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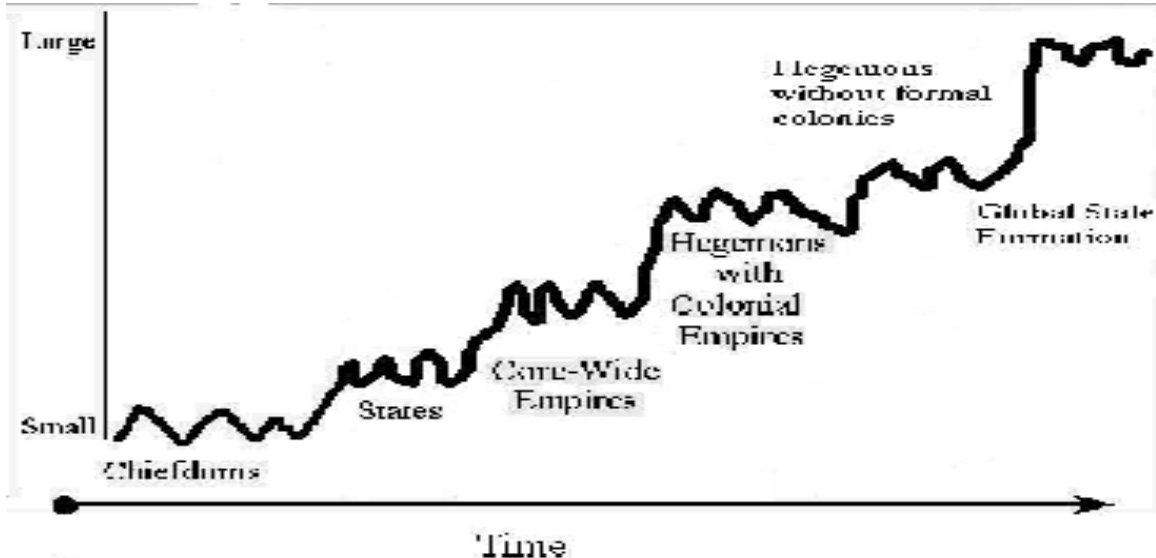
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Upward Sweeps in The Historical Evolution of World-Systems*

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New systems theories in international relations should study human interaction networks over very long periods of time (since the Paleolithic) and the interactions between the human systems and biological and geological systems in order to comprehend and explain the patterned changes of the past and the possible futures for humanity. World-systems are whole important human interaction networks including relations among polities, trade and communications networks. Human social evolution is about the rise of larger and more hierarchical and more complex societies and the growth and intensification of long-distance interaction networks. This paper outlines a research project on the growth/decline phases of cities and states since the Iron Age in order to comprehend the possibilities for future global state formation.

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Patterns of expanding state formation constitute a long-term evolutionary trend that will probably eventually result in the emergence of a single world state. The very nature of the expansion of political integration has itself evolved because new institutions that facilitate

regional integration, cooperation and conflict have emerged. Military conquest and the long-term interaction between sedentary agrarian empires and confederations of pastoral nomads came eventually to be replaced by a process of geopolitical and economic competition among states in a world that has increasingly been integrated by market exchange. In the last 200 years international governmental and transnational non-governmental organizations have emerged to constitute the first beginnings of world state formation, and the national states have been partially reconfigured as instruments of an increasingly integrated global elite. World state formation may be desirable because the problems created by human technological and social change are increasingly global in scope. But a world state will need to be legitimated in the eyes of a majority of the human population of the Earth and this means that democracy must be constructed on a global scale. Evolutionary world-systems ecology examines several probable future trajectories of global political integration based on models of growth, decline and systemic transformation by studying patterns of political integration over the past 100,000 years.

The term “evolution” needs to be cleansed of its non-scientific baggage to be useful for scientific studies of social change (Sanderson 1990). Ideas about progress, inevitability, and teleological explanations in which things are explained by their purposes, and claims about “ultimate reality” are out of place in science because they are either based on value assumptions or are scientifically unknowable.^{1[1]} Scientifically knowable evolution is only about patterned change and its more or less proximate causes. Social evolution is importantly different from biological evolution because it is mainly based on culturally constructed symbolic systems rather than on genetic adaptation.^{2[2]} It is the study of social evolution that is proposed in this paper.

The word “system” also has some unfortunate connotations. As used by biologists and economists it often involves assumptions about homeostatic processes and functionalist accounts that are often falsely applied to human institutional change. Human social change is often contingent, path-dependent and conjunctural. To signify this recognition we prefer the terms “historical systems” and “historical evolution.”

In the nineteenth and twentieth centuries expansion and intensification of intercontinental interactions has been called globalization. But earlier regional systems also exhibited similar waves of “globalization,” albeit on a smaller spatial scale, and these waves of network expansion and contraction, punctuated by occasional huge jumps in the scale of networks, eventually led to the formation of the modern global social system. Evolutionary world-systems ecology studies the spatial nature of human interaction networks over time and the relationship between these networks and the growth decline/phases of cities and states.

This paper presents a new theoretical synthesis based on Peter Turchin's (2003) model of the dynamics of agrarian state growth and decline, network theory, a population pressure iteration model and explanations of the rise and fall of modern hegemony. It proposes to test the hypothesis of “semiperipheral development” – the idea that it has mainly been semiperipheral societies that have expanded networks, made larger states, and innovated and implemented new techniques of power and new productive technologies that

^{1[1]} Sanderson (1990) usefully distinguishes between developmentalism as a model of directional unfolding and teleological explanation as based on alleged purposes or goals. In practice these are usually conflated but they need not be. An unfolding model need not be based on claims about purposes or goals.

^{2[2]} The analogy between genes and symbols proposed by Lenski (2005) and others is suggestive of both similarities and important differences.

have transformed the very logic of social change. The elaboration of cooperative and coordinated global policies for dealing with the emergent problems of the twenty-first century will be usefully informed by understanding the probable trajectories of international political integration.

I begin with a demographic and ecological model of the growth and decline of land-based “tellurocratic” states followed by a model of the growth of “thalassocratic” maritime capitalist city-states. These models are then combined to simulate the transition to the “modern” pattern of the rise and fall of capitalist hegemonic nation-states. We also propose to test a model of the interactions among world regions that can account for the East/West synchrony of growth/decline phases of cities and states discovered in earlier research. These models will help us to explain the human past and will have important implications for the future of global governance because the long-term causes of past political expansion and of future state formation will be modeled. Using city and regional population sizes and the territorial sizes of states and empires as the main indices of civilizational rise and fall, we will model the interacting effects of population growth, environmental degradation, resource use, migration, and the growth and decline of cities and empires and the interactions of regional systems with one another. Interregional trade, warfare, incursions and disease vectors are important factors that have affected social change in regional interaction networks.

World-Systems

World-systems are systems of societies (international systems) that are strongly linked to one another by interaction networks (trade, alliances, warfare, migration and information flows). Thousands of years ago these were small regional affairs, but they have gotten larger, merged with one another and the big ones have engulfed smaller ones. This process of network expansions has eventuated in the single global macrosocial system of today. One important meaning of the globalization is the expansion and intensification of large-scale interaction networks. At the same time that macrosystems have become spatially larger, the societies and intersocietal systems that make them up have become more complex and hierarchical. And the dynamics of systemic expansion may have qualitatively changed as new institutions, especially markets and financial systems, have emerged and become predominant.

The patterns of expansion and incorporation can be traced by examining changes in the spatial extent of human interaction networks (Chase-Dunn and Hall 1997). Figure 1 illustrates the spatiotemporal history of the political/military network (PMN) [interpolity system] that emerged first in Mesopotamia 5000 years ago.

