THE EVOLUTION OF POLITICS

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(In Franz Wuketits, and Christoph Antweiler, eds., *Handbook of Evolution,* Vol I. Wiley-VCH Verlag GmbH & Co., 2004)

This chapter summarizes, updates and augments a theory of political evolution – known as the "Synergism Hypothesis" – that was first proposed in 1983. This theory is based on a definition of a political system as the cybernetic aspect, or "subsystem" of any socially organized, cooperating group or population. Politics in these terms refers to social processes that involve efforts to create, or to acquire control over, a cybernetic social system, as well as the process of exercising control. The underlying thesis, in a nutshell, is that synergistic effects of various kinds have been the "drivers" of the broad evolutionary trend toward increased complexity at all levels of living systems, including social systems, and that cybernetic decision-making, communications, and control processes are a necessary concomitant. This model of politics can be related to the so-called "tradition of discourse" (and to the various "schools" of modern-day political science), and it is proposed that the cybernetic definition provides a "bridge" between "idealist" (or holistic) theories and "realist" (or individualistic/egoistic) approaches. The relationship of this theory to Neo-Darwinism and Sociobiology is also discussed, and the shortcomings of the "selfish gene" paradigm are critiqued. In contrast with models of social life (and politics) that are gene-centered and depend on inclusive fitness theory, the Synergism Hypothesis is quintessentially an economic (or bioeconomic) theory of social/political organization. It is focused on the synergies that are produced by the "phenotypes" and their functional (adaptive) consequences. I also briefly review the accumulating evidence in support of this theory – including a plausible scenario for the evolution of humankind, ethological studies of politics among various social animals, and cross-cultural studies of political evolution in ancient and contemporary human societies.

1 Introduction

Aristotle characterized humankind as the distinctively "political animal" (*zoon politikon)*, and political theorists ever since have used Aristotle's evocative term as a touchstone. But what does it mean? And, equally important, how did this trait – if indeed it is distinctive – originate and develop as the human species evolved, over several million years, from an arboreal primate ancestor?

Unfortunately, there has never been a consensus even on how to define politics, much less how to explain it. In fact, the cumulative index for the eight-volume *Handbook of Political Science* (Greenstein and Polsby, 1975), the most comprehensive synthesis of political science ever attempted, does not even include a citation for a definition of politics.

Nor is the term "political evolution" listed in the index.[1] But this is not surprising. It is only within the past 35 years, dating back to the emergence of the so-called "biopolitics" movement, that a serious effort has been made to account for political behaviors from an evolutionary/biological perspective. (See especially Somit, 1968, 1976; Corning, 1971, 1974, 1983; Tiger and Fox, 1971; Alexander, 1974, 1979; Masters, 1975, 1983, 1989; Willhoite, 1976, 1981;Weigele, 1979; Schubert, 1981; White, 1981; de Waal, 1982; and many others since.) Traditionally, political theorists have either treated the subject in an ahistorical manner or have traced its roots back only to the classical Greeks (or to some hypothetical "state of nature").

Nevertheless, over the course of the past three decades much has been learned – in a number of different disciplines – that sheds new light on these issues. It may well be that an evolutionary perspective can serve as an arbiter – or, better said, a "bridge" – that can reconcile and integrate the competing "schools" of political theory. In the course of this chapter, I will attempt to point the way toward such a reconciliation. But more important, I will review the evidence that political behaviors (as defined here) exist in many other species, and I will summarize a causal theory that seeks to explain the evolution of organized political systems, both in nature and in humankind. I will conclude that the evolutionary roots of our politics and political systems date back several million years.

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1. The more recent single-volume compendium, *A New Handbook of Political Science* (Goodin and Klingemann eds., 1996), represents only a marginal improvement over the original. The editors define politics as the "constrained use of social power," which they acknowledge follows in the tradition of Weber, Lasswell, Dahl, Duverger and others (p. 7). However, they also concede that the concept is "well known to be a fraught conceptual field." Rather than getting "bogged down" in this controversy, they opt for the Weberian approach, which stresses the "non-violent" power of one person over another – whatever that may mean. (Falling in love may powerfully influence a person's life, but is it politics?) On the other hand, the editors say, unconstrained power (or "force") is "more the province of physics," or maybe "military science" (*ibid.*). Among other shortcomings, this is hardly consistent with the widely-accepted claim that the state is defined by a monopoly over the "legitimate" use of force. Later on in the *New Handbook*, moreover, Iris Marion Young (pp. 479-80) tacitly contradicts this definition by invoking Hannah Arendt's vision of politics as activities relating to the concerns of the political community – a throwback to Plato and Aristotle (see below). The *New Handbook* also fails to mention the relationship between biology and politics or the contributions of the biopolitics movement, much less the concept of political evolution.

2 Defining Politics

2.1 The "Idealist" Model

We begin with the problem of how to define politics, and with the writings of Plato and Aristotle (who in turn may have been inspired by the teachings of Socrates). In his classic dialogue, the *Republic*, Plato proceeded from the core premise that the *polis* (or polity) is fundamentally an economic association; it is very different in character from an amorphous aggregation of individuals who happen to share a common language, territory or culture and may, or may not, engage in arms-length exchanges. A polity is characterized by a specialization of roles and a division of labor (or, more precisely, a combination of labor) and, equally important, interdependence with respect to the satisfaction of our various needs and wants. As Plato observed:

> A city — or a state — is a response to human needs. No human being is self-sufficient, and all of us have many wants...Since each person has many wants, many partners and purveyors will be required to furnish them.... Owing to this interchange of services, a multitude of persons will gather and dwell together in what we have come to call the city or the state....[So] let us construct a city beginning with its origins, keeping in mind that the origin of every real city is human necessity....[However], we are not all alike. There is a diversity of talents among men; consequently, one man is best suited to one particular occupation and another to another....We can conclude, then, that production in our city will be more abundant and the products more easily produced and of better quality if each does the work nature [and society] has equipped him to do, at the appropriate time, and is not required to spend time on other occupations...(Book II, 369, 370b,c, 371c).

In other words, an organized polity, or state, produces mutually beneficial economic synergies; it is quintessentially a "collective survival enterprise" – a functionally interdependent "superorganism". (For more on superorganisms, see Corning, 2002a.) We will return to this key point later on.

However, this is not the only purpose that the state may serve. Plato went on to argue that it should also strive to attain "the good life" (in both a material and moral sense), though he advanced this objective as a continuing quest, not a ready-mix formula. Moreover, and this was one of Plato's most profound insights, human nature is inherently "at war with itself." There is a double-edge to the human psyche. Our "lower-level" appetites and urges manifestly serve our needs, but they can also become destructive, both to the community and to ourselves. As Aristotle (Plato's star student) observed in the *Politics* (1,2: 1253a, 31ff): "Man, when perfected, is the best of animals, but, when separated from law and justice, is the worst of all."

Our prodigious appetites must therefore be constrained by the higher-level dictates of "reason", along with our social and ethical impulses, and by the collective actions of the community to protect and preserve itself. To Plato, therefore, ethics and "justice" are not primarily derived from some higher metaphysics. Nor is it reducible to a tug-of-war over our "rights" as individuals. Social justice is

concerned with equitable rewards for the proper exercise of our abilities and our calling, and our conduct, in a network of interdependent economic relationships.

Aristotle, in the *Politics*, supplemented his mentor's views in some important ways. First, Aristotle emphasized that physical security — both external and internal — is also a fundamental function of the state, one of its principle *raisons d'? tre* (a point Plato also made in a later work, the *Laws*). The collective survival enterprise is not, therefore, exclusively an economic association. Aristotle also stressed that human nature is not an autonomous agency. It entails a set of innate aptitudes that are uniquely fitted for society and that can only be developed in a network of social relationships. Thus, social life involves more than being simply a marketplace for economic transactions. It also involves a life in common; we are all enriched by it. Indeed, a hermit is not only economically deprived; he/she is not fully human and, equally important, has no evolutionary future. (We will also return to this important point.)

Aristotle also devoted much attention to the fundamental political challenge, well appreciated by Plato, that a society is composed of many different, often competing interests. Indeed, Aristotle seconded Plato's conclusion that the basic, seemingly inescapable cleavage between the few who are rich and the many who are poor is potentially the most dangerous social division of all and the underlying cause of much civil unrest. The key to preserving any political community, therefore, is to strike a balance between the members' conflicting interests. To this end, the law must be "sovereign" and must serve as an impartial arbiter — "reason unaffected by desire." Moreover, there must be moral equality before the law. The law cannot be used as a tool to favor the rich and powerful but must be an instrument for achieving social justice, which he defined as "giving every man his due."

Aristotle also discussed the role of government institutions. Recognizing that Plato's proposal in the *Republic* for rule by specially-trained, benevolent dictators (philosopher kings) was impracticable, if not dangerous, Aristotle proposed that the best alternative was a "mixed state," with elements drawn from a cross-section of the community. (Plato himself conceded the point in his later writings.) The state should strive to achieve social justice, not as an end in itself but as an instrument for preserving, even improving society as a stable, "self-sufficing" community. The objective of the state should be to achieve a "balance" among various interests and factions, and the ultimate measure of its success in doing so is the willing (uncoerced) consent of the citizenry. Another way of putting it is that politics is ultimately concerned with the overarching interests, problems and needs of the collective survival enterprise – the "public interest."

This paradigm, which has often been termed the "idealist" view of politics, has many modern echoes. Political theorist Sheldon Wolin (1960, pp. 2-3, 10-11) speaks of activities related to or affecting "the community as a whole." Karl Deutch (1966[1963], p. 124) calls politics "the dependable coordination of human efforts and expectations for the attainment of the goals of the society." David Easton's (1965, p. 21) definition, though a bit ambiguous, is probably the most widely employed by contemporary political scientists. He termed politics the processes through which "values are authoritatively allocated for a society." But perhaps the modern apotheosis of the idealist stance is Larry Arnhart's normatively-laden definition in *Dawinian Natural Right* (1998, p. 1): "the ultimate aim of politics is to form the

character of human beings to promote some conception of the best life." This is so, Arnhart says, because "every political debate depends fundamentally on opinions about what is good and bad, just and unjust." These moral opinions, Arnhart concludes, express "a universal human nature."

2.2 The "Realist" Model

Unfortunately many theorists over the years have disputed the claims of the idealists (also referred to as "holists"). What has been called – at times with a supercilious tone – the "realist" (and sometimes "materialist") view of politics traces its origins back at least to the classical Greeks, including the Sophists, Skeptics, Cynics and Epicureans (their very names give the game away). These theorists advanced a radically different, individualist definition of the good life, and of politics. For them, the claims of the community, and the very concept of a "public interest," were rejected as a chimera, and the primacy of individual "self-interest" was posited as the foundation of social life. Justice, according to the character Thrasymachus in Plato's *Republic*, is nothing more than "the interest of the stronger."

Typical of this genre was the Epicurean School, which arose when the Greek city-states were in decline. The Epicureans advocated a thoroughgoing materialism and an individualistic pain-pleasure ethic that long predated the social contract theorists, utilitarians and other conservative modern thinkers. To the Epicureans, individual self-interest is the driving force in humankind, and the "good life" amounts to nothing more than the satisfaction of our personal appetites and material wants. States are formed primarily to provide security against the depredations of others, and anything beyond this represents, in effect, a set of conditional, contractual arrangements to facilitate our personal self-interests.

In the Epicurean paradigm, moreover, there is no instinctive preference for, or obligation to, society, and justice is solely a matter of expediency. According to the Golden Maxims of Epicurus, the school's founder: "There never was an absolute justice but only a convention made in mutual intercourse, in whatever region, from time to time....Whatever in conventional law is attested to be expedient in the needs arising out of mutual intercourse is by nature just, whether the same for all or not, and in case any law is made and does not prove suitable to the expediency of mutual intercourse, then this is no longer just... For the time being, it was just, so long as we do not trouble ourselves about empty terms but look broadly at facts" (quoted in Hicks, 1910, p. 177ff).

The Cynic school was even more hostile to the community and the state. Rejecting all social life, all rules of social intercourse or conventions, even the benefits of learning, the Cynics' attitudes ranged from rugged individualism to utopian anarchism and an idealized communism. The modern libertarian novelist, Ayn Rand (much-admired in conservative circles), provides us with a high-decibel echo of these ancient theorists. In her two best-selling novels, *The Fountainhead* and *Atlas Shrugged*, Rand's protagonists were defiant individualists. "Just as life is an end in
itself, so every living human being is an end in himself, not the means to the ends or welfare of others — and, therefore, man must live for his own sake, neither sacrificing himself to others nor sacrificing others to himself" (Rand, 1962, p 35). Rand's political philosophy seems paradoxical: "Civilization is the process of setting man free from men" (Rand, 1943, p. 685).

Needless to say, there have been many variations on the realist theme over the past 2000 years. For example, in Niccol? Machiavelli's darkly cynical masterpiece, the *Prince,* politics is portrayed as the pursuit of self-interest clothed in altruistic rhetoric ("who gets what, when, how," in the words of the modern political scientist Harold Lasswell), and political power is often an end in itself. In Machiavelli's view, human nature is incurably selfish, aggressive and acquisitive. Only the raw power of the state can prevent anarchy. (In the cutthroat political environment of 16th century Italy, there was, unfortunately, much truth to this claim — a point that we will revisit later on.) Indeed, Machiavelli was the very father of the argument that Machiavellian machinations — the use of deception, chicanery and naked force – were necessary if a ruler hoped to obtain his ends (see Sabine, 1961).

Thomas Hobbes, whose outlook was deeply affected by the turmoil of the English civil wars, purveyed an equally dour vision of the political community. If economics is the "dismal science" (in Thomas Carlyle's epithet), Hobbes was the perpetrator of a dismal political science. In the state of nature, Hobbes claimed in the *Leviathan* (1962[1651], p.161), humans are totally, relentlessly egoistic. "I put for a general inclination of all mankind, a perpetual and restless desire for power after power, that ceaseth only in death." Since all men are more or less equal in strength and cunning, Hobbes asserted, the state of nature is a "war of every man against every man" (*ibid*., p. 189). Although peaceful cooperation may also be conducive to our self-preservation, fear of punishment is the only reliable way to curb our egoistic behavior. "Covenants without the sword are but words, and of no strength to secure a man at all"(*ibid*., p. 223). Therefore, the state is primarily an instrumentality for curbing our natural appetites and assuring mutual self-preservation; it amounts to nothing more than a contingent social contract. Furthermore, only an absolute monarchy (a "leviathan") can be truly effective in preventing anarchy. Hobbes, like the Epicureans, also viewed "justice" as a meaningless term. It amounts to whatever a person can get, and keep, and the good life is merely the sum of our separate self-interests.

The other great English social contract theorist, John Locke, lived in a very different, less turbulent period and pursued a different political agenda. As a self-appointed spokesman for a rising middle class that wanted to curb the power of the monarchy, Locke adopted a sharply contrasting set of assumptions about the state of nature. Whereas Hobbes viewed his fellow men darkly as the slaves of restless, irrational passions, Locke, in his *Two Treatises of Government* (1690), portrayed humankind as fundamentally rational; the state of nature was therefore a condition of peace and mutual aid. Humans are also endowed with certain inherent "natural rights," especially property rights. Hence societies (and governments) exist to preserve and enhance these rights; in effect, a society is a voluntary association for mutual benefit. According to Locke, the state does not exist to serve some vision of what is good for the community as a whole, or some disinterested concept of justice. The state's claims to power are circumscribed by its limited, contractual purpose. If this sounds familiar, it is because the fathers of the American Constitution were greatly influenced by Locke's thinking (see Sabine, 1961). As Grady and McGuire (1999) point out, modern constitutions are as much concerned with imposing constraints on the exercise of "sovereign power" as with any conception of the "general welfare."

