19th and 20th centuries (Wallerstein 1976). In other words what a succession theorist might construe as a developmental 'stage,' world system theorists see as 'an unchanging condition,' a persistent pattern of exploitation. Succession theorists might agree with their critics when they argue, as Odum (1969) did, that human societies like to keep certain communities at the early stages of succession primarily because these communities are so productive. The example that Odum would give would be heavily fertilized fields in the primary growing areas for commercial agriculture in the American Middle West. Just as some areas in a partitioned environment become preserves, so others become sites for intense productive activity, and still others become sites for intense extractive activities. Extending this logic, one might argue that the world system thrives on the human exploitation that characterizes places exhibiting intense extractive or productive activities.

A related objection to the use of succession theory to interpret the environmental history of human societies stems from its neglect of what Gerschenkron (1950) has called the 'latecomer' effect. In his terms, the first societies to evolve from a 'developmental' to a 'mature' stage do so in ways that are quite different from the ways in which later societies accomplish this transition. In particular, elites in the later societies to make the transition, are much more 'conscious' of the changes under way, and for that reason much more likely to welcome the changes or reject them (Rudel and Hooper 2005). In these instances the support of elites for these changes can accelerate the changes, so that, for example, fertility declines occurred much more rapidly in societies where the declines began in the 1960s than they did in societies where the declines began in the 1870s. Trends in norms about human consumption may follow a similar pattern. Elites in industrialized societies raise their consumption standards and others throughout the world feel compelled to follow in an accelerating competition for positional (status) goods that places an increasing environmental burden on the global environment (Hirsch 1978; Frank 1999). These types of behavior stem from interactions between communities in a world system and do not fit well into the community oriented frameworks of succession theory.

Developmental idealisms like succession theory also ignore systemic effects, like global warming, that apply on a global scale to all units in the system. In other words greenhouse gas emissions, originating mostly in the already industrialized societies, alter climates in both industrializing and industrialized societies. While the historical trajectory of greenhouse gas emissions may change in ways that are roughly interpretable in the terms of succession theory, the impact of these changes on the climate can best be understood in a unitary, systemic way that can not be captured by the community oriented theoretical categories of succession theory. For example, global warming rewards species that can colonize new regions in much the same way that global-

ization rewards entrepreneurs who can incorporate new populations into global networks of commerce. In this sense globalization and global warming set in motion co-evolutionary trends among humans and other organisms (Norgaard 1994) that reward generalists who transform themselves to meet the demands of a changing environment and test specialists who have trained themselves to work in highly structured environments. Succession theory has no place for this type of systemic effect that ranges across all communities.

Conclusion

The preceding pages document the theoretical successes and failures of succession theory. It has no place for important features of human societies like globalization and the world system, but it does describe a wide range of changes in human interactions with the biome that occur as societies industrialize. In effect it offers us a flawed meta-narrative, a general description of how societies have changed in the way that they interact with the biosphere during the course of industrialization. Under these circumstances the theory's chief value may be heuristic in nature. The relative ease with which we can reconceptualize diverse social changes in terms of a single ecological theory in an empirically defensible manner suggests that these social changes may be part of a single process about which we might theorize.

This type of intellectual enterprise holds out two types of promise for us. First, like all productive theorizing, it could organize a tremendous amount of information. While the scope of the phenomena and the range of places considered in this theoretical tradition promise a comprehensive theory, this promise will not be realized unless we can come up with a theoretical infrastructure that ties together the diverse trends described above in credible ways. I am not presumptuous enough to think that I can spin this theory out in a few short paragraphs, but it might be sufficient for the time being to suggest several factors that appear to play an important role in the processes described above.

One factor would be scale. Increases in the scale of human enterprises appear to drive several of the changes described above. Increases in the volume of goods have filled the landfills and made the disposal of solid waste so expensive that communities in affluent, densely populated places now find it cost effective to recycle as much of their waste as possible. Similar increases in the scale and intensity of land uses explain attempts to separate different types of land uses (commercial vs. residential). To these ends, local politicians have created zoning laws and contributed to the stratification and spatial heterogeneity that characterizes urban land use patterns.

The increasing division of labor (Durkheim 1897) that has accompanied the increase in the scale of human activities has also contributed to a number of the trends noted above. The prolonged socialization of children stems from the parents' perception that their children must become skilled specialists if they are to prosper as adults. The increasing expense of children and the corresponding decline in fertility stems in part from this increase in specialization. The same sort of niche fitting explains to some degree the fragmentation of markets and the growing emphasis on quality in the production of commodities.

A series of related changes in community social structures stem from the increasing age of communities and their inhabitants. As people in communities become more familiar with one another and recognize their common interests, they begin to appreciate their obligations to one another to conserve the natural resources that provide them with their livelihoods. This sense of obligation to each other and to future generations grows over time (Firey 1960). A somewhat similar dynamic can emerge in large organizations. Large organizations find themselves repeating the same highly specialized tasks. Their employees become interested in finding the least expensive ways of accomplishing these tasks, which places a primacy on accounting, information processing, and the creation of feedback controls. An analogous set of changes occurs among individuals as longevity increases, and life cycles become more complex.

The criticisms of succession theory do not so much invalidate this approach to understanding environmental problems as they suggest limits on using it. As a theory that focuses on endogenous processes, it has the virtues of a 'generative' theory (Barth 1966). In the hands of skilled practitioners this theory can generate widely observed patterns of environment-society relations. At the same time the theory is particularly insensitive to contextual effects, so it provides much less insight into large systemic processes like globalization or climate change. In addition, like all arguments by analogy that borrow from ecological theory, succession theory does not, as the neglect of the latecomer effect indicates, attend to the reflexive nature of human affairs. Taken together, these points suggest that, despite its defects and current neglect, succession theory in modified form belongs in the intellectual tool kits of structural human ecologists, not because it provides some sort of 'master narrative' about environment and society, but because it offers potential explanations for some patterns of historical change in human communities as they become more established.

Finally, a revised, more credible version of succession theory might cause us to rethink ideals like sustainable development. Discussions of the problem of sustainable development, such as the Brundtland Commission's work (World Commission on Environment and Development 1987), have had a vacuous and ambiguous quality. By rethinking sus-

tainable development in terms of some widely recognized and well documented empirical trends like declining fertility, increasing energy efficiency, and the partitioning of natural resources, succession theorists might articulate a more coherent and achievable form of sustainable development. Succession by itself will not deliver sustainable development. Of the three widely recognized dimensions of sustainable development, equity, economy, and environment (Barbier 1987), succession offers little hope of achieving more equity over time between organisms. It may be easier to develop arrangements that deliver some economic growth and some environmental protection. In other words, sustainability may prove to be more achievable than sustainable development. With this disclaimer, a validated form of succession theory may help us identify a form of sustainable development to which we can realistically aspire. In this sense it might give us a new metaphor for sustainable development.[5]

Endnotes

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2. 'Essentialist' arguments are those that do not allow for varied circumstances and meanings in explaining events. Anti-essentialist arguments give a prominent place to alternative understandings of situations and do not give primacy to any one account of a situation. Because anti-essentialist approaches have been more welcoming to subaltern voices, they have been especially prevalent in feminist scholarship over the past two decades.
3. The language here needs clarification. In 'ecological communities' plants and animals other than humans are the dominant species. In 'human communities' homo sapiens are the dominant species.
4. The increase in the stock of goods also occurs in less physically evident ways. Increases in levels of education contribute to the stock of human capital. The cumulative effect of profitable enterprises creates over the years stocks of financial capital.
5. An anonymous reviewer suggested this language.

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