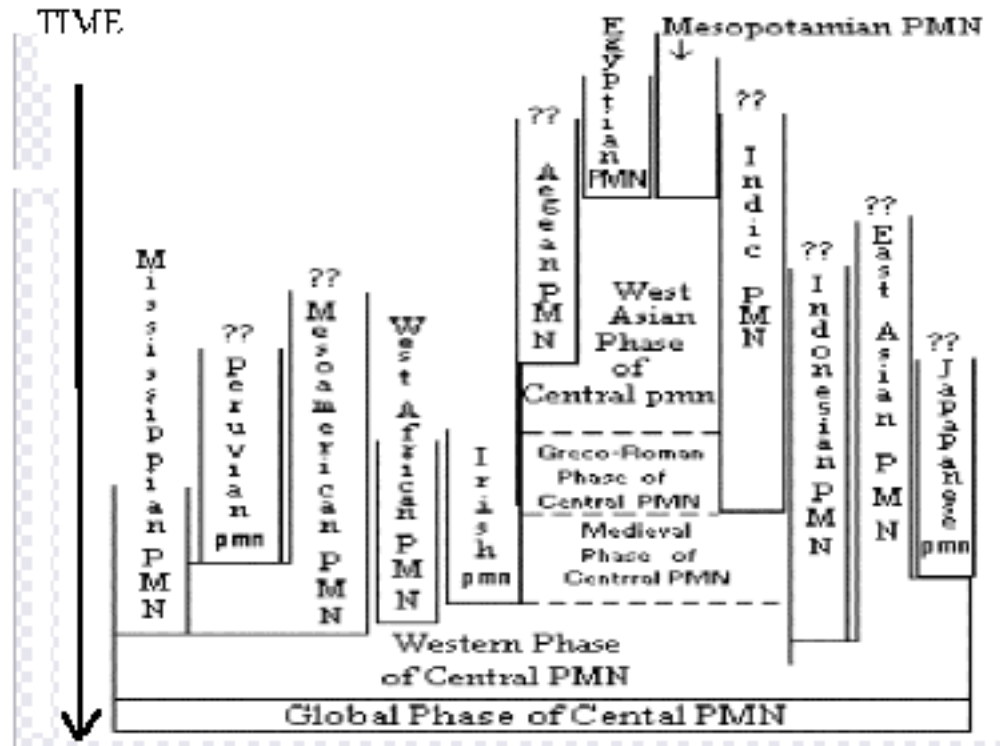


Figure 1: 5000 Year Emergence of the Central System (adapted from Wilkinson 1987)

The processes of expansion and increasing complexity have not produced a smooth upward trend in which the originally less complex and hierarchical areas became increasingly more complex. Rather social change has been characterized by uneven development in both space and time. Original areas where leading edge developments have emerged eventually lost out to new regions where unprecedented levels of complexity and hierarchy developed. Temporal cycles of expansion and political centralization were punctuated by occasional **upward sweeps** to new higher levels – a stair-step pattern.

All hierarchical macrosystems, even including those based on chiefdoms (Anderson 1994) and early states (Marcus 1998) experience a sequence of the **rise and fall** of large polities – a cycle of centralization and decentralization of political power. This is known in state-based systems as the rise and fall of empires. In the modern macrosystem of the last few centuries a similar (but also different) phenomenon can be seen in the rise and fall of hegemonic core states such as Britain in the nineteenth century and the United States in the twentieth century. Interaction networks also expand and contract in a pattern that we can call **pulsation**. This expansion and intensification of large interaction networks corresponds to one important aspect of what is called “globalization” in the modern world-system. The recent wave of global trade and investment integration since World War II was preceded by a globalization phase during the last half of the nineteenth century that attained nearly the same degree of worldwide connectedness (Chase-Dunn, Kawano and Brewer 2000).

These cyclical processes (rise and fall; pulsation) *must be modeled* in order to understand the more rare instances in which new higher levels of integration and hierarchy have emerged. Both cities and empires in Eastern and Western Asia have been found to grow and decline

synchronously from 500 BCE until 1500 CE, but South Asia did not follow this pattern (Chase-Dunn, Manning and Hall 2000; Chase-Dunn and Manning 2002).

The dynamics of agrarian states

The primary resources in agrarian economies are land and people. Geopolitical models, such as those developed by Randall Collins and Robert Hanneman (Collins 1995, Hanneman et al. 1995), postulate that state power is directly related to the amount of territory and population that the state controls. This causal dependence leads to positive-feedback dynamic: a state that expands territory increases its power, which in turn enables it to expand more, and so on (a classical example is the Roman expansion under the late republic). However, eventually the ability of the state to extend its territorial control becomes limited by the difficulty and expense of projecting power across space. This connection between the state size and “logistical loads” is sometimes referred to as the *imperial overstretch* principle (Kennedy 1987).

Spatial location is important for explaining the geopolitical trajectories of states. Historians noticed long ago that new, aggressive states that have an excellent chance to grow into a large empire tend to arise on the marches (edges) of old empires (e.g. McNeill 1963). Within the comparative world-systems perspective, this phenomenon is termed *semiperipheral marcher conquest*, in which a new state from out on the edge of the circle of old states conquers all (or most) of the states in the old core region to form a “core-wide empire” (Chase-Dunn and Hall 1997). The geopolitical theory explains this empirical pattern by invoking the *marchland position* principle: states with enemies on fewer fronts expand at the expense of states surrounded by enemies (Collins 1995). However, a comprehensive empirical test on the European material during the first two millennia CE indicates that there is no statistical association between protected position of a region and the size of polity emerging from it (Turchin 2003).

An alternative explanation is suggested by the observation that not all imperial marchlands or semiperipheries give birth to aggressively growing polities. It appears that incipient empires arise primarily in locations where pre-existing imperial boundaries coincide with intense cultural, or ethnic, frontiers. During the last two millennia the most common symbolic markers demarcating such *metaethnic frontiers* (the prefix *meta* indicates the intensity of ethnic difference across the frontier) have been based on world religions (thus, the most common variety in the European context are the Christian-Muslim frontiers). Metaethnic frontiers are zones where groups come under enormous pressure, and where ethnocide or even genocide, but also ethnogenesis, commonly occur (Hall 2000). Intense intergroup competition eventually results in one group with high internal cohesion absorbing other ethnically similar groups, and in the process constructing the core of a rising empire (Turchin 2003).

An implicit assumption of the geopolitical model discussed above is that geopolitical resources, land and people, come as a package. In reality, however, the population of a state can grow (or decline) without corresponding addition or loss of territory. Growing population density initially increases geopolitical power of the state, because there are more taxpayers and recruits for the army. However, population growth in excess of the productivity gains of the land has deleterious effects on social institutions (Goldstone 1991). It leads to persistent price inflation, falling real wages, rural misery, and urban migration; an increased number of aspirants for elite positions and intense intra-elite competition; and spiraling state expenses due to inflation and expanding real costs, since armies and bureaucracies grow together with population. As all these trends intensify, the state goes into

bankruptcy and loses military control. Elite movements of regional and national rebellion and a combination of elite-mobilized and popular uprisings lead to the complete breakdown of central authority (Goldstone 1991). In turn, state collapse and ensuing sociopolitical instability cause higher death and emigration rates, lower birth rates, and negative effects on the productive infrastructure such as irrigation canals and flood-control dams.^{3[3]} Models incorporating both the effect of population growth on state stability, and the feedback from state instability to population decline suggest that we should observe long-term demographic-political cycles, with periods of roughly two-three centuries (Turchin 2003).