2.3 The Ethological Model

A new chapter in this ancient debate opened with the emergence of the science of ethology in the 1960s. Although the systematic study of animal behavior dates back to Darwin's day – as evidenced in his landmark book on *The Expression of the Emotions in Man and Animals* (1965[1873]), as well as the pioneering work of the so-called comparative psychologists during the latter 19th and early 20th centuries – many social scientists of the 20th century rejected the evolutionary/biological paradigm as being irrelevant to humankind. Human nature was widely assumed to be a *tabula rasa* that was shaped exclusively by cultural influences. In a famous, often-cited passage, the well-known anthropologist of that era, Ashley Montagu (1949; also 1952, 1955), asserted that, except for a fear of falling and of sudden loud noises, human beings have no instincts.

However, support for this ideologically-tainted model began to erode with the publication of various ethologically-grounded books by Konrad Lorenz, Nicholas Tinbergen, Desmond Morris, Robert Ardrey, Irenaus Eibl-Eibesfeldt and others, along with the rise of the biopolitics movement in political science and, somewhat later, the founding of sociobiology and evolutionary psychology. (The origins of ethology predated World War Two, but only in the 1960s did its contributions become widely known – and debated.) The new debate over the nature of politics and its role in human evolution was initiated by anthropologists Lionel Tiger and Robin Fox in their provocative popularization, *The Imperial Animal* (1971). What Tiger and Fox did, and with a certain relish, was to equate politics in human societies with dominance competition in the natural world. Thus politics is "a world of winners and losers." The political system, they claimed, is synonymous with a "dominance hierarchy."

At first glance, it may seem that Tiger and Fox were promoting the Machiavellian vision (seconded by such modern-day theorists has Hans Morgenthau) that politics is essentially "a struggle for power." As the character O'Brien put it in George Orwell's masterpiece, the novel *1984*, "power is not a means; it is an end...the object of power is power." Yet Tiger and Fox also recognized that dominance competition in nature also has a purpose. It is related to competition for scarce resources – nest sites, food, and especially obtaining mates. Tiger and Fox concluded that "the political system is the breeding system." Having thus flagrantly caricatured this ancient term, Tiger and Fox were then forced to concede that politics in human societies serves very different purposes. It is more often associated with leadership, the division of labor and cooperative activities of various kinds. It has become dissociated for the most part from breeding functions (with some notable exceptions, like Genghis Khan). Unfortunately, Tiger and Fox did not bring this crucial distinction into focus. In the end, we were left mainly with a loose analogy.

A more coherent case for the proposition that human politics is related to dominance behaviors in other species was developed in a succession of works by the primatologist Frans de Waal, beginning with his *Chimpanzee Politics: Power and Sex Among Apes* (1982). (See also de Waal, 1989; Harcourt and de Waal, 1992; and de Waal, 1996.) Drawing on his own extensive research in captive chimpanzees, as well as the many long-term field studies of these animals, de Waal offered a deeper, richer perspective on the issue. The struggle for power and influence is ubiquitous among these animals, he acknowledged. From the animals' motivational perspective, this may well be an end in itself. And, yes, the dominant

animals may gain advantages in terms of such things as nesting sites and breeding privileges. But there is much more to dominance behaviors than this. The competition for status very often involves coalitions and alliances; it is often a group process rather than an individualistic, Hobbesian "war". Indeed, there is much evidence that social constraints on dominance behaviors are common, both in these and other social animals; coalitions sometimes form to thwart the actions of a dominant animal. And in bonobos (or pygmy chimpanzees), a loose female hierarchy seems to form the organizational backbone of the group; females often band together to constrain an aggressive male (de Waal 1997). (Also relevant is the evidence for what Boehm,1993, 1997, 1999, calls an "egalitarian syndrome" in small-scale human societies, like hunter-gatherers.)

More important, stable dominance hierarchies in chimpanzees and other social animals also have functional importance for the group – maintaining peace, arbitrating disputes, limiting destructive competition, mobilizing collective action, even defending the group against outside threats. The intense interdependence of social animals like chimpanzees and bonobos also leads to a degree of reciprocity and generosity, such as food sharing. More recent work in chimpanzees, bonobos, orangutans and other socially-organized species also suggests that interpersonal social relationships and interactions can be very complex, and that cultural influences may also play an important part (see especially de Waal 1989, 1996, 1999, 2001). In fact, there may even be a degree of "democratic" participation in various group decision-making processes (Conradt and Roper, 2003). Nor does one size fit all. The dynamics may differ from one group to the next, or even within the same group over time. (In addition to the de Waal references, see also Kummer, 1968, 1971; E.O. Wilson, 1975; Lopez, 1978; Strum, 1987; Dunbar, 1988; Wrangham, 1994, Boesch and Tomasello, 1998, Whiten et al., 1999, and van Schaik et al, 2003.)

De Waal (1982, p. 213), invoking Aristotle, concluded that chimpanzees are also political animals: "We should consider it an honour to be classed [along with chimpanzees] as political animals," he says. (For the record, this is also consistent with Aristotle's usage, as Arnhart points out. Aristotle applied the term to any socially-organized species that cooperates in jointly pursuing various aspects of the survival enterprise, from honeybees to wild dogs and killer whales. For obvious reasons, Aristotle placed humans at the pinnacle of this category.)

In sum, the ethological model indicates that both the holistic (idealist) model of politics and the egoistic (realist) model have some validity; they are not mutually exclusive. As de Waal (1996, pp. 9, 102) points out, we also need to ask "what's in it for the subordinate?" His answer: "The advantages of group life can be manifold....increased chances to find food, defense against predators, and strength in numbers against competitors....Each member contributes to and benefits from the group, although not necessarily equally or at the same time...Each society is more than the sum of its parts." (In other words, cooperative social groups may produce mutually-beneficial synergies. Again, we will return to this key point.)

Accordingly, in the modern version of the ethological model, dominance behaviors may take on the functional attributes of leadership, and a dominance hierarchy may provide a framework for organizing

various cooperative activities, including a division (combination) of labor (see Corning, 1983; cf., Masters, 1989; Grady and McGuire, 1999; Rubin, 2002). Such organized "political systems" are characterized by overarching collective goals, decision-making, interpersonal communications, social control processes and "feedback". In short, political systems are cybernetic systems.

2.4 The Cybernetic Model

Political scientist Robert Dahl (1970, p. 8) has written that a definition is in effect "a proposed treaty governing the use of terms." The treaty I have long promoted embraces both idealist and realist models, and much more. It defines politics as being isomorphic with social cybernetics. To be specific: *A political system is the cybernetic aspect, or "subsystem" of any socially organized, cooperating group or population. Politics in these terms refers to social processes that involve efforts to create, or to acquire control over, a cybernetic social system, as well as the process of exercising control.* Power, in this definition, is essentially a means, not an end. Moreover, political power can be attained in many different ways, including family inheritance, acquired wealth, seniority, expertise, merit, drawing straws, elections, the use of lethal force, and, yes, the often potent influence of amorous love. (Indeed, Mohandas K. Gandhi – and many others since – have shown that political power can also be exerted by withholding cooperation, or through the use of non-violent "civil disobedience" – see Schell, 2003.)

This definition of politics is not original. The term "cybernetics" can be traced back to the Greek word *kybernetes,* meaning steersman or helmsman, and it is also the root of such English words as "governor" and "government." In the nineteenth century, the French scientist André Amp? re took to using the term cybernetics as an equivalent for politics. More recently, the term has been employed by, among others, political scientists Karl Deutsch (1966[1963]), David Easton (1965), and John Steinbruner (1974), and by this author (1974, 1983, 1987, 1995, 1996a, 2001a, 2002b, and Corning and Hines, 1988). See also Miller, 1995; and François, 1999. The cybernetic model is also widely employed by life scientists, engineers and physicists, and there are numerous books and several scientific journals devoted to this subject.

The single most important property of a cybernetic system is that it is goal-oriented. Consider this problem: When a rat is taught to obtain a food reward by pressing a lever in response to a light signal, the animal learns both the instrumental lever-pressing behavior and how to vary its behavior patterns in accordance with where it is in the cage when the light signal occurs, so that whatever the animal's starting position, the outcome is always the same.

How is the rat able to vary its behavior in precise, "purposeful" ways so as to produce a constant result? Some Behaviorist psychologists of the twentieth century promoted a mechanistic model in which environmental "cues" were said to be modifying the properties of various stimuli that were acting on the animal, thus modifying the animal's behavior in a deterministic way. But this model is implausible. It requires the modifying cues to work with quantitative precision on the animal's nervous system; these cues are hypothetical and have never been elucidated; and most important, this model cannot deal with

novel situations in which the animal has had no opportunity to learn modifying cues. A far more economical explanation is that the animal's behavior is "purposive": the rat varies its behavior in response to immediate environmental feedback in order to achieve an endogenous goal (food), which in this case also involves a learned sub-goal (pressing the lever).

The pioneer systems theorist William T. Powers (1973) has shown that the behavior of a cybernetic system can be described mathematically in terms of its tendency to oppose an environmental disturbance of an internally controlled quantity. The system will operate in such a way that some function of its output quantities will be nearly equal and opposite to some function of a disturbance of any of the environmental variables that affect the controlled quantity, with the result that the controlled quantity will remain nearly at its zero point. The classic example is a household thermostat. In this model, "feedback" plays a key role in controlling the behavior of the system. In other words, cybernetic processes are always the result of a system-environment interaction (see Figure 1).

((insert Figure 1 here))

Figure 1. A cybernetic control system (From W.T. Powers, "Feedback: Beyond Behaviorism," *Science* 179: 351-356, 1973.)

Needless to say, more complex cybernetic systems are not limited to maintaining any sort of simple and eternally fixed steady state. In a complex system, overarching goals may be maintained (or attained) by means of an array of hierarchically organized subgoals that may be pursued contemporaneously, cyclically, or seriatim. Furthermore, homeostasis shares the stage with "homeorhesis" (developmental control processes) and even "teleogenesis" (goal-creating processes). But in all cases, cybernetic systems are goal-oriented.

What is the justification for "dehumanizing" politics and converting the multifarious real-world processes to an abstract analytical model? One advantage is that it reduces the many particular cases to an underlying set of generic properties which transcend any particular institutional arrangement, not to mention the motivations and perceptions of the actors who are involved. The cybernetic definition is also functionally-oriented. It is focused on the processes of goal setting, decision making, communications and control (including the all-important concept of feedback), which are in fact indispensable requisites for all purposeful social organizations. Indeed, cybernetic regulatory processes exist in families, football teams, business firms, and at all levels of government. To quote Dahl again (1970, p. 1): "Whether he likes it or not, virtually no one is completely beyond the reach of some kind of political system. A citizen encounters politics in the government of a country, town, school, church, business firm, trade union, club, political party civic association and a host of other organizations...Politics is one of the unavoidable facts of human existence."

However, in the cybernetic model, relationships of "power, rule or authority" (Dahl's definition of politics) are not ultimately ends in themselves but the means to various ends (goals). Moreover, these goals can range from very personal and self-interested – in conformity with the realist model – to public

goals that are widely, or even universally shared – in accordance with the idealist model. Or, very often, the system may reflect an admixture of personal and public goals. (Full disclosure: The synthesis of realist and idealist models proposed here was implicit but not so clearly stated in the author's previous renderings of the cybernetic model.) Needless to say, this model also accommodates a range of alternative decision-making processes, from autocratic fiats to head-to-head (zero-sum) competition among various contestants to "negotiated" decisions, democratic "voting" processes or even entirely self-organized voluntary processes (see below).

The relevance of the cybernetic model can perhaps be illustrated with another diagram (Figure 2). It involves an adaptation of Powers's original, generic model to serve as a model specifically for the government of a modern nation-state.

((insert Figure 2 here))

Figure 2. A cybernetic model of a modern political system

In the cybernetic paradigm, the struggle for power – or "dominance competition" in the argot of ethology – is relevant and may (or may not) affect the Darwinian fitness of the participants, but this aspect is subsidiary to the role of politics qua cybernetics in the operation of any social system. Equally important, power struggles are a subsidiary aspect of the explanation for *why* such systems evolve in the first place. Social goals (goals that require the cooperation of two or more actors) and the anticipated or realized functional outcomes are the primary drivers.

Another advantage of this definition is that it enables us to view human politics as one variant among the array of functionally analogous (and sometimes even homologous) cybernetic regulatory processes that are found in all other socially organized species – from bacterial colonies to army ants and wolf packs – and in all known human societies, including by inference our group-living proto-hominid ancestors of more than 5 million years ago (see below). Though there are great differences among these species, and among human societies, in how political/cybernetic processes are organized and maintained, both the similarities and the differences are illuminating. They are variations on a common theme.

Thus, a cybernetic definition of politics is grounded in a biological – and functional – perspective and is related, ultimately, to the biological problem of survival and reproduction in, and for, organized societies. Politics in these terms can be viewed as an evolved phenomenon that has played a significant functional role in the evolutionary process; political evolution has been inextricably linked to the synergies that have inspired the "progressive" evolution of complex social systems – in nature and human societies alike. Not only is the cybernetic model compatible with both realist and idealist models (and the modern ethological model) but it fully conforms with Aristotle's (and Plato's) enduring vision.

3. Theories of Politics

3.1 Human (and Animal) Nature in Politics

Many of the most famous theories of politics over the past 2000 plus years were derived from rather simplistic (and often one-sided) assumptions about the basic propensities of human nature. We noted earlier how the "realist" model was/is based on the claim that egoism and the pursuit of naked self-interest has energized and shaped the evolution of politics. The most extreme rendering of this viewpoint was encapsulated in Hobbes's image of the "state of nature" (i.e., without the constraining influence of "leviathan") as a war of every man against every man.[2] (In fact, recent research in behavioral economics, evolutionary psychology and other fields has challenged this model. Human nature is far more complex. See Note 3 below.)

The other extreme view of human nature was perhaps most boldly articulated in the writings of one of the other great social contract theorists, Jean Jacques Rousseau. Rousseau's publications, especially the *Discours sur l'inégalité* (1915[1754]) and *Du Contrat Social* (1984[1762]), were grounded in his deeply-rooted conviction that man is innately good. In the state of nature, Rousseau claimed, humankind enjoyed a natural morality and lived the idyllic life of a "noble savage." Humans are also innately social and are "completed" by their social relationships. Hence, society is fundamentally social rather than contractual in nature; it originated in the state of nature.

Accordingly, society is prior to civil government, and the state should serve only to further what he called the "general will" (*volonté générale*) — the good of the community. For Rousseau, it is the corrupting influence of civilization, and especially the unbridled pursuit of selfish material interests, that has turned us into the calculating, rapacious egoists described by Hobbes. The insatiable lust for property that civilization induces has perverted us and led to the enslavement of

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2. For the record: Though Machiavelli is often lumped together with Hobbes, his views were actually more complex. As political scientist George H. Sabine (1961) pointed out many years ago, there are really two Machiavelli's, or rather two sides to his political theory. Most famous are his writings in the *Prince*, which were concerned with how a ruler must cope with a corrupt, anarchic and perhaps revolutionary society. The other side, articulated in other writings, had to do with how to govern a stable society. There Machiavelli borrowed ideas from Aristotle, the Roman theorists Polybius and Cicero, and others.

the masses of humankind. In sharp contrast with Locke, Rousseau concluded that all rights, including property rights, exist only within the community; they have no prior claim. "The right which each individual has to his own estate is always subordinate to the right which the community has over all." Rousseau passionately believed in human freedom, but the dark side of his vision, as many critics have pointed out, is that, in elevating the will of the community — the collective good — into a superordinate claim to power, it could be used as a justification for authoritarian, or even totalitarian regimes (and Robespierre, Lenin, Mao and Hitler, among others, did just that).

By contrast, Plato and Aristotle – notwithstanding the "idealist" label that some opponents have pinned on them – occupied a middle-ground between the extreme individualist and radical collectivist visions of human nature and politics. As noted above, Plato and Aristotle recognized that an organized society is based on a division (combination) of labor and various forms of collective action to satisfy human needs

and wants. It represents a network of cybernetic systems, from families to factories, markets and perhaps multiple layers of government. Aristotle's famous observation, in the *Metaphysics* (Book H, 1045:8-10), says it all: "The whole is something over and above its parts, and not just the sum of them all." To reiterate, a society can be characterized as a "collective survival enterprise" – an interdependent "superorganism" that produces mutually beneficial synergies; it is organized to provide for our basic survival and reproductive needs. (For an in-depth discussion of "basic needs" as an empirically-grounded concept, along with an explication of the "Survival Indicators" project, see Corning, 2000.)

However, Plato and Aristotle were also well aware of the fact that there is an inherent tension between the "public interest" and the sometimes destructive self-interests of various individuals and factions. Societies are not, unfortunately, self-equilibrating. (This is precisely why the concept of social justice played such an important part in their political thought.) Accordingly, there is no "standard model" to which all governments conform. In practice, Plato and Aristotle argued, governments can range from a highly exploitative tyranny to a top-heavy oligarchy, mixed democracy or anarchic mob rule. Needless to say, this profoundly important distinction among different types of government – and their political biases – has been overwhelmingly confirmed in the past 2000 years of political history. (The research on politics in primates, especially the Great Apes, documented by de Waal and many other primatologists, also provides supporting evidence.)

3.2 Neo-Darwinism, Sociobiology and Political Theory

A word is also in order about the influence on political theory of Neo-Darwinism and sociobiology (and lately evolutionary psychology). The Neo-Darwinian approach to social behavior is based on a radically individualist model – epitomized by Richard Dawkins's (1989[1976]) "selfish gene" metaphor. The core assumption is that the individual organism is the basic unit of survival and reproduction (genetic "self-interest" is the driver), and that cooperation and sociality are constrained to be consistent with the reproductive interests of the participants. Thus, Neo-Darwinism is a spiritual cousin of Hobbes and Locke (and of the neo-classical economists).
However, as originally formulated, Neo-Darwinism (and sociobiology) seemed to offer little in the way of a theoretical basis for social life. In his seminal papers on "The Genetical Evolution of Social Behavior," biologist William D. Hamilton (1964a,b), identified only three possible categories of social behavior: (1) altruism, (2) exploitative (zero-sum) selfishness, and (3) spite. Only later did he add "reciprocity". Accordingly, Hamilton initially equated social cooperation with altruism, which made it appear to be a very problematic phenomenon.

Hamilton's truncated formulation was seconded by E.O. Wilson in his discipline defining volume *Sociobiology: The New Synthesis* (1975), where he identified altruism as "the central theoretical problem of sociobiology" (p. 3). The implication, which guided much of the early theory and research in sociobiology, was that cooperative behaviors are a theoretical "problem" that can be overcome only under exceptional circumstances. Since the differential selection of altruistic groups was considered to be highly improbable – in the wake of George Williams's (1966) widely-accepted critique of "group selection" theory – this left mainly Hamilton's model of "inclusive fitness" (or what biologist John

Maynard Smith called "kin selection") to account for social behavior in the natural world.

The basic idea, which actually traces back to Darwin's concept of "family selection," is that altruism (sociality) might be a viable option if an individual's genetic self-sacrifices were offset by gains to close kin that shared many or most of their genes in common. Early on, the only other theoretical "window" for social behavior was biologist Robert Trivers's (1971) concept of "reciprocal altruism" – which, on close scrutiny, was not really altruism but a mutually advantageous reciprocity with a delayed repayment schedule. (For a more in-depth analysis of this issue, see Corning, 1983, 1997, 2003.)

Political scientist Gary R. Johnson (1992) relied on this constricted theoretical framework in advancing a sociobiological explanation for the origin of human polities. Politics, in Johnson's view, is derived from reproductive competition (shades of Tiger and Fox). Moreover, its role in furthering cooperative efforts was seen by him as secondary, as a causal explanation for government, to the containment of individual conflicts (shades of Hobbes). Johnson also adopted the sociobiological assumption that there are only three grounds for social organization, all of them rooted in individual reproductive interests, namely, altruism (or nepotism toward closely-related individuals), reciprocity, and exploitation. Nepotistic "kin selection," he concluded, was the "primary force" responsible for the emergence of societies, and political systems, among evolving humans.

As we shall see, kin selection/inclusive fitness (that is, reproductive self-interest) may very well have facilitated some of the earliest steps in hominid social evolution (as Darwin himself supposed). However, kin selection is neither a *sufficient* explanation nor is it even necessary as a precondition for cooperation, and it certainly cannot be called a "force". Reproductive self-interest is universal in nature and always imposes a constraint on social behavior. So the question is, why have some species exploited various modes of cooperative behavior while others have not? In many species, in fact, close kin do not cooperate at all. Conversely, there are a great many cases of cooperation in nature that do not involve closely related individuals (see Corning, 1996b 1997, 2003 and the references therein). Also, there are many species that engage in symbiotic partnerships with altogether different species, in total disregard for their biological relatedness. For that matter, kinship is often irrelevant in human cooperation. Thus, something more than kinship is required to explain social life.

Part of the answer to this paradox derives from the growing realization, backed by a large body of research, that cooperation is not equivalent to altruism (there can be egoistic cooperation as well as altruistic cooperation) and therefore does not depend on genetic relatedness. In fact, much of the cooperation in the natural world is based on reciprocities and win-win mutualism (again, see Corning, 1996b, 1997, 2003). Cooperation can more fruitfully be viewed in economic terms – in terms of the costs and benefits – rather than in terms of the genetic relationships (or lack thereof).

One source of support for this proposition comes from the rapidly expanding literature in game theory. First introduced into evolutionary biology by John Maynard Smith (1982a, 1984), game theoretical models of cooperation are distinctive in being totally indifferent to the genetic relationships among the "players". The key to cooperation in game theory models, in fact, is the synergy – the "economic" gains

that are assigned to the payoff matrices, though various measures may also be required to prevent "defection", or cheating. Thus, in the famous "tit-for-tat" (or iterative) model of Robert Axelrod and William D. Hamilton (1981), only 1 point each was allowed for mutual defection, whereas asymmetrical cooperation yielded 5 points for the defector and none for the cooperator, and mutual cooperation yielded six points, evenly divided. Since defectors would be penalized by mutual defection in the next round, after two rounds the mutual cooperators would out-gain a defector.

Likewise, in the model developed by Martin Novak and Karl Sigmund (1993), called "Pavlov", the players could in effect punish cheaters by excluding them from future rounds in the game. As it turns out, Pavlov (and similar models developed since) conform well with the reality in nature. It is now recognized that "policing" of cooperation and punishment of cheaters is common, and that cooperation is not so constrained by the threat of cheating as early game theory models implied (see especially Boyd and Richerson, 1992; Clutton-Brock and Parker, 1995; S.A. Frank, 1995, 1996; and the analyses in Michod, 1996, 1999).

Another major source of support for the economic model of cooperation comes from the realization that some of the most important forms of collaboration in nature involve interactions that produce combined effects (synergies) that are self-policing because they are interdependent. This is frequently the case in symbiotic partnerships, where each participant contributes different capabilities or resources, and in species (like humans) that depend on a division/combination of labor.

Maynard Smith and Szathmáry (1995) have suggested a useful metaphor to illustrate this distinction. Suppose that two oarsmen decide to cooperate in rowing a small boat across a river. In one alternative configuration, a "sculling" arrangement, the oarsmen each have two oars and row in tandem. In this situation, it is possible for one oarsman to slack off (to cheat) and let the other one do most of the work. This represents the classical game theory relationship. Now imagine instead a "rowing" arrangement. In this configuration, each oarsman has only one opposing oar, and their relationship to the performance of the boat is interdependent. If one of the oarsmen slacks off, the boat will go in circles and will not reach its goal.

Thus, functional interdependence may have the effect of making a cooperative relationship self-policing. Maynard Smith and Szathmáry (1995, p. 261) conclude that the rowing model is a better representation of how cooperation (and complexity) evolves in nature than are game theory models of arms-length exchanges. "The intellectual fascination of the Prisoner's Dilemma game may have led us to overestimate its evolutionary importance." (We will return to this crucial point below.)

Closely related to this is the fact that existing game theory models exclude one of the most common forms of cooperation in animal and human societies alike, namely, "teamwork" that produces what I call "corporate goods." In the corporate goods model (which can include any number of players), the participants may contribute in many different ways to a joint product (say the capture of a large game animal or the manufacture and sale of an automobile). However, unlike "collective goods" that are indivisible and must be equally shared (even possibly with non-participants and cheaters), corporate

goods can be divided in accordance with various principles, or "rules" or "contracts". The division of the spoils is thus not preordained, as is the case with the payoffs in game theory models; the payoff matrix can be manipulated. Indeed, the question of how the goods are divided up may be crucially important in determining if the "game" will be played at all. If this sounds familiar, even commonplace, it is because corporate goods "games" are, in fact, ubiquitous in human societies. Yet, surprisingly enough, this phenomenon has not been treated systematically either in sociobiology (evolutionary psychology) or in game theory, to my knowledge.

Some other problems with the conventional game theory paradigm – and Neo-Darwinism – should also be noted. For instance, there are many cases in nature where the alternative to a win-win cooperative effort is not zero (the lowest possible value in a game theory payoff matrix) but death. If you were a small animal faced with the prospect of confronting a large predator, cooperative defense might be the only logical choice. Cheating would be self-defeating. Another problem is that game theory models have not as a rule dealt with multiple interests, where cooperation in one area – say mutual grooming – may also affect cooperation in other areas, like hunting, meat sharing, coalition-building or mutual defense. Nor does game theory capture the sometimes complex interplay between the costs and benefits associated with various choices, or "strategies."

A further problem, inherent in the game theory paradigm and in Neo-Darwinism generally, is that it is particularly insensitive to synergies of scale – the many cases where collective action produces combined effects that would not otherwise be possible. Biologist Lee Dugatkin (1999) cites an example (based on some research by Susan Foster) involving the collective behavior of the wrasse, a tropical reef fish that preys on the abundant supply of eggs produced by the much larger Sergeant-major damselfish. Because female damselfish aggressively defend their nests, no single wrasse, nor even a small group, can overwhelm the damselfish's defenses. However, very large groups can do so and are rewarded with a gourmet meal of damselfish caviar. Since success in raiding a damselfish's nest can only be achieved by a large group of wrasse acting in concert, it is an unambiguous example of a synergy of scale. Dugatkin calls this "byproduct mutualism" (an incidental byproduct of individual actions), but this is a misnomer. If an animal will only engage in a dangerous activity (like mobbing a predator) in concert with other animals and will reliably choose flight when it is alone, such collective behaviors are not simply statistical artifacts.

One other mode of cooperation in the natural world should also be mentioned, namely "reciprocity". One well-studied example of this behavior is called "indirect reciprocity." It involves a class of cooperative actions that do not seem to have any relationship at all to reproductive fitness. For instance, helping behaviors among unrelated individuals – say meerkat "baby sitters" or the "helpers at the nest" in various bird species – appear to be an evolutionary puzzle. What do the helpers gain from this? Some years ago, biologist Richard Alexander (1987) developed the concept of "indirect reciprocity" as a possible explanation. Alexander's argument was that, in a stable, ongoing network of cooperators, a donor might ultimately receive a fair return "indirectly" for some helping behavior if it later became the recipient of some other member's generosity. It amounted to a formalization of the old expression "what goes around comes around."

Much more thought and analysis has been devoted to this phenomenon in recent years, and the consensus seems to be that indirect reciprocity may well be a factor in sustaining socially-organized species, independently of kinship (see especially Boyd and Richerson, 1989; Mumme et al.,1989; Mesterton-Gibbons and Dugatkin, 1992; Nowak and Sigmund, 1998a,b; Gintis, 2000a,b; Clutton-Brock et al., 2001; Clutton-Brock 2002). Significantly, this phenomenon seems to occur under the conditions that, most likely, also characterized the evolution of the human species (see below).

Also important is the work by Gintis (2000a,b), Fehr and Gächter (2000a,b, 2002), Sethi and Somanathan (2001), Fehr et al. (2002) and others on "strong reciprocity" as a cooperation-enhancing mechanism. As the term implies, strong reciprocity is cooperation that is egoistic, not altruistic, and is therefore dependent on an equitable distribution of the benefits (a.k.a., corporate goods), as well as aggressive punishment to prevent cheating or defection. Closely related to this is the expanding body of work on "fairness" as a facilitator of cooperation in humankind (see especially Corning, 2002c; also see Rabin (1993), Fehr and Gächter (2000a,b, 2002), Fehr and Schmidt (1999), Henrich and Boyd (2001), Henrich et al. (2001), Price et al. (2002). Also important is the work by Robert Boyd, Peter Richerson (2002) and others on the role of group-serving norms in securing cooperation.[3]

Finally, the recent revival of group selection theory should be mentioned because, among other things, this phenomenon is particularly relevant to the explanation of human evolution and the evolution of human political systems (again, see below). Very briefly, the widespread taboo against group selection theory was largely due to the theoretical misperception described above. If social cooperation is presumed to require altruism, then it would seem improbable that cooperating (read altruistic) groups composed of non-kin could be favored by natural selection. However, if much (perhaps most) of the cooperation in nature involves reciprocity or mutualism – where all the participants are likely to benefit – the theoretical obstacle to group selection dissolves. Biologist David Sloan Wilson, who has been most closely associated with the resurrection of group selection theory in recent years, likes to call it "trait group" selection (see especially D.S. Wilson, 1975, 1980, 1999; Wilson and Sober, 1989, 1994; Sober and Wilson, 1998). Maynard Smith (1982b) developed a similar model, which he called "synergistic selection." I refer to it as "Holistic Darwinism" (Corning, 1997, 2003, in press), because it implies that selection can act on wholes that have irreducible functional properties; these wholes are not only greater than the sum of their parts but their "wholeness" may be the difference that makes a difference (to use anthropologist Gregory Bateson's mantra) to natural selection.

We can illustrate the idea of group selection with a variation on the "sculling" and "rowing" models described earlier. Recall that in the sculling model, one of the two tandem oarsmen could "defect" (cheat) without undermining the attainment of their joint objective. Of course, this is a hypothetical situation. In the real world of small boating, a high wind, or a strong current, or a distant goal might demand the combined efforts of both oarsmen. But now imagine a very different situation, where the boat is in a race against another boat. Now if the two oarsmen want to win the race they will most likely have to make an all-out effort. It has become a group selection game, and the fate of the two oarsmen is totally interdependent, even if they are rowing in tandem.

As an aside, it might be pointed out that Dawkins himself acknowledged the role of group selection in one of the less-frequently quoted passages of *The Selfish Gene* (1989[1976]). The genes are not really free and independent agents, he explained. "They collaborate and interact in inextricably complex ways...Building a leg is a multi-gene, cooperative enterprise" (p.39). To underscore the point, Dawkins himself employed a metaphor from rowing. "One oarsman on his own cannot win the Oxford and Cambridge boat race. He needs eight colleagues...Rowing the boat is a cooperative venture" (p.40). Furthermore: "One of the qualities of a good oarsman is

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3. The scientific evidence that a norm of fairness and reciprocity is a universal aspect of human nature can fairly be called robust and continues to grow. Indeed, fairness is a day-in, day-out issue in any society. (It is found in virtually every society, and the few pathological exceptions seem to prove the rule.) There is also a large experimental literature on this phenomenon in psychology, game theory and experimental economics. Most noteworthy, perhaps, are the so-called "ultimatum games," an experimental paradigm which has been used (repeatedly) to demonstrate that people are willing to share with others in ways that do not reflect their own "rational" self-interest but reflect instead a sense of fairness. Equally important, it appears that people are far more willing to invest in policing fairness and punishing deviants than classical economic theory predicts. There are even some rudimentary examples of a sense of fairness in other species — the most conspicuous being sharing behaviors and reciprocity. To be sure, we also have a tendency to rationalize fairness away when it suits our interests. And, in the real world, power (and greed) often trumps fairness.

teamwork, the ability to fit in and cooperate with the rest of the crew" (p.41). In other words, a group selection game creates a "public interest."