Theories of Rise and Fall

Complex interchiefdom systems experienced a cycle in which a single paramount chiefdom became hegemonic within a system of competing polities by conquering adjacent chiefdoms (D.G. Anderson 1994; Kirch 1984).^{4[4]} Once states emerged within a region they went through an analogous cycle of rise and fall in which a single state became hegemonic and then declined. Eventually most of these systems of states (interstate systems), experienced the phenomenon of **semiperipheral marcher conquest** in which a new state from out on the edge of the circle of old states conquered all (or most) of the states in the old core region to form a “core-wide empire”.^{5[5]}

These patterns repeated themselves in several world regions for thousands of years, with occasional leaps in which a semiperipheral marcher state conquered larger regions than had ever before been subjected to a single power (e.g. Assyrian Empire, Achaemenid Persia, Alexandrian Empires, the Chin and Han Dynasties, Roman Empire, the Islamic Caliphates, the Aztec and Inca Empires, the Manchu Dynasty in China). During the Bronze and Iron Age expansions of the tributary empires a new niche emerged for states that specialized in the carrying trade among the empires and adjacent regions. These semiperipheral capitalist city states were usually “thalassocratic” entities that used naval power to protect sea-going trade (e.g. the Phoenician city-states, Venice, Genoa, Malacca), but Assur on the Tigris, the Old Assyrian city-state and its colonies, was a land-based example of this phenomenon that relied mainly upon donkey caravans for transportation (Larsen 1976). The semiperipheral capitalist city-states did not typically conquer other states^{6[6]} to construct large empires, but their trading and production activities promoted regional commerce and the emergence of markets within and between the tributary states.

^{3[3]} Ecological degradation can also be part of the explanation of uneven development. As older core regions become deforested and soil-depleted more recently developed areas can come to have an advantage.

^{4[4]} D.G. Anderson’s (1994) excellent review of the anthropological literature on the rise and fall of chiefdoms uses the term “cycling” to refer to this phenomenon. Patrick Kirch’s (1984) model of the emergence of complex chiefdoms on Pacific islands implies that the marcher chiefs who manage to conquer adjacent polities and create a larger island-wide polity are frequently from junior lineages on less ecologically favorable regions of the island.

^{5[5]} There were a few instances in which new core-wide empires were formed by internal revolt (e.g. the Akkadian Empire) or conquest by peripheral marchers (e.g. the Mongol Empire), but by far the majority of new empires were the work of semiperipheral marcher conquests.

^{6[6]} The Assyrians later switched to the semiperipheral conquest strategy and created the largest contemporary empire in the world. Hannibal’s attempt to conquer Rome was a similar change from the semiperipheral capitalist city-state strategy to the semiperipheral marcher state strategy. The failure of his Carthaginian allies to send support at a crucial juncture (due to ambivalence about the switch in strategy) was the main reason why his extraordinary effort failed.

With the eventual rise of Europe and intensified capitalism a modification of the old pattern of semiperipheral marcher conquest appeared. In the European interstate system the semiperipheral marcher states were outdone by a new breed of capitalist nation-states. These capitalist hegemonies established primacy in the larger system without conquering adjacent core states, and so the core remained multicentric despite the continued rise and fall of hegemonic core powers. Imperialism over adjacent states was reorganized as colonial empires in which each core state had its own distant peripheral colonies – the European domination of peoples in Africa, Asia and the Americas. The efforts by some modern core powers to conquer their neighbors were defeated by coalitions that sought to reproduce a multistate structure among core states. Thus the oscillation between “core-wide empire” and an “interstate system” came to end and was replaced by the rise and fall of hegemonic core powers. The hegemonic sequence of the modern interstate system alternates between two structural situations as hegemonic core powers rise and fall: hegemony and hegemonic rivalry. This was a new form of the process of rise and fall.

The Westphalian interstate system, in which the sovereignty of separate and competing states is institutionalized by the right of states to make war to protect their independence, has become a taken-for-granted institution in the modern world-system. Historians of international relations (e.g. Kennedy 1987) and theorists of international relations (e.g. Waltz 1979) have come to define this situation as a natural state of being. Authors with greater temporal depth (e.g. Wilkinson 1988, 1999) have argued that the peculiar resistance of the modern interstate system to the emergence of a universal state by means of conquest has been the result of an evolutionary learning process unique to modern Europe in which states realized that in order to protect their own sovereignty they should band together and engage in “general war” whenever a “rogue state” threatens to conquer another state.

A rather different explanation of the modern transition from the pattern of semiperipheral marcher state conquest to the rise and fall of hegemonic core powers points to the emergent predominance of capitalist accumulation in the European-centered interstate system. Once capitalism had become the predominant strategy for the accumulation of wealth and power it partially supplanted the geopolitical logic of institutionalized political coercion as a means to accumulation. Powerful capitalist core states emerged that could effectively prevent semiperipheral marcher states from conquering whole core regions to erect a core-wide empire. The first capitalist-nation state to successfully do this was the Dutch republic of the seventeenth century.

Modern Rise and Fall

There are several important ways in which explanations of modern rise and fall are different from one another. One important distinction is between the functionalists (who see emergent global hierarchies as serving a “need for global order,”) and conflict theorists (who dwell more intently on the ways in which hierarchies serve the privileged, the powerful and the wealthy). The term “hegemony” usually corresponds with the conflict approach, while the functionalists tend to employ the idea of “leadership,” though several analysts occasionally use both of these terms (e.g. Arrighi and Silver 1999). Another difference is between those who stress the importance of political/military power vs. what we shall call “economic power.” This issue is confused by disciplinary traditions (e.g. differences between economics, political science and sociology). Most economists entirely reject the notion of economic power, assuming that market exchanges occur among equals. Most political scientists and sociologists would agree that economic power has become more important than it formerly was. Some of the literature on recent globalization goes so far as to argue

that states and military organizations have been largely subsumed by the power of transnational corporations and global market dynamics (e.g. Ross 1995).

The three most important approaches to theorizing modern hegemony are those of Wallerstein (1984, 2002), Modelski and Thompson (1994); and Arrighi (1994). Wallerstein defines hegemony as comparative advantages in profitable types of production. This economic advantage is what serves as the basis of the hegemon's political and cultural influence and military power. Hegemonic production is the most profitable kind of core production, and hegemony is just the top end of the global hierarchy that constitutes the modern core/periphery division of labor. Hegemonies are unstable and tend to devolve into hegemonic rivalry.

Wallerstein sees a Dutch seventeenth century hegemony, a British hegemony in the nineteenth century and U.S. hegemony in the twentieth century. He perceives three stages within each hegemony. The first is based on success in the production of consumer goods; the second is a matter of success in the production of capital goods; and the third is rooted in success in financial services and foreign investment stemming from the institutionalized centrality of the hegemon in the larger world-system.

George Modelski and William R. Thompson (1994) contend that the world needs order, and world powers rise to fill this need. Global leaders rise on the basis of economic comparative advantage in newly leading industries, which allow them to acquire the resources needed to win wars among the great powers and to mobilize coalitions that keep the peace. World wars are the arbiters that function as selection mechanisms for global leadership. But the comparative advantages of the leaders diffuse to competitors and new challengers emerge. Successful challengers are those that ally with the declining world leader against another challenger (e.g. the U.S. and Britain against Germany).

Giovanni Arrighi's (1994) *The Long Twentieth Century* employs a Braudel approach to the analysis of what he terms "systemic cycles of accumulation." Arrighi sees hegemonies as successful collaborations between finance capitalists and wielders of state power. His tour of the hegemonies begins with Genoese financiers who allied with Spanish and Portuguese statesmen to perform the role of hegemon in the fifteenth century. In Arrighi's approach the role of hegemon itself evolves, becoming more deeply entwined with the organizational and economic institutional spheres that allow for successful capitalist accumulation. He sees a Dutch hegemony of the seventeenth century, then a period of contention between Britain and France in the eighteenth century, and a British hegemony in the nineteenth century, followed by U.S. hegemony in the twentieth century.