3.3 The Synergism Hypothesis

The liberation of sociobiology and evolutionary psychology – not to mention social theory in general – from the constraints of inclusive fitness theory have created a climate in which the Synergism Hypothesis – a causal theory of socio-political evolution that is focused on the "bioeconomics" of the process (the "phenotype") rather than the genes – can now flourish. (Although this theory was first proposed in 1983, the theoretical climate was not then propitious.)

The Synergism Hypothesis is based on a fundamental characteristic of the material world, namely, that things in various combinations, sometimes with others of like kind and sometimes with very different kinds of things, have been a prodigious wellspring of evolutionary novelties. Moreover, these novel "cooperative effects" have over the past 3.5 billion years or so produced at every level of life distinct, irreducible "higher levels" of causation and action whose constituent "parts" have been extravagantly favored by natural selection. Indeed, in many instances these "wholes" have themselves become parts of yet another new level of combined effects as synergy begat more synergy.

The formal hypothesis is that synergistic effects of various kinds have been a major causal agency and a key source of creativity in biological evolution (see Corning 1983, 1998, 2003, in press). The Synergism Hypothesis posits that it was the functional (selective) advantages associated with various forms of synergy that have undergirded the evolution of complex, functionally organized biological and social systems. In other words, underlying each of the many particular steps in the "complexification" process,

a common functional principle has been at work.

Evolutionists often speak metaphorically about natural selection (as did Darwin himself) as if it were an active selecting agency, or literally a mechanism. Thus, Edward O. Wilson (1975: 67) assures us that "natural selection is the agent that molds virtually all of the characters of species." Ernst Mayr (1976: 365) tells us that "natural selection does its best to favor the production of programs guaranteeing behavior that increases fitness." And George Gaylord Simpson (1967: 219) asserted that "the mechanism of adaptation is natural selection." The problem is that natural selection does not do anything; nothing is ever actively selected (though sexual selection and predator-prey interactions are possible exceptions). Natural selection refers to whatever factors are responsible in a given context for causing the differential survival and reproduction of genes, or genic "interaction systems" (in Sewall Wright's term), or genomes, or phenotypes, or populations, or species. It is the functional effects produced by various "units" of selection that matter. Indeed, evolutionary causation is actually iterative; it also runs backwards from our conventional notion of cause and effect. In evolution, functional effects are also causes.

Evolutionists have traditionally tended to focus their research efforts on a particular factor, or "selection pressure," or on the functional properties of a "gene." This has proven to be a useful heuristic device, but in fact the dynamics of evolutionary causation are always interactional and relational, and iterative. To cite a textbook example, genetically-based differences between the light, "cryptic" strain of the peppered moth *(Biston betularia)* and the darker melanic strain (*carbonaria*) played a role in the documented change in their relative frequencies in the English countryside during the Industrial Revolution. But the color differences between these strains became significant only because industrial soot progressively blackened the lichen-encrusted tree trunks that were the moths' favored resting places. Moreover, this change in background coloration was significant only because the moths were subject to avian predators that used a visual detection system--as opposed, say, to the sonar systems used by bats (Kettlewell, 1955, 1973). In other words, the "mechanism" that was responsible for this micro-evolutionary change was the relationship between genetically-determined traits, the background coloration of the trees, the behavior of the moths, and the nature of their predators.

Accordingly, any factor that precipitates a change in functional relationships – that is, in the viability and reproductive potential of an organism or the pattern of organism-environment interactions – represents a potential cause of evolutionary change. It could be a functionally significant gene mutation, a chromosomal rearrangement, a change in the physical environment, or, most significant for our purpose here, a change in behavior. In fact, a sequence of changes may ripple through an entire pattern of relationships: a climate change might alter the ecology, which might induce a behavioral shift to a new environment, which might lead to changes in nutritional habits, which might precipitate changes in the interactions among different species, resulting, ultimately, in the selection of morphological changes. A well documented case in point is the long-term study in the Galápagos Islands of thirteen different species of birds, known as "Darwin's finches," that recently diverged from a common mainland ancestor (Grant 1986; Grant and Grant 1989, 2002).

What, then, are the sources of creativity in evolution? There are many different kinds, but the role of behavioral changes as a "pacemaker" of evolutionary change should be emphasized. To quote an authority on the subject, biologist Ernst Mayr (1960:373, 377-378):

> A shift to a new niche or adaptive zone requires, almost without exception, a change in behavior .... It is very often the new habit which sets up the selection pressure that shifts the mean of the curve of structural [and he might have added functional] variation .... With habitat selection playing a major role in the shift into new adaptive zones and with habitat selection being a behavioral phenomenon, the importance of behavior in initiating new evolutionary events is self-evident .... Changes of evolutionary significance are rarely, except on the cellular level, the direct result of mutation pressure.

However, this model also begs the question: What causes behavioral changes? While this is obviously a very complicated subject, one important underlying principle can be identified. In fact, behavioral changes often involve a proximate causal "mechanism"– the immediate rewards and "reinforcements" that psychologist E.L. Thorndike (1965 [1911]) associated with his famous Law of Effect, which forms the backbone of Behaviorist psychology. At the behavioral level, in other words, there is a *proximate* selective process at work that is analogous to natural selection. I call it Neo-Lamarckian Selection. Moreover, this "mechanism" is very frequently the initiating cause of the *ultimate* changes associated with natural selection (see Corning, 1983, 2003; also Plotkin, 1988; Bateson, 1988; cf., Skinner, 1981).

One example of this "mechanism" is the evolution of giraffes, which are frequently cited in elementary biology textbooks as an illustration of the distinction between Lamarckian and Darwinian evolution. Evolutionists like to point out that the long necks of modern giraffes are *not* the product of stretching behaviors that were somehow incorporated into the genes of their short-necked ancestors (as Lamarck supposed). Instead, natural selection favored longer-necked giraffes once they had adopted the "habit" of eating tree leaves. And that is the point. A change in the organism-environment relationship among ancestral giraffes, occasioned by the adoption of a novel behavior, precipitated a new "selection pressure" for morphological change. (So Lamarck was half right.) This example of adaptionist theorizing is supported by the fact that there happens to be a short-necked species of Giraffidae called the okapi (*Okapia Johnstoni*) in Africa that inhabit a very different environment from that of the prototypical giraffe (woodlands) and, as expected, employ a very different feeding strategy.

This is where the phenomenon of functional synergy fits into the picture. It is the immediate functional "payoffs" from synergistic innovations in specific environmental contexts that are the causes of the biological/behavioral/cultural changes that, in turn, have led to synergistic longer-term evolutionary changes in the direction of greater complexity, both biological and cultural/ technological.

Consider these two illustrations, one in bacteria and the other in a complex human society. Among the many examples of a division (combination) of labor found in nature, one of the most remarkable involves *Anabaena*, a colonial cyanobacterium which engages in both nitrogen-fixing and photosynthesis, a dual capability that gives it a significant functional advantage. However, these two functional processes

happen to be chemically incompatible; the oxygen produced by photosynthesis will inactivate the nitrogenase required for nitrogen-fixing. *Anabaena* has solved this problem by complexifying. When nitrogen is abundantly available in the environment, the cells are all uniform in character. However, when ambient nitrogen levels are low, specialized cells called heterocysts are developed which lack chlorophyll but are able to synthesize nitrogenase. The heterocysts are then connected to the primary photosynthesizing cells by filaments. Thus, a compartmentalization and specialization of functions exists which benefits the "whole" (Shapiro 1988).

The second illustration involves a well-known example from Adam Smith's *The Wealth of Nations* (1964[1776]). Smith drew a comparison between the transport of goods overland from London to Edinburgh in "broad-wheeled" wagons and the use of sailing ships between London and Leith, the seaport that serves Edinburgh. In six weeks, two men and eight horses could haul about four tons of goods to Edinburgh and back. In the same amount of time, a merchant ship with a crew of six or eight men could carry 200 tons to Leith, an amount that, in overland transport, would require 50 wagons, 100 men and 400 horses.

The advantages of shipborne commerce in this situation are obvious. Indeed, shipment over water has almost always been an economically advantageous form of long-distance transport, as many different societies have discovered. But the causal explanation for Smith's paradigmatic example is not so straightforward as it might appear. In part, it entailed a division of labor and the merging of an array of different human skills; in part it required the fairly sophisticated technology of late eighteenth century sailing vessels; it also required the capital needed to finance the construction of the ships; it required a government that permitted and encouraged private enterprise and shipborne commerce (including the protection afforded by the British navy); it also required a market economy and the medium of money; in addition, it required an unobtrusive environmental factor, namely, an ecological opportunity for waterborne commerce between two human settlements located (not coincidentally) near navigable waterways with suitable tidal currents and prevailing winds.

In other words, the causal matrix involved a synergistic configuration of factors that "worked together" to produce a favorable result. And the result -- which played an important role in the rise of the British Empire -- represented a significant step in the ongoing process of societal evolution. However, it should also be emphasized that, if any major ingredient were to be removed from the recipe, the result would not have occurred. If you were to take away, say, the important component technology of iron smelting, there would have been no ocean-going merchant ships. Thus synergistic causation is always configural, and relational, and interdependent; the outcomes are always co-determined. (The "Synergism Hypothesis" is discussed in much greater detail in Corning, 1983, 2003, in press.)

3.4 Explaining Political Evolution

How, then, do we account for the evolution of political systems, both historically and in the often puzzling contemporary cases? In *The Synergism Hypothesis* (Corning, 1983), a chapter was devoted to what was called an "Interactional Paradigm" (which was really a synthesis of various interdisciplinary

paradigms that have been put forward over the past few decades). Here I can only provide a sketch of that causal framework. In brief, the pattern of causation in something as complex and variegated as the evolution of human societies requires a framework that is multidisciplinary, multi-leveled, "configural" (or relational), functional, and cybernetic. It involves geophysical factors, biological and ecological factors, an array of biologically-based human needs and many derivative psychological and cultural influences, as well as organized economic activities, technology (broadly defined) and, of course, political processes, all of which interact with one another in a "path-dependent," cumulative historical "flux" (see Figure 3).

((insert Figure 3 here))

Figure 3. The Interactional Paradigm

This framework compels us to focus explicitly on the many *co-determining* factors that, in each case, interact synergistically, rather than trying to single out some monolithic causal variable that is ultimately destined to fall short. Also, it requires a recognition that the process of political evolution is always situation-specific, even when there may be invariances and recurrent patterns of covariance within the total configuration of factors. (The development of the new fields of "evolutionary economics" and "bioeconomics" over the past decade or so have introduced a similar perspective into economic theory.)

Some of these variables are obvious to political scientists. They involve the staples of conventional political analyses. But other variables are not always appreciated, or may even be treated as a given. One case in point is fresh water resources, which have played a key role (necessary but not sufficient) in co-determining both the locations and the rise and decline of various civilizations – not to mention the conflicts between them. Thus, recent research has indicated that a major climate change most likely precipitated the sudden collapse of the Akkadian empire in ancient Mesopotamia about 2200 BC, and possibly the disappearance of some other early civilizations as well (Weiss et al., 1993; Weiss, 1996, 2000; Weiss and Bradley, 2001). I refer to this phenomenon as "synergy minus one."

Two examples will perhaps suffice to illustrate the synergistic nature of such evolutionary changes, and the integral role of politics. The rise of the Zulu nation in the nineteenth century provides an instructive example of the interplay of among environmental, technological and political factors. (My sources are Gluckman, 1940, 1969; and Morris, 1965). Until the early 1800s, the people of mainly Bantu origin that inhabited what came to be known as Zululand (part of the modern South African province of Kwa-Zulu Natal), were a disorderly patchwork of cattle-herding and minimally horticultural clans that frequently made war on one another. The most common *casus belli* were disputes over cattle, grazing lands and water rights, but the ensuing combat was usually brief. For the most part it entailed prearranged pitched battles at a respectable distance between small groups of warriors armed with assegai (a lightweight, six-foot throwing spear) and oval cowhide shields. Injuries and fatalities were usually few.

However, the Bantu were hemmed in geographically, and, as the human and cattle populations increased over time, they began to experience increased crowding. Anthropologist Robert Carneiro (1970) calls it "environmental circumscription." This led to a corresponding increase in the frequency and intensity of

warfare among the clans until a radical discontinuity occurred in 1816, when a 29-year-old warrior named Shaka took over the leadership of the Zulu clan. Shaka immediately set about transforming the pattern of Bantu warfare by introducing a new military technology involving disciplined phalanxes of shield-bearing troops armed with short hooking and jabbing spears designed for combat at close quarters.

Shaka's innovation was as great a revolution in that environment as were the introduction of the stirrup, or gunpowder, or tanks into European warfare. After ruthlessly training his ragtag army of some 350 men, Shaka set out on a pattern of conquests and forced alliances that quickly became a juggernaut. Within three years Shaka had forged a nation of more than a quarter of a million people, with a formidable and fanatically disciplined army of about 20,000 warriors who were motivated in part by Shaka's decree that they were not allowed to marry until they were blooded in battle. Shaka's domain had also increased from about 100 square miles to 11,500 square miles. There was not a tribe in all of black Africa that could oppose the new Zulu kingdom, and soon Shaka began to expand his nation beyond the Bantu peoples' traditional boundaries.

The further evolution and ultimate downfall of the Zulu nation at the hands of the Europeans in the latter part of the century is another chapter (but with a similar theme). What is significant here is the profound structural and functional changes – changes involving the superposition of an integrated political system – that occurred among the Zulu by virtue of decisive political entrepreneurship stimulated by population pressures and coupled with synergistic changes in military techniques and organization. Again, the causal process was configural and interactional, with cybernetic control processes being an integral part of the synergies that resulted.

The second example comes from some elegant fieldwork many years ago by the anthropologist Charles B. Drucker (1978) among an isolated Philippine population called the Igorot. The Igorot occupy a remote mountainous area of Luzon, where for centuries they have practiced irrigated rice cultivation within an awe-inspiring system of earthwork terraces, dams and canals that were laboriously carved with simple tools out of the precipitous mountainsides. It was once thought that these massive structures, characterized by early explorers as the "eighth wonder of the world," were thousands of years old and had taken thousands of years to build. But in fact they are much more recent – the product of a heroic response to the Spanish conquest and their seizure of the choicest lowland and coastal areas in the sixteenth century, which produced a wave-like flight of the resident natives into the mountains. The Igorot people had traditionally practiced a low-intensity, seasonally shifting form of cultivation called "slash-and-burn" (or swiddening), but the sudden increase in the population density, and the demand for food, in the more mountainous areas prompted a radical change in the Igorot's food production technology.

The introduction of a rice terrace farming system is only part of the story, however. The remarkable sustained yields achieved by the Igorot's rice paddies also depend on the constant replenishment of soil nutrients, especially nitrogen. Yet the environmental sources of nitrogen in this area are totally inadequate. The solution, and one key to the Igorot's successful adaptation, is the presence in the ponds

of a nitrogen-fixing blue-green algae that lives in a symbiotic relationship with the rice plants. Respiration from the root structures of the plants generates the carbon dioxide that the algae need for photosynthesis and nitrogen fixing. At the same time, the leaves of the plants shade the rice terrace mud, where the algae live, keeping temperatures cool enough for the algae to thrive. The supply of nitrogen in turn stimulates the growth of the rice plants. The result is extremely high productivity coupled with great ecological stability. For the past several centuries the Igorot have been able to grow almost enough staple food on a single hectare (2.47 acres) to feed a family of five.

But there is one more critical element in the Igorot system. The ancestral Igorot lived in isolated family groups that were well-adapted to a shifting, small-scale plant cultivation strategy, but the adoption of the rice terrace technology required these families to coalesce into a large, integrated organization. Sustained cooperative efforts were necessary, first to design and build this remarkable agricultural system and then to utilize it, maintain it, and expand it over the course of time. Indeed, without constant weeding and repairs the system would rapidly deteriorate. Accordingly, the Igorot had to invent a social and political system to coordinate in a disciplined manner the activities of the many individual family groups. The result is that the Igorot today have a political system that would be unrecognizable to their pre-Hispanic ancestors. It represents an interwoven set of ecological, technological, social and political elements – a synergistic system. How do we know it's synergistic? Just remove a single element – say the blue-green algae – and observe the consequences.

3.5 Explaining Political "Devolution"

Indeed, a major challenge for any theory of political evolution is that it must be able to account not only for "progressive" complexification but also for "regressive" changes, for the episodic decline (devolution) of political systems. Some climate-related examples were noted above, and climate changes are also implicated in the dissolution of the Mayan civilization and Teotihuacán. Other examples of devolution include the Easter Islanders, where the decisive factors were (apparently) the exhaustion of their wood supply and soil depletion. For the Ik in Africa it was a drought that apparently did them in. For the Moriori of the Chatham Islands (in the pacific) it was a genocidal foreign invasion. For the Aboriginal Australians, the South African San people, the Mississippian chiefdoms and many other Native American civilizations, it was imported disease epidemics.

In short, if synergy refers to the combined effects produced by wholes, the removal of even a single major part (synergy minus one) should have a negative effect on the performance of the whole and may even be fatal. And if political cum cybernetic control systems arise to facilitate the operation of complex, synergistic systems at all levels of social organization, then the fate of the political system is necessarily tied to the functional viability – the economic well-being (in a broad sense) – of the system and its parts.

To be sure, the term devolution can be defined in a number of different ways. On the one hand, it could refer only to reduced economic complexity. Or it could mean the complete collapse, dissolution or physical extinction of a population. Similarly, it could refer either to a voluntary disaggregation or to an externally-imposed, or coerced change. In light of the definition of politics proposed above, the focus

here will be limited to the cybernetic processes – the systems of communications and control among various individuals, groups, and populations.

To be specific, if the "progressive" evolution of political complexity is associated here with the emergence of decision-making, communications and control processes designed to mobilize people and resources for one or more collective purposes, then the converse involves a decline or collapse of a cybernetic (political) system and its capabilities. In these terms, political devolution can be either voluntary or coerced. Likewise, it can involve only a limited functional decline or it can be accompanied by the physical disappearance of a population. But, in any case, the hypothesis is that both the development and the dismemberment of any political (cybernetic) system is ultimately determined by the underlying "economic" situation – its integral (and necessary) relationship to the production of various functional synergies.

Many forms of political devolution in these terms involve the termination of a system that was intended to be only temporary, narrowly focused and ephemeral. The research literature on primates and social carnivores provides many examples: for instance, coalitions of lions, hyenas, or chimpanzees that coordinate individual efforts for the purpose of joint predation, or for collective defense against another group, or to compete with other males for mating privileges, or even to contain and resist a dominant animal. In these cases, devolution occurs when the job is done.

Likewise, the ethnographic research literature concerning human societies provides many examples of ephemeral political systems. One of the most famous involves the Great Basin Shoshone of the American southwest. Until very recently, the native Americans who inhabited this dry, harsh environment survived mainly by foraging in small family groups for various plant foods -- nuts, seeds, tubers, roots, berries and the like. Occasionally, however, these families would gather into larger groups numbering 75 or more when there were opportunities for a large-scale rabbit (or antelope) hunt under the leadership of a “rabbit boss.” These “joint ventures” involved highly coordinated efforts with huge nets, rather like tennis nets only hundreds of feet long, that were used to encircle and capture large concentrations of prey. Nevertheless, when the hunt was completed and the prey were consumed, the family groups would disperse once again (Steward, 1938, 1963; Johnson and Earle,1987).

In a similar vein, the native Americans of the Northern Great Plains were legendary for their massive summer encampments. Dozens of small foraging bands, each with 50 members or less, would congregate into tribes numbering in the thousands once each year under a tribal council and a “chief”, who was responsible for organizing and directing various tribal activities, especially the annual buffalo hunt (Carneiro, 1967).

There are also a great many examples of ephemeral political systems in contemporary human societies. When the basketball game is over, the team-members will go home for the night. When the show is over, the actors will disperse. And when the collective response to a local disaster has achieved its immediate objectives, the ad hoc political system that arose to coordinate the efforts of various agencies (fire, police, repair services, housing, food distribution, volunteers, etc.) will be disbanded. Such temporary

systems have been studied in depth by political scientist Louise Comfort (1994a,b, 1998).

Similarly, in the business world there are innumerable joint ventures and partnerships between different firms that are short-term and single-purpose, while many others are multi-faceted and enduring. Some are highly successful, while others are abject failures that are quickly abandoned. In either case, devolution is a common occurrence in the private sector as well. The downsizing of many 1960s "conglomerates" during the 1980s provides one obvious example. By the same token, there have been innumerable military alliances between bands, tribes, chiefdomships and states (in the anthropologists' terminology) over the past few millennia that have lasted only so long as there was a common enemy to be resisted – or attacked.

However, the most significant cases of political devolution involve the systems that are associated with the overarching "collective survival enterprise" – i.e., a human population that is more or less permanently engaged in the joint procurement or protection of the requisites for meeting their basic survival needs. For example, how can we account for the collapse of the Soviet empire, which, as political scientist Kenneth Jowitt points out, "was not supposed to happen?" Or, for that matter, how can we account for the recent "Balkanization" of the Balkans? There is, needless to say, a long tradition of scholarship on the political devolution of human societies, from Edward Gibbon's *Decline and Fall of the Roman Empire* to the writings of Oswald Spengler, Arnold Toynbee, Herbert Simon, various systems theorists, catastrophe theorists, chaos theorists and, of course, many modern-day environmentalists (the Club of Rome and the "Limits to Growth" theorists come to mind).

Especially important, however, are the data and case-studies on political devolution in anthropology, archaeology and ancient history. Over the past several millennia, a great many societies have downsized, disaggregated or disappeared. Some were defeated on the battlefield and were put to the torch. Others disappeared mysteriously. Still others seem to have been burdened by a complicated nexus of destructive factors -- a negative synergy. By the same token, in some cases the society's central places were completely depopulated while in other cases the population continued to grow in succeeding centuries, albeit under new management. The list of relevant case-studies includes, among many others, the Mayans, the Incas, the Aztecs, the Olmec, Teotihuacán, the Anastazi, the Hohokam, the Sumerians, the Babylonians, the Akkadians, the Hittites, the Minoans, Mohenjo-Daro, the Easter Islanders, the Moriori, the Tasmanians, the Maasai, the Hawiian and Zulu kingdoms, Han China, Carthage and, of course, Rome.

Indeed, Rome provides the classic example of an involuntary decline that was influenced by many complex, interacting factors. To modify the ancient saying, Rome was neither built nor destroyed in a day. The sack of Rome by Alaric in 410 A.D., and its ignominious aftermath, culminated several centuries of progressive decline involving a complex nexus of ecological, economic, social and political factors. No doubt this is one reason why the fall of Rome is a source of endless fascination – and endless scholarship. Rome provides a relatively well-documented example of a multi-factored, "dysergistic" process, but it is not unique. (For a more detailed analysis of Rome's rise and decline, incorporating recent scholarship and new insights, see Corning, 2003.)

A more benign example of political devolution – theoretically significant because it exemplifies the many temporary systems that are created to meet a defined, short-term goal and then later dissolved – can be found in, of all places, the United States of America. Although the image of "Big Government" and the election campaign rhetoric about the federal government as a "bloated bureaucracy" has been a recurring theme in American politics over the past two decades, the reality is quite different if one contrasts the size and scope of the government, and the level and intensity of cybernetic control over the population, in 1944 (at the height of World War Two) and in 1994, fifty years later.

The conversion of the United States from a depression-plagued peacetime economy with a very small military (350,000 in 1939) to a huge war machine (the "Arsenal of Democracy"), with 11.4 million uniformed military personnel and 3.3 million civilian employees, is well documented. And this does not count the many millions of Americans who became involved in war production work (17 million new jobs were created during the war, a 34 percent increase in the labor force), or the 10 million organized civilian volunteers of various kinds. In short, the war produced a radical economic, political and military transformation, a national mobilization (cybernation) at every level of society, and the degree of regimentation and control exerted over the population and the economy were totally unprecedented in the U.S., before or since. To be sure, this massive undertaking succeeded only because the population was united against two formidable enemies and (by and large) willingly accepted the sacrifices and constraints that were imposed. Nevertheless, the changes were radical and convulsive. (For more details, see Corning, 2002b.)

Even before the war was over, the U.S. government began planning for "reconversion" to a peacetime economy. A special concern was how to meet the pent up demand for consumer goods, from automobiles to washing machines, without causing runaway inflation. (Despite the high level of wartime taxes, liquid assets waiting to be spent had increased from $50 billion in 1941 to $140 billion in 1944.) So industries that were expected to experience a rapid surge in demand after the war were given a priority in shifting out of war production work. In this and many other areas, the government deliberately planned for a demobilization and downsizing (and a devolution of the federal government's role) that was not only successful but, despite the Cold War that followed, never reverted to anything approximating the broad scope and pervasive power that was exercised during World War Two.

Fifty years after the war ended, the statistics tell the story. Federal employment in 1994, including the military, amounted to 1.53 percent of the total U.S. population, versus 10.7 percent during the war. In fact, the absolute number of civilian and military personnel combined in 1994 represented less than one-third the number in 1944. Despite the contrary perceptions of most Americans, federal employment as a share of the total population was only one-half a percentage point higher than in 1939. Likewise, total federal government outlays as a percentage of GDP amounted to 21.1%, less than half the 1944 percentage (or 46.8%) and roughly equivalent to the percentage in 1939 after subtracting transfer payments for Social Security, welfare and the like, plus interest on the national debt (again, see Corning, 2002b).

The conclusion seems well-justified. The “reconversion” that occurred in the U.S. after World War Two fulfilled the theoretical expectation that political devolution can be the result either of success or failure. By the same token, it can either be voluntary or coerced. From a functional, synergy perspective, this duality is not at all paradoxical. In this case, it was a direct consequence of the disappearance of the underlying functional need, which was clearly survival-related. No other theory that we are aware of can reconcile this seeming paradox.

4 The Evolution of Political Systems

4.1 Animal Politics

Much insight into the evolution of political systems in humankind can be gained from observing cybernetic social processes at work in other species. There are many illuminating examples. One of the most impressive involves the social insect *Eciton burchelli*, a species of army ants found in Central and South America (see E.O. Wilson, 1975; Hölldobler and Wilson, 1990, 1994). These creatures form highly organized colonies of about 500,000 members, with four distinct "castes" that divide up the responsibilities for colony defense, foraging, transport, nest-making and care of the brood. The big "submajors" (or porters), for instance, team up to carry sometimes very large prey which, if split up into pieces, would be more than each individual submajor could carry alone.

The army ants' highly coordinated foraging system is also legendary. In a single day, a raiding party of up to 200,000 workers -- armed with potent stingers and marching in a dense phalanx -- might reap some 30,000 prey items, many of which are then split up and hauled back to the nest for all to share. Because they forage en masse, army ants can also collectively subdue much larger prey than would otherwise be possible -- even lizards, snakes and nestling birds. It's an impressive example of a synergy of scale.

Perhaps the most remarkable form of synergy in army ants though, involves the way the colony builds its nests. The workers form the nest out of many thousands of their own interlinked bodies. Not only are these living nests quick and efficient to construct but, most impressive, they are able to maintain a constant internal nest temperature that varies by no more than $\pm 1^{o}$ Celsius. (These nests are also ideally suited for a tropical species that must frequently relocate its home base when the local food supply is exhausted.) Although a full understanding of the decision-making, communications and control processes in army ants still eludes us, it appears to be a self-organized, even “democratic” process based on distributed control rather than being a centralized control process. Aggregations of chemical signals in threshold-breaking concentrations seem to play an important role in mobilizing army ant behaviors.

Another example of a superorganism in nature is found in naked-mole rats (*Heterocephalus glaber*). The mole-rat is an African rodent species that lives in large underground colonies (usually numbering 75-80 but sometimes over 200). They subsist by eating plant roots and succulent tubers. Affectionately dubbed "sabre-toothed sausages" because they are hairless and have two outsize front teeth used for digging, the naked mole-rats represent a particularly significant model of a division/combination of labor

in mammals. In fact, these odd-looking animals utilize specialized worker "castes" and a pattern of breeding restrictions that is highly suggestive of the social insects.

Typically (but not always), the breeding is done by a single "queen", with other reproductively suppressed females waiting in the wings. The smallest of the non-breeders, both males and females, engage cooperatively in tunnel-digging, tunnel-cleaning and nest-making, as well as transporting the colony's pups, foraging for food and hauling the booty back to strategic locations within the colony's extensive tunnel system. (One investigator, Robert A. Brett, found a mole-rat "city" in Kenya that totalled about two miles of underground tunnels and occupied an area equivalent to 20 football fields.) Biologist Paul Sherman (Sherman et al.,1991,1992), and the group of researchers who have studied these animals extensively, wrote the following description of the mole-rats' tunnel-building activities:

> The animals line up head-to-tail behind an individual who is gnawing [with it's outsized, powerful front teeth] on the earth at the end of a developing tunnel. Once a pile of soil has accumulated behind the digger, the next mole-rat in line begins transporting it through the tunnel system, often by sweeping it backward with its hind feet. Colony mates stand on tiptoe and allow the earthmover to pass underneath them; then, in turn, they each take their place at the head of the line. When the earthmover finally arrives at a surface opening, it sweeps its load to a large colony mate that has stationed itself there. This "volcanoer" [so-named because its actions appear to an observer outside to produce miniature volcano eruptions] ejects the dirt in a fine spray with powerful kicks of its hind feet, while the smaller worker rejoins the living conveyor belt (Sherman et al.,1992, p.78).

The vital and dangerous role of defense in a mole-rat colony is also allocated to the largest colony members, who respond to intruders like predatory snakes by trying to kill or bury them and/or by sealing off the tunnel system to protect the colony. The mole-rat "militia" will also mobilize for defense against intruders from other colonies.

The students of animal behavior find many analogies between the naked mole-rats and eusocial insects like the army ants and honey bees. But in their politics and government, the mole-rats are more convergent with other social mammals, like chimpanzees or humans. As is the case with many other socially-organized species, naked mole-rats exhibit a combination of self-organized cooperation (volunteerism) and social controls that are enforced by various coercive measures (policing).

The cybernetic control role of the breeding queen is of central importance. The queen is usually the largest animal in the colony (size determines the dominance hierarchy), and she aggressively patrols, prods, shoves and vocally harangues the other animals to perform their appointed tasks. Indeed, it has been observed that her aggressiveness varies with the relative urgency of the tasks at hand. In addition, the queen acts to suppress breeding and reproduction on the part of the other females, who are always ready to take over that role. (Occasionally other females are allowed to share the breeding function with the queen; why this is so is not known.) The mole-rat queen also intervenes frequently in the low-level competition that goes on among colony members over such things as nesting sites and the exploitation of

food sources. And when the reigning queen dies, there is a sometimes bloody contest among the remaining females to determine her successor.