A distinctive element of Arrighi's approach is his contention that profit making from trade and production becomes less profitable toward the end of a 'systemic cycle of accumulation' and so big capital increasingly focuses on financial manipulations. Arrighi's approach is compatible with the idea that new lead industries are important for the rise of a hegemon, but he sees the economic activities of big capital during the declining years in terms of speculative financial activities. These latter often correspond with a period of "growth" in which incomes are rising during a latter-day *belle époque* of the systemic cycle of accumulation. But this period of accumulation is based on the economic power of *haute finance* and the centering of world markets in the global cities of the hegemon rather than on their ability to produce real products that people will buy, and so these *belle époques* are unsustainable bubbles that are followed by decline.

The main task of the HSD-funded project will be to develop dynamical models of the rise and fall of states and the occasional upward sweeps in which newly emergent states break through the extant ceiling of state size to produce a much larger polity than has ever

existed before (See Figure 2). We will begin with a demographic and ecological model of the growth and decline of land-based “tellurocratic” states. Then we will develop a model of the growth of “thalassocratic” maritime capitalist city-states. These models will then be combined to model the transition to the “modern” pattern of the rise and fall of capitalist hegemonic nation-states (e.g. from Genoa to Amsterdam to London to New York).

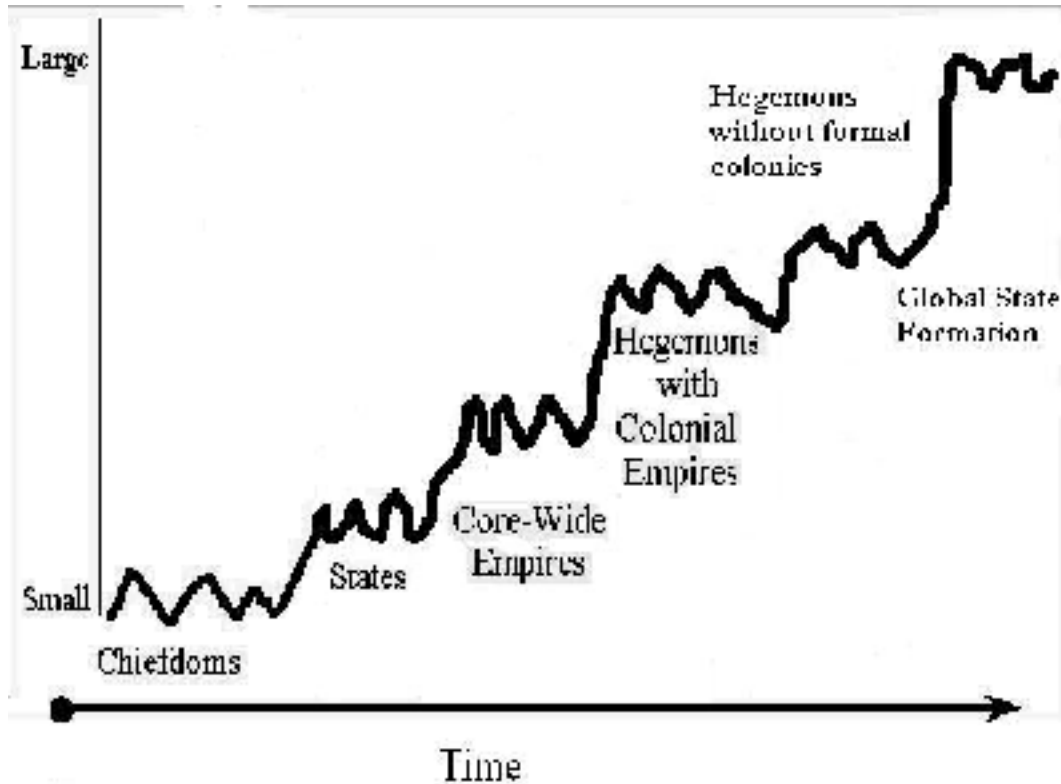


Figure 2: Rise and Fall with Upward Sweeps of State Size

The basic model

Figure 3 (below) illustrates our several hypotheses about the causal relations among the main variables that cause city and empire growth. At the top of Figure 3 is **Population Growth**. Procreation is socially regulated in all human societies, but despite this there has been a long-run tendency for population to grow. **Population Growth** leads to **Intensification**, defined by Marvin Harris (1977:5) as “the investment of more soil, water, minerals, or energy per unit of time or area.” Intensification leads to **Environmental Degradation** as raw material inputs become scarcer and the unwanted byproducts of human activity (pollution, etc.) modify the surrounding environment. Together **Intensification** and **Environmental Degradation** lead to rising costs in terms of labor time needed to produce the food and raw materials that people need, and this condition is called **Population Pressure**. In order to feed more people, farmers must use more marginal land because the best soils have become degraded. Or deer hunters must travel farther to find their quarry once deer have become depleted in nearby districts. Thus the cost in time and effort of producing a given amount of food increases (Boserup 1965; 1981). Some resources are less subject to depletion than others (e.g. fish compared to big game), but increased use usually causes rising costs. Other types of environmental degradation are due to the side effects of

demographic regulator, e.g. the Marquesas Islands (Kirch 1991). This cycle corresponds to the path that goes from **Population Pressure** to **Migration** to **Circumscription** to **Conflict**, and then a negative arrow back to **Population Pressure**. When population again builds up another round of heightened conflict knocks it back down again. This is the “nasty bottom” of the iteration model.^{8[8]}

Under the right conditions a circumscribed situation in which the level of conflict has been high will be the locus of the emergence of more hierarchical institutions, larger states and larger cities. Carneiro (1970) and Mann (1986) reasonably contend that people will be inclined to run away from state-formation if they can in order to maintain autonomy and equality. But circumscription prevents exit, and exhaustion from prolonged or extreme conflict may make subservience to a new state the lesser evil. It is often better to accept a king than to continue fighting. And so kings (and big men, chiefs and emperors) emerged out of situations in which conflict had reduced the resistance to centralized power. This is quite different from the usual portrayal of those who hold to the functional theory of stratification. The world-system insight here is that the newly emergent elites most often come from regions that have been semiperipheral. These larger states build new (or expand existing) cities.

Intersocietal systems are often structured as hierarchies in which powerful core states dominate and/or exploit less powerful semiperipheral and peripheral peoples. And yet some semiperipheral agents of change are unusually able to put together effective campaigns for erecting new levels of hierarchy.^{9[9]} This may involve both innovations in the “techniques of power” and innovations in productive technology (**Technological Change**). Newly emergent elites often implement new production technologies as well as new waves of intensification. This, along with the more peaceful regulation of access to resources structured as legal regulation of property, creates the conditions for a new round of **Population Growth**, which brings us around to the top of Figure 3 again. Female education and involvement in the world of work outside the household lowers the birth rate, and many countries in the contemporary world have stable population sizes, but the world as a whole has not yet reached that point and so the iteration model is still working. In about 50 or 75 years humans are likely to reach a stable population maximum, and the iteration model will need to be greatly modified to explain subsequent development.

The emergence of regional market exchange and states specializing in trade articulated changes in intensification, environmental degradation and population pressure with technological change, and so the mechanisms at the bottom of the model in Figure 2 were by-passed (at least temporarily) until population growth became so great that these articulations were overwhelmed. Then the process once again shifts toward greater conflict.