All of this control activity is facilitated by an elaborate communication system (and information sharing) that includes 17 distinct categories of vocalizations — alarms, recruitment calls, defensive alerts, aggressive threats, breeding signals, etc. In fact, the mole-rats' communication system rivals that of some primate species in its sophistication.

A famous example of a self-organized, ephemeral political system in baboons is also noteworthy. It involved the development of cooperative hunting behavior in a troop of olive baboons (known as the "Pumphouse Gang"). In the course of studying a group of 49 baboons on a huge ranch near Nairobi, Kenya, over a period of several years, Shirley Strum, Richard Harding and several other co-workers observed the emergence and spread of a new "cultural" pattern (Harding, 1973 Strum, 1975a,b; Harding and Strum, 1976). At first it was confined to a few adult males that opportunistically pursued and captured newborn antelopes or hares. It was a solitary activity and there was no food sharing. But over the course of time the pattern changed. The amount of predation increased; females and juveniles began to participate; food sharing became more commonplace; hunting skills and efficiencies improved; most important, the troop began to evolve systematic searches and coordinated attacks. In sum, it was the synergies (the proximate rewards) that drove the behavioral changes, not genetic mutations or natural selection, and it was not a hierarchically-organized activity controlled by a single dominant animal. It was a voluntary coalition. Indeed, the new behavior was eventually abandoned. It is not clear why.

A final example involves a unique symbiotic partnership between two different species that requires systematic behavioral coordination. The African honey guide is a highly unusual bird with a peculiar taste for beeswax, a substance that is more difficult to digest even than cellulose. In order to obtain beeswax, however, the honey guide must first locate a hive then attract the attention of a co-conspirator, such as the African badger (or ratel). The reason is that the ratel has the ability to attack and dismember the hive, after which it will reward itself by eating the honey while leaving the wax behind for the honeyguides. However, this unusual example of co-operative predation by two very different species depends upon a third co-conspirator. It happens that the honey guides cannot digest beeswax. They are aided by a symbiotic gut bacterium which produces an enzyme that can break down wax molecules. So this improbable but synergistic feeding relationship is really triangular (Bonner 1988).

What makes this example of a cross-species partnership particularly apropos is the fact that the honey guides also form symbiotic partnerships with humans, the nomadic Boran people of northern Kenya. Biologists Hussein Isack and Hans-Ulrich Reyer (1989) conducted a systematic study of this behavior pattern some years ago and found that Boran honey hunting groups were approximately three times as efficient at finding bees' nests when they were guided by the birds. They required an average of 3.2 hours to locate the nest compared with 8.9 hours when they were unassisted. The benefit to the honey guides was even greater. An estimated 96% of the bee hives that were discovered during the study would not have been accessible to the birds had the humans not used tools to pry them open. The honey guide-human partnership is also aided by two-way communications — vocalizations that serve as signals.

4.2 The Evolution of the "Political Animal" (A Synopsis)

A major challenge for the Synergism Hypothesis as a theory of political evolution is the growing body of evidence regarding the evolution of humankind. Since this issue is addressed in some detail in Corning (1983, 2001b, 2003), here I will be brief. The underlying thesis, first articulated in *The Synergism Hypothesis* (1983), is that there was no prime mover in human evolution. Rather, the process was propelled by proximate behavioral innovations and choices; the common thread was various forms of functional synergy with significant "payoffs" for the immediate problems of survival and reproduction, in accordance with the model described above.

In the truest sense, the evolution of humankind involved an entrepreneurial process — a pattern of behavioral invention, trial-and-error learning, "selective retention" and the subsequent natural selection of supportive anatomical changes. Humankind in effect invented itself. Moreover, much of our ancestors' inventiveness was focused on new forms of synergy; synergy played a key role in this evolutionary change. It generated potential bioeconomic benefits/payoffs of various kinds — new synergies of scale, combinations of labor, functional complementarities, cost- and risk-sharing, tool and technology symbioses, and more. (My sources here include the full-length textbook treatments by paleoanthropologists Bernard Campbell, 1985, Richard Klein, 1999, and Milford Wolpoff, 1999a, plus the other sources cited below.)

4.2.1 The Rise of the Australopithecines

Three distinct "transitions" can be seen in the 5-6 million-year process of human evolution. The first, and perhaps most momentous, involved the shift from an arboreal lifestyle to terrestrial living. Most likely this did not happen all at once. For one thing, it involved substantial costs and risks. As foraging ranges expanded, so did the time and energy required to exploit them, and the early Australopithecines were imperfect bipeds — competent but not as efficient as later *Homo erectus/Homo ergaster*. More important, the exploitation of a mosaic environment introduced serious new risks from predators and competitor species, not to mention rival proto-hominid groups. Some theories of human evolution have downplayed these threats, but it was in fact a major challenge, with life and death consequences. (See especially Anderson, 1986; Cheney and Wrangham, 1987; Dunbar, 1988; van Schaik, 1989; Cowlishaw, 1994; Iwamoto et al., 1996; Wrangham, 2001.) There is substantial evidence for the proposition that our remote ancestors were subject to serious "predation pressure" (Brain, 1981, 1985; Foley, 1995; Isbell, 1995; Lee-Thorp et al., 2000.)

Accordingly, the question is: How did a diminutive ape with constrained mobility on the ground and no natural defensive weapons solve the problem of shifting to a terrestrial habitat, broadening its resource base and, over time, greatly expanding its range? (By three million years ago, Australopithecines had spread through much of Africa.) Political organization — the creation of superorganisms — was very likely a key factor. In a patchy but abundant environment that was also replete with predators, competitor species and sometimes hostile groups of conspecifics, group foraging and collective

defense/offense was the most cost-effective strategy. There were immediate payoffs (synergies) for collective action that did not have to await the plodding pace of natural selection. Indeed, the odds of survival were greatly enhanced. It is also likely that the earliest of these proto-hominid pioneers stayed close to the safety of the trees. However, as they began to venture further from their safe havens, the risks increased commensurately. (A number of other theorists over the years have endorsed the group-defense model, including George Schaller, Alexander Kortlandt, John Pfeiffer, Richard Alexander, Richard Wrangham and others.)

There may very well have been group selection involved in this process, but it was not based on altruism. It involved "collective goods." Nor did it require a "cooperative gene." It required only a degree of intelligence about means and ends, and costs and benefits. Moreover, because these superorganisms were most likely formed around a nucleus of closely-related males (an unusual pattern among the primates), individual selection, kin selection and group selection would have been aligned and mutually reinforcing — just as Darwin had originally proposed in *The Descent of Man* (1874). Indeed, only 6% of the 167 primate species studied to date have male-based groups, and this may have been one of the keys to the emergence of the hominid adaptive pattern (Wrangham, 1987; Lee, 1994).

Why would the males defend the females and infants? For one thing, the males might not have known their paternity if the females followed a reproductive strategy of promiscuous matings and, perhaps, disguised ovulation (as bonobos evidently do). Another factor was that all of the infants would have been closely-related — "nephews", "cousins", or even younger siblings. A third point is that, in an extremely "K-selected" species with a very long reproductive cycle and a short life span, each offspring was relatively more valuable. Finally, in a tightly organized, interdependent group it was not significantly more costly to defend the offspring of close kin than it was to defend one's own progeny, and oneself; it was not a matter of altruism, or reciprocal altruism but of teamwork in a win-win (or lose-lose) situation — a synergy of scale. One appropriate analogue, as many other theorists have noted, is the organization of savanna baboon troops. (See especially Cowlishaw, 1994, and other references cited therein. For a general review of primate social patterns, see Pusey, 2001.)

Was there also a division/combination of labor? Contemporary hunter-gatherer societies, not to mention most modern societies, typically have a division of labor along sexual lines, and it is possible that a rudimentary version of this pattern existed also among the early Australopithecines. It seems likely that the females would have been primarily responsible for carrying the infants and shepherding the juveniles, while the males served as the primary (though not necessarily exclusive) guardians for the group. We may never know for certain about this and many other details relating to human evolution, but group living/group foraging and a cooperative division of labor allowing for increased access to a more dangerous but abundant terrestrial environment is likely to have been primordial in the hominid line. It would have involved the most limited, incremental behavioral changes with the most cost-effective payoffs for the participants; it was highly synergistic. Moreover, as time went on the group-living mode of adaptation led to other forms of social cooperation and more elaborate political organization.

One other innovation may also have played a crucially important role in the transition of our ancestors

from arboreal to terrestrial apes, namely a synergistic "soft technology" of wood and bone implements, and perhaps thrown objects as well. There have been many tool-use advocates over the years, from Darwin to Dart, Szalay, Washburn, Birdsell, Coursey and Mann (Wolpoff, 1999a). Tool-use can have a revolutionary effect. It can be the functional equivalent of opening up a new ecological niche, or a whole new adaptive mode. Sources of food that would otherwise be unattainable can suddenly become a reliable, even abundant part of an animal's diet. Also, the payoffs are immediate; they need not await the workings of natural selection. (See also the discussions in Lewin, 1993, and Kingdon, 1993.)

It seems unlikely that the early Australopithecines could have adapted successfully to a terrestrial life-style and survived, even prospered, for perhaps three million years without the acquisition and skilled use of various natural objects such as digging sticks, hammers, carriers and the like. Indeed, chimpanzees, elephants, capuchin monkeys and many other species are frequent users of tools for procuring food, and sometimes in conflict situations as well.

By the same token, it seems likely that "weapons" also played an indispensable part in the successful transition to a terrestrial life-style. One can hardly exaggerate the value to a diminutive, relatively slow-moving biped, lacking the baboon's outsized canine teeth, of being able to use a short stick (similar to the modern billy club) or a large femur, or even a well-aimed rock, as a defensive weapon (as Darwin himself argued in *The Descent of Man*). A group of Australopithecines traveling together in dangerous or unfamiliar country with digging tools/weapons carried at the ready would have been far more likely to hold their own in any life-and-death situation. These creatures may not always have been subject to predation, but even one incident in a lifetime would have been one too many.

This is not to say that the influence of individual competition, status rivalries, internal social conflicts, etc., somehow magically disappeared. Then as now it is likely that there was a sometimes precarious interplay between competition and cooperation, between various individual self-interests and the interests of the group. As noted earlier, a dynamic tension between individual and group interests is also a common phenomenon in other social mammals, just as it is in modern humankind (see especially de Waal, 1996).

The key to Australopithecine sociality lay in the relative costs and benefits to each individual for cooperation or non-cooperation. Why should the males, even if they are closely related, cooperate with one another? And why should the females help one another if they are unrelated and perhaps rivals for social status and the attentions of the males? Reciprocity and reciprocal altruism may help to explain it. But the benefits associated with being included in the group — and the high cost of ostracism — may also have been a major factor. The social group was a vitally important survival unit (it produced corporate goods that were measured in terms of life and death), which each individual had a stake in preserving and enhancing.

In other words, the "public interest" was rooted in the group's potential for generating collective synergies. For instance, a larger group was more likely — all other things being equal — to benefit from synergies of scale in confrontations with predators or competitors (not to mention potential prey). These

collective synergies provided an overarching incentive for containing conflict and enhancing cooperation — and punishing cheaters and free-riders.

4.2.2 Enter Homo Erectus

The same principle of corporate synergy (and policing to maintain it) may well have contributed to the next major transition in human evolution. In the scenario described above, systematic group hunting was evidently not a part of the picture. The current consensus seems to be that the Australopithecines may have opportunistically scavenged meat and hunted easily-captured small prey as components of a diversified food quest (see especially the review in Stanford, 1999). No doubt seasonal fluctuations and the specific opportunities and constraints in different habitats played a role. However, there are also indications that major behavioral changes began to occur about 2.5 million years ago. A recently discovered 2.4-million-year-old species, *Australopithecus garhi* (or an as yet unidentified contemporary) at Gona, in Ethiopia, was already adept at transporting flaked stone tools over some distance and using them for chopping, cutting, smashing bones and perhaps skinning both antelopes and wild horses (Asfaw et al., 1999).

The importance of these "crude" Oldowan tools (so-named because they were first discovered at the Olduvai Gorge by Louis Leakey, father of Richard) can hardy be overstated. It really amounted to a technological revolution, because it enabled our ancestors to become systematic hunters (and scavengers) and to exploit the teeming herds of large animals that populated the open grassland areas in East Africa, and beyond. Once stone tools were deployed, moreover, the carcasses of these animals provided "raw materials" — horns, bones, skin and sinew — for many other uses as well. Just as digging sticks and hand-held weapons may have played a key role in the success of the early Australopithecines, the invention of stone tools vaulted our ancestors into a new ecological niche. Equally significant, this adaptive revolution evidently predated the emergence of *Homo erectus/Homo ergaster* by several hundred thousand years. In other words, synergistic behavioral changes — including technological innovations — preceded and supported the major anatomical developments that are reflected in the fossil record much later on.

The most plausible explanation for the transition from Australopithecines to *Homo erectus/Homo ergaster*, I (and others) believe, is that a major behavioral shift occurred, and that this shift was the "pacemaker" for succeeding anatomical changes (see Wood and Collard, 1999; Wrangham, 2001). In the half million years after stone tools became a standard part of their tool-kit, our hominid ancestors joined the ranks of "top carnivores" and learned how to hold their own in confrontations with other carnivore competitors — not to mention potential predators. This conclusion is not original, of course (see, for example, Washburn and Lancaster, 1968; Shipman and Walker, 1989, Wrangham and Peterson, 1996; Stanford, 1999; Wolpoff, 1999a). But I would add that it is also the most parsimonious explanation for the anatomical changes that occurred.

Other scenarios are also possible, of course, but the group hunting/scavenging/foraging plus food sharing/provisioning scenario seems most consistent with other evidence — tooth wear patterns, tool use

patterns and the anatomical changes that are found in *H. erectus/H. ergaster*. Over the course of time there were also progressive improvements in tool-making skills (as reflected in the Developed Oldowan and Acheulean traditions), plus more selective use of raw materials, more complete "processing" of animal carcasses and evidence of more specialized tools for different uses, such as wood working, skinning, and plant food processing.

The package of behavioral synergies that undergirded the anatomical development of *Homo erectus/ergaster* in turn provided a foundation for many other improvements that followed. Among other things, this pattern allowed for the elaboration of the group – the superorganism – as a unit of collective adaptation, with greater social and political organization, more coordination of activities and especially a division (combination) of labor. One important example was the adoption of consistently-occupied "home bases" or encampments. This led to a significant improvement in economic efficiency for the group as a whole, because it allowed for a more elaborate combination of labor. Resources as needed — meat, plant foods, stone tool "cores", animal skins, water, firewood, etc., — could be carried to a safe haven and then shared and utilized through a network of reciprocities. (For a primate model, see Kortlandt, 1992.)

Another important technological innovation, often underrated these days perhaps because it is "old news" and a veritable cliché about human evolution, was the adoption and controlled use of fire. "Revolutionary" is by no means too strong a word to use for the consequences of this multipurpose invention. Moreover, fire may have begun to play a major part in our evolution at a much earlier date than has traditionally been assumed. The so-called Karari sites analyzed by anthropologist Randy Bellomo (1994) suggest that hearths were used by hominids at least 1.6 million years ago (see also B. Campbell, 1985). However, Richard Wrangham and his colleagues (1999) (also Wrangham, 2001) believe there are fossil “signals” that go back to 1.9 million years ago.

Eventually, fire came to have many other valuable uses as well — defending against predators, chasing competitors away from carcasses, tenderizing meat, killing harmful bacteria, breaking down toxic chemicals in the many plant foods that could not be eaten raw, hardening wooden tools, drying skins, deterring insects, providing warmth (especially in colder, temperate climates), and even facilitating long-distance signaling and communications. Indeed, Wrangham (2001) postulates that the adoption of cooking was a key to the emergence of *Homo erectus/ergaster*, because it vastly expanded our ancestors’ nutritional repertoire and necessitated home bases.