City growth. The growth of cities, a major component of the anthropogenic built environment, is affected by multiple factors. One important factor is demographic change. In the agrarian era cities were population sinks, and relied on immigration from rural areas to sustain themselves. Rural population growth exacerbated this “sink” effect. When rural population increased beyond a certain threshold, rural areas suffered from an excess of labor, prompting migration to the cities. Such periods were usually accompanied by a

^{8[8]} It is analogous to flour beetles in a jar. If the amount of flour provided daily is doubled, more flour beetles grow up until a certain ratio of food to beetles is restored. If the amount of flour is reduced by half, the beetles eat each other until the same ratio of food to beetles is restored.

^{9[9]} This is the semiperipheral development hypothesis.

flowering of crafts, because labor was cheap, and elites, enjoying greater returns from agriculture (due to high rents), tended to spend some of their wealth on the products of artisan labor. On the other hand, low real wages meant that an increasing proportion of the urban population was living below the subsistence level. As a result, urban mortality rates tended to rise, and birth rates to decline.

Another important factor affecting city growth is technological development, which leads to greater agricultural productivity and a larger proportion of population living in the cities. Improvements in sanitation and health did not greatly affect the urban mortality rate until the middle of the nineteenth century.

Imperial expansion. So far we have addressed the nonspatial aspects of the modeled system – either acting in a local fashion (population growth, agricultural intensification) or, conversely, in a global fashion (global climate change, millennial growth of technological knowledge). What makes a model explicitly spatial, however, are processes that connect various localities, and whose strength declines with distance. One such mechanism is the spatial expansion of empires resulting from conquest of adjacent territories. The first, and obvious, factor is the size of the population controlled by the empire. However, the effect of population size on military strength is nonlinear. One of the important factors affecting imperial conquest is the strength of the state (S), since wealthy empires can raise large armies, purchase expensive equipment, and sustain armies in the field for lengthy periods of time. Thus, an empire during the unfavorable phase of the demographic cycle (when it suffers from fiscal crisis) has great difficulties in financing war operations. These are periods when empires are extremely vulnerable to adversary empires, or to barbarians. Other mechanisms affecting warfare that we will investigate are changes in military technology and the military advantages developed by Central Asian steppe nomads.

An important spatial process affecting imperial growth is the logistical aspect of the ability of the state to project its power over distance. This theory has been well developed as a result of work by Randall Collins (1999) on geopolitics (see also Hanneman 1995 and Turchin 2003b). We will model geopolitical processes by focusing on spatial units located on or near the boundary between adjacent states, and calculating the power that each state can bring to bear on these spaces. In the simplest formulation, the power of State 1 delivered to square with coordinate x,y is:

$$P_1(x,y,t) = S_1 \exp[-d_1(x,y)/b]$$

where S_1 is the resources of State 1 and d_1 is the distance from the center of State 1 to the spatial unit x,y . Parameter b modulates how fast power diminishes with distance (and its units are km). $P_2(x,y,t)$ is calculated analogously. The relative values of P_1 and P_2 determine whether State 1 or State 2 will conquer the unit. For example, a simple rule is that the probability of the square going to State 1 is equal to $P_1/(P_1+P_2)$, and vice versa.

The logistics parameter b can be made a function of the local geography. It is easier to project power across flat space than across mountains. We will also investigate the effect of a multiplier that will reflect the military technology available to each state, or reflect the difference between, say, nomads and settled polities.

Core/periphery status. Examination of the hypothesis that semiperipheral societies are frequently the loci of change agents that expand and transform institutional structures requires coding the positions of societies in core/periphery hierarchies. Fortunately David Wilkinson (1991) has already produced a coding of sedentary societies into core, peripheral

and semiperipheral categories. We will improve upon Wilkinson's work by distinguishing between different kinds of semiperipheries and by including nomadic peoples.

Causes of East/West Synchrony

One important product of our modeling project will be to determine the causes of a fascinating synchrony that emerged between East Asia and the distant West Asian/Mediterranean region in the growth/decline phases of cities and empires, but did not involve the intermediate South Asian region. Studies have used data on both city sizes and the territorial sizes of empires to examine the hypothesis that regions distant from one another were experiencing synchronous cycles of growth and decline (e.g. Chase-Dunn, Manning and Hall 2000; Chase-Dunn and Manning 2002). Frederick Teggart's (1939) path-breaking world historical study of temporal correlations between events on the edges of the Roman and Han Empires argued the thesis that incursions by Central Asian steppe nomads were the key to East/West synchrony. A study of city-size distributions in Afroeurasia (Chase-Dunn and Willard 1993; see also Chase-Dunn and Hall 1997: 222-223) found an apparent synchrony between changes in city size distributions and the growth of largest cities in East Asia and West Asia-North Africa over the period from 500 BCE to 1500 CE. That finding led to a study of the territorial sizes of empires, which found a similar synchrony (Chase-Dunn, Manning and Hall 1999).^{10[10]} Plausible causes of these synchronies are climate change, epidemics, trade cycles, and the incursions of Central Asian steppe nomads.

Global State Formation

The scientific literature on future global state formation has mainly consisted of linear or quadratic extrapolations of several different cross-temporal empirical indicators. Robert Carneiro's (1978) original study quantified the long-term decline in the number of autonomous polities on Earth to predict an emergent world state in about 1000 years from the present. Earlier studies by Raul Naroll (1967) and Louis Marano (1973) had used the territorial sizes of states for a similar purpose. Peter Peregrine, Melvin Ember and Carol R. Ember (2004) employ a similar extrapolation approach that uses indicators based on codings of archaeological evidence. Based on an indicated quadratic curve over the past 12,000 years, they predict the emergence of a global state by CE 5000.

The careful study of the territorial sizes of the largest empires over the past 3000 years by Rein Taagepera (1978, 1997) shows that the largest states in different regions tended to rise and fall with occasional radical upward swings. Taagepera observes that the median duration of large polities at more than half their peak size has been around 130 years. He also notes that polities that expand fast are somewhat shorter-lived than polities that expand more slowly. And he reports that three sudden increases in polity sizes occurred around 3000 BCE, 600 BCE and CE 1600.^{11[11]}

Upward Sweeps

The question of the timing of upward sweeps to new levels is entirely germane to the problem of modeling global state formation. So also is the issue of how unusually large states have been formed in the past. Upward sweeps have mainly been instances of a

^{10[10]} Chase-Dunn and Manning (2002) have re-examined the city size data using constant regions rather than PMNs to see if the East/West synchronous city growth hypothesis holds when the units that are compared are somewhat different. Their results confirm the existence of East/West city growth synchrony.

^{11[11]} But close inspection of Taagepera's data reveals that the trajectories and timing of upward sweeps are temporally distinct in different regions.

semiperipheral marcher state conquering and unifying adjacent older core states and nearby peripheral areas. So conquest has been the main mechanism of large-scale political integration. But the pattern of hegemonic rise and fall in the modern world-system has been different. The most powerful states, the hegemons (the Dutch, the British and the United States), have fought semiperipheral challengers (e.g. Napoleonic France and Germany) to prevent the emergence of a core-wide empire. We contend that this is because the hegemons are the most capitalist states in the system, the ones for whom economic success is most closely tied to the ability to make superprofits on the technological rents that return from new lead technologies.

Only during hegemonic decline have the modern capitalist hegemons shown a tendency toward “imperial overreach” in which their military power is employed in a last ditch effort to prop up a declining economic hegemony. These efforts have not been successful, and a new hegemon only emerges after a period of hegemonic rivalry and world war. This is a method of choosing “global leadership” that we can no longer afford to employ, and so the issue of institutions that can peacefully resolve the struggle for hegemony is of the first importance for our very survival as a species.

The approach that we propose is to model the main causes of state formation and upward sweeps taking into account the ways in which the basic processes have been altered by the emergence of new institutions. We will elaborate and improve upon the recent work of Robert Bates Graber (2004). Graber develops both an ahistorical and an historical population pressure model of political integration. His ahistorical model is a very simplified version of the iteration model displayed in Figure 3 above that includes population growth rates and the number of independent polities. Graber’s historical model takes account of the emergence of the League of Nations and the United Nations as our approach will do. But we add the rise and fall cycle, the emergence of markets and capitalism, and the growth of other international political organizations and non-governmental organizations to our model of political globalization.

The main political structure of the modern world-system has been, and remains, the international system of states as theorized and constituted in the Peace of Westphalia. This international system of competing and allying national states was extended to the periphery of the modern world-system in two large waves of decolonization of the colonial empires of core powers. The modern system already differed from earlier imperial systems in that its core remained multicentric rather than being occasionally conquered and turned into a core-wide empire. Instead, empires were organized as distant peripheral colonies rather than as conquered adjacent territories. Earlier instances of this type of colonial empire were produced by thalassocratic states, mainly semiperipheral capitalist city-states that specialized in trade. In the modern system this form of colonial empire became the norm, and the European core states rose to global hegemony by conquering and colonizing the Americas, Asia and Africa in a series of expansions (see Figure 4). The international system of sovereign states was extended to the colonized periphery in two large waves of decolonization (see Figure 4). After a long-term trend in which the number of independent states on Earth had been decreasing, that number rose again with decolonization and the core states decreased in size when they lost their colonial empires.

Extension of the State System to the Periphery

The decolonization waves were part of the formation of a global polity of states. And one of the decolonized regions became “the first new nation,” and eventually rose to hegemony to become the largest hegemon the modern system has seen – the United States.

The doctrine of the national self-determination, long a principle of the European state system, was extended to the periphery.

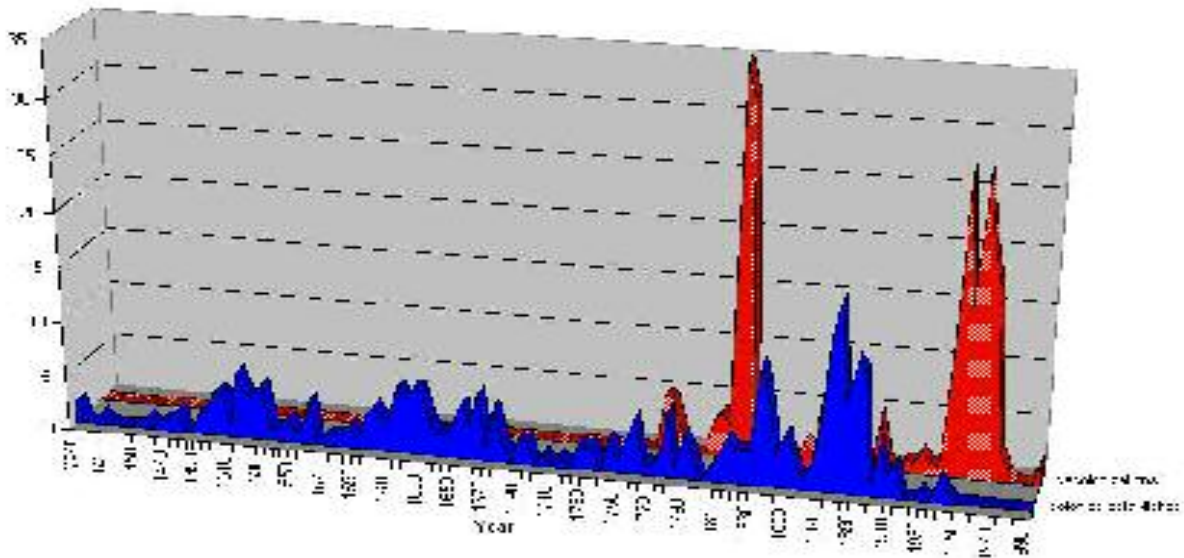


Figure 4: Waves of colonization and decolonization based on Henige (1970)

This multistate system has also experienced waves of international political integration that began after the Napoleonic Wars early in the nineteenth century. Britain organized a “Concert of Europe” (Jervis 1985) that was intended to prevent future French revolutions and Napoleonic adventures. During the middle of the nineteenth century a large number of specialized international organizations emerged such as the International Postal Union (Murphy 1994) that underwrote the beginnings of a global civil society that included more than elites, and this network of transnational voluntary associations grew much larger during the most recent wave of economic globalization since World War II. After World War I the League of Nations was intended to provide collective security, though it was weakened by the failure of the United States to join. After World War II the United Nations became a proto-world-state, the efficacy of which has waned and waxed since then. The system of national states is being slowly overlain by global and regional transnational political organizations that blossom after periods of war and during periods of economic globalization.

Our historical model will add marketization, decolonization, new lead technologies, the rise and fall of hegemonies, and the rise of international political organizations to the population pressure model in order to forecast future trajectories of global state formation. And we will assemble empirical data for the last two hundred years on the trend toward global political integration in order to parameterize our models. This will allow us to examine how changing assumptions about the relationships among variables will affect probable future trajectories of international political integration. Our conceptualization of the cyclical nature of many processes will allow us to consider how downward plunges and possible collapses might affect the probable trajectories of global state formation.

We will also take into account the structural differences between recent and earlier periods. For example, the period of British hegemonic decline moved rather quickly toward conflictive hegemonic rivalry because economic competitors such as Germany were able to develop powerful military capabilities. The U.S. hegemony has been different in that the United States ended up as the single superpower after the decline of the Soviet Union. Economic challengers (Japan and Germany) cannot easily use the military card because they are stuck with the consequences of having lost the last World War. This, and the immense size of the U.S. economy, will probably slow the process of hegemonic decline down relative to the speed of the British decline (Chase-Dunn, Jorgensen, Reifer and Lio, Forthcoming).^{12[12]}

Our modeling of the global future will also consider changes that have occurred in labor relations, urban-rural relations, the nature of emergent city regions, and the shrinking of the global reserve army of labor (Silver 2003).

The Trajectory of Political Globalization

We conceptualize political globalization analogously to our understanding of economic globalization as the relative strength and density of larger versus smaller interaction networks and organizational structures. Much has been written about the emergence and development of global governance and many see an uneven and halting upward trend in the transitions from the Concert of Europe to the League of Nations and the United Nations toward the formation of a proto-world state. The emergence of the Bretton Woods institutions (the International Monetary Fund and the World Bank) and the more recent restructuring of the General Agreement of Tariffs and Trade as the World Trade Organization, and the visibility of other international fora (the Trilateral Commission, The Group of Seven [Eight]; the World Economic Forum, the World Social Forum meetings, etc.) support the idea of emerging global governance. The geometric growth of international non-governmental organizations (INGOs) is also an important phenomenon of global governance and the emergence of global civil society (Murphy 1994; Boli and Thomas 1999).

As we have discussed above, all world-systems go through cycles of political centralization and decentralization with occasional leaps toward new and higher levels of political integration (Chase-Dunn and Hall 1997). In the modern world-system the cycle for the last 400 years has taken the form of the rise and fall of hegemonic core states. Some claim that the **hegemonic sequence** is now morphing into a new structure of core condominium (Goldfrank 1999). We intend to study both the hegemonic sequence and emerging global governance. While these might be combined into a more general concept of

^{12[12]} Robert Carneiro (2004) contends that the current war in Iraq is a sign that global state formation may once again take the road of military conquest. But U.S. unilateralism and the “new imperialism” may also be interpreted as the “imperial overstretch” of a declining hegemon playing one of its last cards. Hardt and Negri (2004) have argued that the largest impediment to the emergence of a United States of the World is the United States of America because the existing U.S. would have to give up some of its power in a global U.S. No longer could the president be elected by a small majority of the citizens of the existing United States. We see the possibility of the emergence of a global state along the path that has been taken by the European Union, a peaceful and democratic confederation of states on a global scale.