However, the invention of more efficient food-procurement technologies was only half the story. "Culture" — the accumulated know-how and experience of the group — also became an increasingly important part of the hominid behavioral package. Larger cooperating superorganisms were able to exploit many new opportunities for social synergy, including the sharing of costs and risks, pooling information, a more elaborate combination of labor and, not least, many synergies of scale against competitors, predators, and prey. Likewise, mutual aid, or "succorant behaviors," could increase the odds of surviving an injury or illness, and the joint policing of "free riders" and cheats could serve to reduce internal conflicts (again, see de Waal, 1996). Anthropologist Christopher Boehm (1996, 1997)

has also stressed that political processes, such as group decision-making, can even become a factor in between-group selection. Recent research on culture in other primates, most notably chimpanzees (Whiten et al., 1999) and orangutans (van Schaik et al. 2003) suggests that the roots of human cultures may trace back 14 million years.

The fossil record also suggests that, beginning with *Homo erectus/ergaster*, culture became cumulative and an increasingly potent adaptive tool; new ideas and inventions were not only preserved and communicated to subsequent generations but were refined and improved upon over time. Boesch and Tomasello (1998) call it a "ratchet effect." The group as a whole became a transgenerational repository of adaptive information and an engine for the invention of more synergies. Spears, for example, came to be made of better raw materials; they were more finely shaped and balanced; their tips were fire-hardened; barbed tips were added to increase their penetrating and holding power; wooden spear throwers were invented as a way to increase their range, striking force and accuracy; finally, bows and arrows were invented as a lightweight alternative that could increase the hunter's range and precision, and (not least) multiply the hunter's supply of "ammunition". Each of these inventions represented a major economic advance. More food could be acquired more dependably with less time, effort and collective risk. However, effective political organization was an essential concomitant.

4.2.3 The Emergence of Homo Sapiens

The last major transition in hominid evolution, the emergence of anatomically (and culturally) modern *Homo sapiens*, perhaps 100-150,000 years ago, is currently a focal point of controversy. The self-flattering image of humankind as the product of a saltatory leap of some kind seems irresistible (e.g., Pfeiffer, 1977; Wills, 1993, 1998; Diamond, 1997; Tattersall, 1998, 2002; Klein, 1999, 2000). However, the final "sprint" to humankind was preceded by a long period of progressive cultural and anatomical changes throughout the Middle Pleistocene (from about 750,000 to 250,000 years ago) and beyond (reviewed in Wolpoff, 1999a). The trend to modernity was already well along when the final Rubicon was crossed, and there are currently two major alternative theories regarding this transition.

One is the so-called multi-regional model (see Wolpoff, 1984, 1999a,b; Wolpoff et al., 2001), which postulates that the emergence of humankind was a world-wide process "with populations connected by gene flow and the exchange of ideas and technologies that spread across the inhabited world..." (Wolpoff et al., 2001:293). The other model is based on the much-publicized "Out-of-Africa" hypothesis. An increasingly compelling body of genetic evidence — mitochondrial DNA and Y chromosome data in particular — indicate that all modern humans trace their lineages back to a very small population in East Africa about 100-150,000 years ago. The data also suggest that this founding population grew larger over time and began to migrate out of Africa, starting about 50,000 years ago, or perhaps earlier. In other words, various genetic "markers" indicate that there was an "epicenter" for the final lap to humanity and that modern humans effectively replaced all of the other hominids in various parts of the world in short order, including (needless to say) the Neanderthals in Europe and the Middle East. (See especially Cann, et al., 1987; Cavalli-Sforza, et al., 1988, 1994; Stoneking, 1993; Hammer, 1995; Nei, 1995; Pääbo, 1995; Relethford 1995; Klein 1999, 2000; Jin et al., 1999; Su et al., 1999;

Ehrlich, 2000; Semino et al., 2000)

There are problems with both of these scenarios, however. Briefly, the multi-regional scenario requires an implausible flow of genes and cultural information over huge distances and diverse populations, while the Out-of-Africa scenario is based on genetic indicators that bear no direct relationship to any known anatomical differences. (A more detailed critique can be found in Ehrlich, 2000; also Corning 2003.) On the other hand, there are data that support both hypotheses. Accordingly, I would propose a third alternative. It is possible that the migrants from Africa had some "slight advantage" (to use a Darwinian expression) which, nevertheless, made a great difference in terms of the "balance of power" between competing populations. In other words, the modern human "revolution" — the explosive growth and world-wide spread of humankind — was a culturally-driven process that utilized new forms of social synergy and political organization (a more potent superorganism).

A number of theorists — Luca and Francesco Cavalli-Sforza (1995), Jared Diamond (1997), Ian Tattersall (1998), Christopher Wills (1998), Richard Klein (1999, 2000), Paul Ehrlich (2000) and others — hold that the perfection of human language and the emergence of a more advanced technology were major factors in the modern human diaspora. It is significant that the timing of the African exodus — if true — coincided with the flowering and spread of the Aurignacian industry, which encompassed a range of technological improvements. Needless to say, a more advanced cultural "package" would have provided an important economic advantage — namely, the means to support a rapidly-growing population in diverse habitats. However, the Aurignacian technology may also have given our East African ancestors a major "military" advantage. It seems likely that the great human diaspora of 50,000 years ago was not a peaceful trek into virgin territory but a more hostile invasion of already occupied lands; the human wave was often (perhaps not always) accompanied by coercion and warfare. This is not a new theory (see the reviews in van der Dennen, 1995, 1999), but it deserves a new look.

I hasten to add that we are not talking here about wars of conquest or imperialism in the modern sense; the terminal Pleistocene humans were not necessarily more "warlike" in temperament, or seeking dominion for its own sake. More likely, the process was driven by a pressing need for resources to support a growing, mobile population in a changing environment. (The last major ice age began about 75,000 years ago, intensified about 33,000 years ago and peaked about 20,000 years ago.) Call it the "resource acquisition" model of warfare — and of human evolution.
This scenario is discussed in more detail in Corning (2001b, 2003).

To summarize the argument, potent new forms of cultural (and political) synergy with immediate functional benefits may have been responsible for the spread of modern humankind out of Africa and around the world. Coercion is very likely to have played a major part in this dynamic, but it would be wrong to treat warfare as a prime-mover. The ability to make war was itself the product of a synergistic package of capabilities. More important, armed conflict is, after all, an instrumentality for attaining various ends; it is not an end in itself. The odds of violence are almost always influenced by a more or less explicit calculus of costs and benefits — and risks. A shorthand slogan for this calculus is, again, the "balance of power" (or more to the point, an "imbalance of power"). But this venerable concept implies

a many-faceted analytical process, not a narrow statistical exercise.

In sum, human evolution, a process that may have taken six million years and is still ongoing, included three distinct transitions — three "great leaps forward" in the current formulation. The first and in many ways the most important transition involved our ancestors' shift from an arboreal to a terrestrial mode of adaptation. This momentous change, I have argued, was accomplished by a synergistic behavioral "package" that included socio-cultural and political synergies and a crucially important tool/weapon symbiosis.

The second transition, which entailed a dramatic "hominization" — a suite of major anatomical developments — was the result of synergistic new pattern of social behaviors, including potent new tools, systematic hunting and, quite likely, the exploitation of fire, the adoption of home bases, the invention of a more elaborate division/combination of labor and, not least, more elaborate political organization.

Finally, the world-wide diaspora that resulted in the replacement of archaic *Homo sapiens* and Neanderthals by modern humans about 50,000 years ago was also a synergistic, cultural and political phenomenon, as larger groups with more advanced technology and organization overwhelmed other hominid populations, not to mention many other "megafauna", in a world-wide spasm of extinctions. In each of these major transitions, moreover, functional synergy and political/cybernetic processes played an important part.

4.3 The Evolution of Complex Societies

4.3.1 Prime Mover Theories

The explosive rise of complex, technologically-sophisticated human societies since the Paleolithic has inspired many prime mover theories. (For more detailed reviews, see Corning 1983, 2003.) Herbert Spencer deserves credit for developing the first full-blown modern theory. In his monumental, multi-volume "Synthetic Philosophy," an outpouring of works that spanned nearly 40 years and influenced many other theorists of his era, Spencer formulated a "Universal Law of Evolution" that encompassed physics, biology, psychology, sociology and ethics. In effect, Spencer deduced society from energy by positing a sort of cosmic progression from energy (characterized as an external and universal "force") to matter, life, mind, society and, finally, complex civilizations. Spencer defined evolution as a process characterized by "a change from an indefinite, incoherent homogeneity to a definite, coherent heterogeneity through continuous differentiations [and integrations]" (1892[1852-1857]:10).

With regard to the evolution of humankind, Spencer (1852) argued, increasing complexity provides functional advantages, but the "proximate cause of progress" in human societies has been the pressure of population growth — the Malthusian dynamic. "It produced the original diffusion of the race. It compelled men to abandon predatory habits and take to agriculture. It led to the clearing of the earth's surface. It forced men into the social state; made social organization inevitable and has developed the social sentiments. It has stimulated men to progressive improvements in production, and to increased

skill and intelligence. It is daily pressing us into closer contact and more mutually-dependent relationships"

Although Spencer ultimately a became a pariah among many 20th century social scientists (an ideologically-tainted episode), he nevertheless inspired many subsequent prime mover theories. For instance, anthropologist Leslie White (1949, 1959), adopted the Spencerian notion that progress is closely associated with the ability to harness and control energy, developed what he called the "Basic Law of Evolution." In White's words,"culture advances as the amount of energy harnessed per capita per year increases, or as the efficiency or economy of the means of controlling energy is increased, or both."(1959:56). Calling himself a "cultural determinist," White claimed that culture evolves independently of our will: "We cannot control its course, but we can learn to predict it" (1949: 39; also pp. 330, 335).

Another modern-day prime mover theory invokes population growth, although Spencer's prior claim to that idea is generally not acknowledged. In the 1960s, anthropologist Esther Boserup (1965) proposed that population growth might have played a key role in the development of agriculture. Don Dumond (1965) focused on the relationship between population growth and cultural evolution in general. But it was Mark Nathan Cohen (1977), in a closely-reasoned book-length treatment, who adopted the most Spencerian posture. Calling population growth the "cause of human progress," he asserted that population pressure is an "inherent" and "continuous" causal agency in cultural evolution. "Rather than progressing, we have developed our technology as a means of approximating as closely as possible the old status quo in the face of ever-increasing numbers" (p. 285).

Unfortunately, this explanation is too simple. All species have the potential for exponential growth and all species ultimately have limits. Humans are not unique in this regard. Not only do human societies practice various means of birth control to limit population growth but various external factors, from wars to diseases, droughts and famines may impose severe population constraints (as Malthus pointed out). More important, human populations do not grow in a vacuum; they grow only in favored locations and at propitious times, when the wherewithal exists in the natural environment for their sustenance and growth. And this in turn has depended on a favorable environments and specific cultural "adaptations".

Social conflict — internal or external — is also frequently touted as the "engine" of cultural evolution, and there is certainly good reason to believe that violent confrontations between human groups have ancient roots (as noted earlier). But many theorists have claimed that warfare accounts for the evolution of "civilization" – from hunter gatherers to advanced nation-states. Darwin, Spencer and a host of Social Darwinists stressed social conflict to varying degrees, but some theorists have gone much further. They attribute cultural evolution to our supposed "aggressive and acquisitive instincts." Sir Arthur Keith, with his *A New Theory of Human Evolution* (1949), was probably the first and least-known theorist of this genre, while the writings of Konrad Lorenz (1966), Robert Ardrey (1966, 1976), and Robert Bigelow (1969), among others, caused something of a furor in the latter 1960s and 1970s. (Some, like Bigelow, stressed the complementary role of cooperation as well.)

The well-known biologist Richard Alexander (1979) took perhaps the strongest position on this issue. In his so-called "balance of power" scenario, Alexander sees the process of cultural evolution as being driven by competition between human groups, which in turn is an expression of inclusive fitness maximizing behavior. In other words, it is a form of reproductive competition by other means (a more militant version of Tiger and Fox). While various economic hypotheses are neither necessary nor sufficient explanations for large-scale societies, Alexander claimed, warfare *is* both necessary and sufficient. (Economist Paul Rubin, in *Darwinian Politics*, 2002, seems to be closely aligned with Alexander. He calls competition between groups the "main force" in human evolution. However, his views are not systematically developed. Indeed, Rubin also recognizes the important role of cooperation and economic development, albeit with a bias toward free market capitalism.)

The theory of cultural/political evolution proposed by anthropologist Robert Carneiro (1970) is more subtle (it relies on a functional argument rather than a presumed instinctual reproductive urge), but it too is monolithic. "Force, and not enlightened self-interest, is the mechanism by which political evolution has led, step by step, from autonomous villages to states." Though state-level political systems were invented independently several times, warfare was in every case the prime mover, Carneiro claimed. However, Carneiro's prime mover had a prime mover of its own. He argued that the "mechanism" of warfare is the result of an underlying dynamic that, as noted earlier, he called "environmental circumscription" — a context in which a population is ecologically constrained by mountains, deserts, limited resources, or even by other human populations. Once a growing, circumscribed population reaches its Malthusian limit, Carneiro reasoned, warfare and conquest become the only alternative to starvation. So Carneiro's theory is really a theory about a predictable reaction of human populations to population pressures.

It is clear that organized warfare has been a major source of synergy in the evolution of human societies. There are, for instance, the synergies of scale and threshold synergies associated with the relative number of combatants on each side. There are the human-tool synergies produced by the appalling number of technologies that humans have invented for killing one another. And there are the synergies that arise when there is a division (or combination) of labor — say the 5,000-person crew of a modern aircraft carrier. The evidence is overwhelming that warfare has played a significant role in shaping the course of recorded human history. For instance, a major study of this issue some years ago examined 21 cases of state development, ranging in time from 3000 B.C., to the nineteenth century A.D. It was found that coercive force was a factor in every case and that outright conquest was involved in about half of them (Corning 2001b).

But is warfare the necessary and sufficient cause of complex societies? If warfare involves grave and possibly fatal risks to the combatants, we need to probe more deeply into why wars occur. In fact, there is a vast research literature on this subject, spanning several academic disciplines, which supports at least one unambiguous conclusion. Warfare is itself a complex phenomenon with many potential causes and many different consequences. Wars cannot simply be treated as the expression of an instinctive urge or an uncontrollable external pressure. There are too many anomalies and too many exceptions for any monolithic theory to be acceptable. Why is it that some quite warlike societies — like the Yanomamö of Venezuela or the Dani of New Guinea — did not evolve into nation states? Why did some societies

achieve statehood and then subsequently collapse or even disappear? And why did the first pristine states appear during a very small slice of time in the broader epic of evolution, within a few thousand years of one another at most? Finally, there are the cases in which population pressures were relieved by increased trade or an intensification of subsistence technologies (again, see Corning 2001b). Indeed, there is evidence that, in many cases, political evolution preceded and perhaps precipitated warfare between societies, rather than the other way around (see especially Hackenberg, 1962; Brumfiel, 1976; R. Cohen, 1978a,b,c; also the discussion and references in Corning, 1983, p. 371).

Technology has also been a popular candidate for the role of prime mover in cultural evolution, and nobody would dispute the fact that technology has played a major role, with synergies that are very often quantifiable. For instance, a !Kung San hunter gatherer living in the African Kalihari desert in the 1960s extracted 9.6 calories of energy from the environment for every calorie expended, according to the classic study by anthropologist Richard Lee (1968). By contrast, an American of the 1960s returned 210 calories for every calorie invested. Since Americans worked twice as many hours as their Kalihari counterparts, they were able to secure 46 times as many calories per person.