Recent discourse from global elites at the 2005 World Economic Forum in Davos implies the emergence of a new global Keynesianism (e.g. Sachs 2005) that may be replacing the neoliberal “Washington Consensus” as the predominant political ideology of development and global governance. If this is true we may see another round of strengthening of transnational global governance as a method of dealing with the polarization, ecological degradation and increasing conflict that has been generated by the latest wave of globalization.

political globalization, we contend that it is important to keep them separate because hegemonic rise and fall is an old feature of the world-system, whereas political globalization is arguably much more recent. Political globalization can be analytically reduced to the question of the relative strength of larger vs. smaller political and military organizations (including also the functionally “economic” ones (IMF, World Bank, WTO) mentioned above.^{13[13]}

The proposed research will expand our understanding of systemic processes of polity formation and better allow us to comprehend the possible futures for humanity by systematically comparing recent times with the past millennia.

REFERENCES

- Abu-Lughod, Janet Lippman 1989 *Before European Hegemony: The World System A.D. 1250-1350* New York: Oxford University Press.
- Anderson, David G. 1994 *The Savannah River Chiefdoms*. Tuscaloosa: University of Alabama Press.
- Arrighi, Giovanni 1994 *The Long Twentieth Century: Money, Power and the Origins of Our Times*. London: Verso
- Bairoch, Paul 1988 *Cities and Economic Development*. Chicago: University of Chicago Press.
- Barabási, A.-L. 2002. *Linked: The New Science of Networks*. Cambridge, MA: Perseus Publishing.
- Barfield, Thomas J. 1989. *The Perilous Frontier: Nomadic Empires and China*. Cambridge, MA: Basil Blackwell.
- Bentley, Jerry H. 1993. *Old World Encounters: Cross-Cultural Contacts and Exchanges in Pre-Modern Times*. Oxford: Oxford University Press.
- Bergesen, Albert and Ronald Schoenberg 1980 “Long waves of colonial expansion and contraction 1415-1969” Pp. 231-278 in Albert Bergesen (ed.) *Studies of the Modern World-System*. New York: Academic Press
- Boli, John and George M. Thomas 1997 “World culture in the world polity,” *American Sociological Review* 62,2:171-190 (April).
- _____ (eds.) 1999 *Constructing World Culture: International Nongovernmental Organizations Since 1875*. Stanford: Stanford University Press.
- Boserup, Ester 1981. *Population and Technological Change*. Chicago: University of Chicago Press.
- Braudel, Fernand 1979 *The Perspective of the World*. New York: Harper and Row.
- Carneiro, Robert L. 1978 “Political expansion as an expression of the principle of competitive exclusion,” Pp. 205-223 in Ronald Cohen and Elman R. Service (eds.) *Origins of the State: The Anthropology of Political Evolution*. Philadelphia: Institute for the Study of Human Issues.
- _____ 2004 “The political unification of the world: whether, when and how – some speculations.” *Cross-Cultural Research* 38,2:162-177 (May).
- Chandler, Tertius 1987 *Four Thousand Years of Urban Growth*. Edwin Mellen Press:

^{13[13]} Our conceptualization of political globalization needs to include regional international organizations such as NATO, the Warsaw Pact, COMECON, the European Community, NAFTA, ASEAN, MERCOSUR and etc.

- Lewiston/Queenston, Lampeter.
- Christopher Chase-Dunn. 1990 "World state formation: historical processes and emergent necessity" *Political Geography Quarterly*, 9,2: 108-30 (April).
<http://irows.ucr.edu/papers/irows1.txt>
- Chase-Dunn, Christopher and Thomas D. Hall. 1997 *Rise and Demise: Comparing World-Systems* Boulder, CO.: Westview
- Chase-Dunn, C. and E. Susan Manning 2002 "City systems and world-systems: four millennia of city growth and decline." *Cross-Cultural Research* 36,4:379-398.
- Chase-Dunn, Christopher, Yukio Kawano and Benjamin Brewer 2000 "Trade globalization since 1795: waves of integration in the world-system." *American Sociological Review*, February.
- Chase-Dunn, Christopher, Andrew Jorgenson, Thomas E. Reifer and Shoon Lio Forthcoming. "The trajectory of the United States in the world-system," *Sociological Perspectives*.
- Christian, David 2004 *Maps of Time*. Berkeley: University of California Press.
- Cioffi-Revilla, Claudio 1996 "Origins and Evolution of War and Politics," *International Studies Quarterly*, Vol. 40, no. 1, March pp. 1-4.
- Collins, Randall 1999 *Macrohistory: Essays in the Sociology of the Long Run*. Stanford, CA: Stanford University Press
- Denemark, Robert, Jonathan Friedman, Barry K. Gills and George Modelski (eds.) 2000 *World System History: the social science of long-term change*. London: Routledge.
- Diamond, Jared 2004 *Collapse*. New York: Viking
- Fischer, David Hackett 1996 *The Great Wave: Price Revolutions and the Rhythm of History*. New York: Oxford University Press.
- Frank, Andre Gunder and Barry K. Gills (eds.) 1993 *The World System: Five Hundred Years or Five Thousand ?* London: Routledge.
Review 15:3(Sum):335-72.
- Friedman, Jonathan and Michael Rowlands 1977 "Toward an epigenetic model of the evolution of 'civilization.'" Pp. 201-78 in J. Friedman and M. Rowlands (eds.) *The Evolution of Social Systems*. London: Duckworth.
- Galloway, Patrick R. 1986 "Long-term fluctuations in climate and population in the preindustrial era." *Population and Development Review* 12,1:1-24 (March).
- Goldfrank, Walter L. 1999 "Beyond hegemony" in Volker Borschier and Christopher Chase-Dunn (eds.) *The Future of Global Conflict*. London: Sage.
- Gimblett, Randy 2001 *Integrating Geographic Information Systems and Agent-Based Modeling: Techniques for Simulating Social and Ecological Processes* New York: Oxford University Press.
- Goldstone, J. A. 1991. *Revolution and rebellion in the Early Modern world*. University of California Press, Berkeley, CA.
- Graber, Robert Bates 2004 "Is a world state just a matter of time?: a population-pressure alternative." *Cross-Cultural Research* 38,2:147-161 (May).
- Hanneman, Robert A. 1988-89 *Computer Assisted Theory Building*. Beverly Hills: Sage.
_____ 1995 "Discovering Theory Dynamics by Computer Simulation: Experiments on State Legitimacy and Capitalist Imperialism." Pp. 1-46 in Peter Marsden (ed.) *Sociological Methodology* (with Randall Collins and Gabrielle Mordt).

- Hardt, Michael and Antonio Negri 2004 *Multitude*. New York: Penguin
- Harris, Marvin. 1977. *Cannibals and Kings: The Origins of Cultures*. New York: Random House.
- Henige, David P. 1970 *Colonial Governors from the Fifteenth Century to the Present*. Madison, WI.: University of Wisconsin Press.
- Hughes, Barry B. 1996 *International Futures: Choices in the Creation of a New World Order*. Boulder, CO:Westview.
- Jervis, Robert 1985 "From Balance to Concert: A Study in International Security Cooperation," *World Politics* 38,1: 58-79
- Johnson, Allen W. and Timothy Earle. 1987. *The Evolution of Human Societies: From Foraging Group to Agrarian State*. Stanford: Stanford University Press.
- Johnson, Amber Lynn 2004 "Why not to expect a "world state." *Cross-Cultural Research* 38,2: 119-132 (May).
- Khaldun, Ibn 1981 *The Muqaddimah*. Princeton: Princeton University Press.
- Kirch, Patrick V. 1984 *The Evolution of Polynesian Chiefdoms*. Cambridge: Cambridge University Press.
- _____ 1991 "Chiefship and competitive involution: the Marquesas Islands of Eastern Polynesia" Pp. 119-145 in Timothy Earle (ed.) *Chiefdoms: Power, Economy and Ideology*. Cambridge: Cambridge University Press.
- Kowalewski, David and Dean Hoover 1995 "The future world-system: a dynamic model" *World Futures* 44:263-285.
- Larsen, Mogens T. 1976 *The Old Assyrian City State and Its Colonies*. Copenhagen: Akademisk Forlag.
- Lattimore, Owen. 1940. *Inner Asian Frontiers of China*. New York: American Geographical Society, republished 1951, 2nd ed. Boston: Beacon Press.
- Lenski, Gerhard 2005 *Ecological-Evolutionary Theory*. Boulder, CO: Paradigm.
- Levy, Jack S. and William R. Thompson 2005 *The Evolution of War*. Englewood Cliffs, NY: Prentice-Hall.
- Li, B. L. and E. L. Charnov. 2001. Diversity-stability relationships revisited: scaling rules for biological communities near equilibrium. *Ecological Modelling*, 140: 247-254.
- Marano, Louis A 1973 "A macrohistoric trend toward world government." *Behavior Science Notes* 8,1, 35-39
- Mann, Michael. 1986. *The sources of social power: Volume I: A history of power from the beginning to a.d. 1760*. Cambridge: Cambridge University Press.
- McNeill, J.R. and William McNeill 2003 *The Human Web*. New York: Norton
- Modelski, George 2003 *World Cities: -3000 to 2000*. Washington, DC: Faros 2000
- Modelski, G., W. R. Thompson. 1996. Leading sectors and world powers: the co-evolution of global politics and economics. University of South Carolina Press, Columbia, SC.
- Murphy, Craig 1994 *International Organization and Industrial Change: Global Governance since 1850*. New York: Oxford.
- Naroll, Raul 1967 "Imperial cycles and world order," Peace Research Society: *Papers*, VII, Chicago Conference, 1967: 83-101.
- O'Rourke, Kevin H and Jeffrey G. Williamson 1999 *Globalization and History: The Evolution of a 19th Century Atlantic Economy*. Cambridge, MA.: MIT Press.

- Pasciuti, Daniel and Christopher Chase-Dunn 2002 "Estimating the population sizes of cities." <http://irows.ucr.edu/research/citemp/estcit/estcit.htm>
- Peregrine, Peter N., Melvin Ember and Carol R. Ember 2004 "Predicting the future state of the world using archaeological data: an exercise in archaeomancy." *Cross-Cultural Research* 38,2: 133-146 (may).
- Polanyi, Karl. 1944. *The Great Transformation: The Political and Economic Origins of Our Time*. Boston: Beacon Press.
- _____. 1957. "Aristotle Discovers the Economy." Pp. 64-96 in *Trade and Market in the Early Empires*, edited by Karl Polanyi, Conrad M. Arensberg, and Harry W. Pearson. Chicago: Regnery.
- Robinson, William I. 2004 *A Theory of Global Capitalism*. Baltimore: MD. Johns Hopkins University Press.
- Roscoe, Paul 2004 "The problems with polities: some problems in forecasting global political integration." *Cross-Cultural Research* 38,2:102-11.
- Rummel, R. J. 2002. url: <http://www.hawaii.edu/powerkills/LINKS.HTM#freedom> - Link to Cross-National Data/Statistics
- Redman, Charles L. 1999 *Human Impact on Ancient Environments*. Tucson: University of Arizona Press.
- Sachs, Jeffrey 2005 *The End of Poverty*. New York: Penguin.
- Sanderson, Stephen K. 1990 *Social Evolutionism*. Cambridge, MA: Blackwell.
- Sassen, Saskia. 1991. *Global Cities*. Princeton: Princeton University Press.
- Silver, Beverly 2003 *Forces of Labor*. Cambridge: Cambridge University Press.
- Sklair, Leslie. 2001. *The Transnational Capitalist Class*. Malden, MA: Blackwell Publishers.
- Smith, D., and D. R. White. 1992. Structure and Dynamics of the Global Economy: Network Analysis of International Trade 1965-1980. *Social Forces* 70:857-894.
- Spufford, P. 2002, *Power and Profit: The Merchant in Medieval Europe*. London & NY: Thames & Hudson.
- Taagepera, Rein 1978 "Size and duration of empires: growth-decline curves, 3000 to 600 BC" *Social Science Research* 7:180-196
- _____. 1997 "Expansion and contraction patterns of large polities: context for Russia." *International Studies Quarterly* 41,3: 475-504.
- Taylor, Peter J. 1996 *The Way the Modern World Works: World Hegemony to World Impasse*. New York: John Wiley.
- Teggart, Frederick J. 1939. *Rome and China: A Study of Correlations in Historical Events*. Berkeley: University of California Press.
- Tilly, Charles 1990 *Coercion, Capital and European States: AD 990-1990*. Cambridge, MA: Blackwell.
- Tobler, Waldo and S. Wineburg 1971 "A Cappadocian Speculation" *Nature* 231, May 7.
- Turchin, P. 2003. *Historical dynamics: why states rise and fall*. Princeton University Press, Princeton, NJ.
- Turchin, P., and T. D. Hall. 2003. Spatial synchrony among and within world-systems: insights from theoretical ecology. *Journal of World Systems Research* 9,1
<http://csf.colorado.edu/jwsr/archive/vol9/number1/pdf/jwsr-v9n1-turchinhall.pdf>
- Thompson, William R. 1990 "Long waves, technological innovation and relative decline." *International Organization* 44:201-33.
- _____. (ed.) 2001 *Evolutionary Interpretations of World Politics*. London: Routledge.
- Van der Pijl, Kees. 1984. *The Making of an Atlantic Ruling Class*. London: Verso.
- Wallerstein, Immanuel. 1984. "The three instances of hegemony in the history of the

capitalist world-economy.” Pp. 100-108 in Gerhard Lenski (ed.) *Current Issues and Research in Macrosociology*, International Studies in Sociology and Social Anthropology, Vol. 37. Leiden: E.J. Brill.

_____ 2000 *The Essential Wallerstein*. New York: New Press.

Wendt, Alex 2003 “Why a world state is inevitable” *European Journal of International Relations*. 9,4: 491-542.

White, Douglas R., F. Harary. 2001 “The Cohesiveness of Blocks in Social Networks: Node Connectivity and Conditional Density.” *Sociological Methodology* 2001, vol. 31, no. 1, pp. 305-359. Blackwell Publishers, Inc., Boston, USA and Oxford, UK.

Wilkinson, David. 1987 "Central civilization" *Comparative Civilizations Review* 17:31-59 (Fall).

_____ 1991 “Core, peripheries and civilizations,” Pp. 113-166 in C. Chase-Dunn and T.D. Hall (eds.) *Core/Periphery Relations in Precapitalist Worlds*. Boulder, CO: Westview Press

_____ 2004 “The power configuration of the central world-system, 1500-700 BC” *Journal of World-Systems Research* 10,3: 655-720.