Many other technological synergies have been documented by human ecologists (see especially Salisbury 1973). A native Amazonian using a steel axe can fell about five times as many trees in a given amount of time as could his ancestors using stone axes, and a chain saw adds literally hundreds of multiples to a lumberjack's bottom line. Similarly, a shotgun is at least two to three times more efficient at bagging game on the hoof than is a bow and arrow. A farmer with a horse and wooden moldboard plow could turn over about one acre per day. His modern-day counterparts, with specially bred work horses and steel plows, can do at least two acres, while a farmer with a tractor and modern farm machinery can plow 20 acres per day, and sometimes much more. (Other examples can be found in Corning 2003.)

However, there are problems associated with elevating technology to the status of the prime mover in cultural evolution. One is that technology is not a "force", or a "mechanism". It is not even confined to tools or machines. It is really an umbrella concept — a broad label that we use to identify the immense number of cultural techniques that we have devised for earning a living and reproducing ourselves. At bottom, the term refers to human activities involving the use of various "inventions"– behaviors, tools, objects, or even other organisms that have been appropriated, developed, or fabricated to serve human purposes. Some technologies are mainly a matter of deploying knowledge and skills. Thus, many agricultural practices — the use of dung as a fertilizer, crop rotation, interplanting, controlled watering regimes and much more — are very important technologies. Likewise, many of our common plant and animal food products are the result of countless generations of selective breeding (genetic engineering) for various desired properties — size, texture, color, nutritional content, disease resistance and the like. Similarly, domesticated animals are, in essence, some of humankind's oldest and most important technologies.

Many other human technologies involve the more or less skillful manipulation of objects in the environment. We have already note the role of fire, one of our earliest and still most vital technologies. The techniques required to gather, process and cook various plant foods played an important role in our

evolution. The use of pits, dead falls, cul de sacs and other stratagems for capturing game were also very likely among the early hominid food getting technologies. The diversion of water for irrigation purposes was a critically important step in the development of large-scale agriculture. So were dams, walls, fences, weirs and many other early cultural innovations. In other words, technology is not really some external agency; it is a synergistic relationship involving human knowledge, human skills and the manipulation of various external objects.

A second key point about technology is that it almost always requires organized cooperative (cybernetic) activities by humans — what Karl Marx called "relations of production." The Boeing Aircraft Corporation, for instance, as of 2001 had 42 major facilities, 200,000 employees and some 10,000 "suppliers" — many of them major corporations in their own right — that are scattered throughout North America and, indeed, the world. A Boeing 747 is the product of a vast cooperative effort. A third point is that every technology is embedded in a specific environment. It is enmeshed, so to speak, in the historical context; it is not a separate, autonomous agency but is always part of a larger economic and cultural system. More important, both the natural environment and the specific historical/cultural/political "venue" exert an important causal influence; they are co-determinants. (Recall the Igorot example cited above.)

Technological innovations have the following things in common: (1) they arise from human needs and human purposes in a specific historical context; (2) they utilize but also modify past cultural and technological attainments; (3) they are interdependent parts of a larger synergistic system; (4) they involve highly purposeful, goal-oriented development processes, as well as many progressive improvements over time; and (5) they are subject to a Neo-Lamarckian selection process; that is, the outcomes are ultimately epiphenomena — the combined result of many individual user choices among the available options. There is at least a tacit benefit-cost calculation associated with each individual decision, though many other cultural influences may also contribute. Yet, in the final analysis, it is the synergies that determine the "emergence" and diffusion of a new technology; it is the payoffs that "induce" the positive selection of each new innovation, in accordance with the backwards logic we talked about earlier. The wellspring of innovation in human societies is organized intelligence, but it is the functional effects — the synergies — that shape the selection process (pro or con).

The main problem with prime mover theories is that they don't work. They may highlight important influences but they are manifestly inadequate — perhaps necessary but certainly not sufficient — to explain cultural evolution. This is especially apparent when you begin to ask historical questions. Why did a particular "breakthrough" happen when and where it did? And why not at some other time or place? Nor can prime mover theories account for the manifest influence of other important "movers". But more important, societies do not change in some automatic way or follow a unilinear path. Often the path leads down hill; prime mover theories are at a loss to explain political devolution.

4.3.2 The Case for the Synergism Hypothesis

Accordingly, I believe the Synergism Hypothesis is also applicable to the ongoing process of cultural

evolution in complex societies. There is nothing predestined about this process, any more than there is a deterministic directionality in biological evolution. Moreover, each succeeding generation in effect reevaluates the technologies and socio-political institutions and practices that it inherits. A given technology/practice is sustained over time by a cultural analogue of what is known in population genetics as "stabilizing selection," just as various functional improvements over time are products of "directional selection" within and across each new generation of users. By the same token, the many cases in which an older technology/practice is supplanted could be likened to adverse selection in nature. In any case, it is always a synergistic process.

One example, among many, might serve to illustrate this point. Jared Diamond, in his landmark study, *Guns, Germs and Steel* (1997), takes up the forbidding challenge of accounting for the rise of large complex civilizations in humankind over the past 13,000 years or so – not simply the reasons why this trend occurred but also why it happened where and when it did, and why it did not happen elsewhere, or at some other time. A key aspect of Diamond's approach, one that directly contradicts some of the deepest metatheoretical assumptions of the social sciences, is that it is not possible to explain such fundamentally historical phenomena in terms of some deterministic (law-like) "mechanism." Context-dependent factors have played a crucial role in the process. Each major "breakthrough" in the evolution of complex human societies, as well as each "replication" of the process in some other geographic "venue", was the result of a site-specific nexus – a convergence of many "ultimate" and "proximate" factors (terms Diamond borrows from evolutionary biology but uses in a different sense). Diamond does not use the term synergy. He refers instead to a "package" of contributing factors. But the meaning is the same; each instantiation involved a combination of necessary and sufficient elements that worked together.

In the agricultural revolution, the development of food production and the creation of food surpluses was a key factor, Diamond argues, but this in turn depended upon many other factors. One important precursor was the prior emergence of anatomically modern humans, including our language skills and our sophisticated cultural resources, perhaps 100-150,000 years ago. Another factor was the decline and mass extinction of many of the large "megafauna" upon which evolving humans had come to depend, coupled with an increase in human population levels. This demand-supply imbalance created a growing pressure to find suitable supplements to the standard hunter-gatherer diet. The fortuitous co-location only in the Fertile Crescent of key "founder crops," especially emmer wheat (which could be domesticated with a single gene mutation), together with legumes and animal husbandry (which allowed for a balanced diet), meant that this was the most likely location for a "technological breakthrough" that could provide food for a large, sedentary, concentrated population. Equally vital, however, were such cultural inventions as fire, tools, food storage, draft animals, record-keeping and, not least, complex political systems.

As Richerson and Boyd (1999) have pointed out, synergy is not enough to account for our recent cultural evolution. Large-scale societies also require "workarounds" to compensate for the lack of the face-to-face social influences that facilitate cooperation and constrain anti-social behaviors in small groups. (On this point, see especially Boehm, 1993, 1997, 1999; de Waal, 1996.) In comparison with

army ants or small hunter-gatherer societies, Richerson and Boyd argue, a large, complex human society is at best a "crude superorganism."

The workarounds that Richerson and Boyd refer to have been many. They include such things as ruling councils, law codes, legislatures and representative government, electoral systems, an independent judiciary, a free press, bureaucracies, police forces, and much more. (Political scientists lump many of these together into three broad functional categories: legislative, executive and judicial.) These and other political/cybernetic practices and institutions have evolved over the last 11,000 years (or more) through a process of trial-and-success (to borrow a term from paleontologist George Gaylord Simpson). Moreover, as human societies have grown in size and complexity, many new political (cybernetic) challenges have arisen. Thus, political evolution has closely tracked the larger process of societal evolution.

The evidence on behalf of this theory was developed and presented in considerable detail in Corning (1983), especially in Chapter Six. Updates can also be found in Corning (1987, 1996a, 2002b) and in Corning and Hines (1988). Here I will provide just a few "data points." One of several propositions that were derived from this theory was the prediction that there will always be a close relationship between population size, socio-cultural complexity and political complexity, and many studies over the years have confirmed these relationships. One confirming example is an analysis done by anthropologist Robert Carneiro (1967). Carneiro first developed a list of 354 societal traits (including political traits), ranging from craft specialization to markets, governing councils and so on. This list was then winnowed to the 205 traits that he judged as being best able to represent a society's organizational complexity. Carneiro then assembled a carefully-screened list of 100 societies (using various criteria), from which he extracted a subset of 46 that consisted of a single community. Carneiro found that the number of societal traits in these societies approximated the square root of the size of the population.

Elsewhere, Carneiro (1970) produced a more pointed analysis involving all 100 of his selected societies, in which he attempted to correlate each of the categories on his list of 354 societal traits with 33 selected traits that were judged to be related to the degree of political organization. These traits ranged from the presence of a permanent headman (81 of the 100 societies had one) to the presence of a professional civil service (only 4 had one). The results are summarized in Table 1. Each cell in the table shows the rank-order correlation coefficient for the two categories that intersect at that cell. The categories all correlate extraordinarily well ($p \leq .001$).

((insert Table 1 here))

Table 1. Correlations between seven categories of cultural traits (from Carneiro, 1970).

To test whether or not similar correlations could also be found in contemporary societies, I undertook a study using demographic and economic data from the Inter-University Consortium for Political and Social Research for 145 societies covering the year 1967 (Corning 1983, pp. 358-59). Specifically, I examined the relationship between (1) population size, (2) GNP, (3) GNP/capita, (4) total land area, (5)

urbanization, (6) government expenditures, (7) military expenditures, and (8) the number of government employees (see Table 2). The results were less uniform (some correlations were not statistically significant), but the most important categories theoretically were highly correlated, especially the number of government employees in relation to population size, GNP, and land area, as well as government expenditures and GNP.

((insert Table 2 here))

Table 2. Some correlates of central government size (145 countries) (from Corning, 1983)

To be sure, there may be some "play" in the relationship between the political system and the economy. This is illustrated with data from the *Ethnographic Atlas* (Murdock, 1967) that was used (recognizing the somewhat imperfect categories devised by anthropologists) to compare the level of economic development and the level of political development in various societies. As Figure 4 indicates, there are limits to the amount of "play" that is possible. No hunter-gatherer society has ever achieved statehood, nor has any pastoral society been able to support a complex nation-state. Indeed, 90% of the 147 hunter-gatherer societies listed in the *Ethnographic Atlas* were nomadic bands, whereas only 4% of the 377 horticultural societies were nomadic.

((insert Figure 4 here))

Figure 4. The "play" in political evolution – an illustration

In a major review of 150 cross-cultural studies some years ago, anthropologist Raoul Naroll (1970) concluded that the following findings were historically valid in "broad outline": (1) there has been a strong allometric trend between population growth and occupational specialization (except for a spurt since the Industrial Revolution); (2) there has been a corollary trend toward greater accumulation and dissemination of information; (3) a similar trend can be observed in the evolution of more diverse and complex organizational types; (4) and several different analyses have documented a clear-cut historical trend toward growth in political system complexity. In other words, the "progressive" evolution of political processes has been an integral part of the larger systemic process by which societies, cultures and economies have evolved. Carneiro (1973, p. 108) likened the process to the workings of a gear-train:

> A sociocultural system may be likened to a train of gears in which each gear represents a different sphere of culture. In the operation of this system the gears are generally in mesh. The gears differ, however. Some are larger than others, some have finer teeth, some turn faster, etc. Moreover, some are drive gears and engender motion to the others, while other gears are passive and do not impart motion of their own, but merely transmit the motion they receive.
>
> The gears also vary in the closeness with which they engage one another. If the mesh between

> any two were perfect and continuous, then the movement of one would automatically produce a corresponding and equivalent movement in the other. But in sociocultural systems, the gears never engage perfectly *or* continuously. Now and then a gear slips out of mesh and may move forward half a turn without causing perceptible motion in the others.
>
> Yet, by and large, the train of gears moves together. A certain position of one gear is not compatible with just any position of some other gear. Thus, leaving our metaphor aside and looking at sociocultural systems directly, we cannot imagine, for example, divine kingship fitting with cave dwellings, trial by jury with percussion flaking, parliamentary procedure with human sacrifice, or cross-cousin marriage with nuclear reactors. When culture advances in one sphere, other spheres do no long remain unaffected. They tend to advance...as a single coordinated system.

The evidence briefly described here and reviewed in greater detail in Corning (1983) supports the contention that cybernetic social processes – political processes – have been an integral and necessary element in the ongoing evolution of human superorganisms (see also Corning, 2002a). Politics is not simply an artifact of competing self-interests but a vitally-important functional aspect of the ongoing collective survival enterprise that has sustained us and our ancestors literally for millions of years.

5 The Future of Politics

Cybernetic social processes are ubiquitous in nature – from the self-organized foraging behavior of army ants to the authoritarian harangues of mole-rat queens, the ad hoc hunting parties of baboons and woodlands chimpanzees, and the highly orchestrated rice terrace system of the Igorot. Though politics as we have defined it here often entails the pursuit of narrow self-interests (in accordance with the realist model), it also takes place within a larger context – the purposes and interests of the collective survival enterprise as an interdependent system (in accordance with the idealist model). Both of these classical renderings of politics have merit; they are not, in fact, mutually exclusive. Indeed, there is an inherent interplay, and very often a tension, between them.

The reality of the human condition is that the "superorganism" is the key to our survival and reproduction, as it has been for millions of years. However, this vision of the "public interest" does not negate or ignore our individual self-interests. Rather, it represents an aggregation of those interests into an immensely complex system of synergies based primarily on mutualism and reciprocity. The superorganism serves our self-interests in a multiplicity of ways; it provides both collective goods and corporate goods. And the public interest consists of preserving and enhancing these benefits.

Accordingly, the "state" has evolved as an instrumentality for "self-government" and the pursuit of the public interest — though its overarching purpose is all too often subverted. Plato and Aristotle apprehended the overarching purpose of the collective survival enterprise (and its inherent vulnerability) in their conception of the *polis*, and Aristotle prescribed a "mixed" government under law as our best

hope for ensuring that the public interest would be faithfully served. Plato and Aristotle also recognized that a fair-minded form of "justice" is an essential element of the public interest; this is the only way to ensure the long-term stability and "legitimacy" (the willing consent) of the members of the community. Over the past 2000 years we have added very little to this vision that is fundamentally new, though we have made many important improvements in the "machinery" of self-government.

What is sobering, even dismaying, is that we seem forever to be forgetting and then re-learning this ancient lesson. Witness the former British Prime Minister Margaret Thatcher, who famously claimed that "there is no such thing as society." The response to her contemptuous remark is that a society exists when people believe it does and act accordingly (or vice versa). Plato and Aristotle, and many others since, have stressed that the political order can be what we make of it. To a significant degree, our actions create self-fulfilling prophesies. If honesty, trust, mutual respect, courtesy and the spirit of compromise are the prevailing norms while deviants are ostracized and penalized, a society and its institutions will likely reflect these values, by and large. Conversely, if the cultural climate encourages deception, vicious partisanship, demonizing opponents, and an uncompromising no-holds-barred attitude toward opposing interests, the social and political environment will more closely fit the paradigms of Machiavelli and Hobbes. In the final analysis, our politics is a matter of choice, not a mindless reflection of human nature. Thus, if we choose to remain captives of destructive racial, religious, cultural or economic class divisions, shame on us.

In any case, the bottom-line conclusion of Plato and Aristotle remains valid today. For better or worse, our evolutionary future is dependent upon the goods and services that are provided (or not) by the collective survival enterprise, along with the decisions and actions that we undertake collectively (or not) in the public interest. For this reason, the continuing quest for social justice, and the good life, remains the central challenge for every organized society, as well as for each one of us. It is a goal worth striving for, because our own survival, and certainly that of our descendants, may very well depend upon it. Nothing less than our evolutionary future is at stake. To paraphrase the American "founding father," Benjamin Franklin, in the long run either we will survive together or go extinct separately.

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