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Reviving the Organismic Analogy in Sociology: Human Society as an Organism

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Reviving the Organismic Analogy in Sociology: Human Society as an Organism

A Dissertation submitted in partial satisfaction
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in

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by

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June 2016

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DEDICATION

Comparing the operation of human societies to the operation of organisms was a common theme in the theories of sociology’s classical era. Despite this early prominence, the organismic analogy has received little attention from sociologists during the late 20\textsuperscript{th} and early 21\textsuperscript{st} centuries. The present dissertation is an attempt to revive the organismic analogy in sociological theory. In so doing, the present dissertation will first outline the organismic analogy as it appeared in the sociological theories of Auguste Comte, Herbert Spencer and Émile Durkheim. After providing that historical foundation, this dissertation will then use contemporary evolutionary theory to define an organism as a collective entity featuring a high level of cooperation and a low level of conflict among its component parts. Featuring a high level of cooperation and a low level of conflict among its component parts allows an organism to adaptively modify flows of energy in its environment, which in turn, enables its persistence. Also, organisms emerge through a
three-part evolutionary process involving social group formation, social group maintenance, and social group transformation. After providing that background, this dissertation will then argue that a human society is a collective entity that exhibits a high level of cooperation and a low level of conflict among the individuals that compose the society. This arrangement allows the society to adaptively modify flows of energy in its environment, which in turn, enables the society’s persistence. Furthermore, human societies emerged through a three-part evolutionary process involving social group formation, social group maintenance, and social group transformation. Following from these arguments, human societies can be considered organisms. After arguing that human societies can be considered organisms, this dissertation will then argue that the organismic character of human societies has, in general, increased over time as societal evolution has unfolded.
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Chapter 1: Introduction

The evolutionary biologist Richard Dawkins is perhaps most famous for his metaphor of the selfish gene, which he first put forward in his book *The Selfish Gene* (1976). In writing *The Selfish Gene*, Dawkins was not re-inventing the wheel; a gene-centered approach to evolution had already been put forward by George C. Williams in his book *Adaptation and Natural Selection*, published 10 years earlier. According to Williams (1966), groups, organisms and genomes are temporary manifestations; groups break up, organisms die and genomes are destroyed through the process of recombination. Because of this temporary character, Williams argued that selection on groups, organisms and genomes cannot lead to the cumulative character seen in evolution. Genes, on the other hand, have the permanence required for cumulative evolution. Genes replicate themselves and as the genes that are better than others at replicating increase their frequency in the gene pool, evolution by natural selection takes place (Williams 1966; Dawkins 1976, 1982). As biological evolution is a process that takes place due to the differential replication of genes in a gene pool, it can be understood through the adoption of a gene-centered view of evolution (Williams 1966; Dawkins 1976, 1982). Although central to Dawkins’ work, these ideas were not unique to him, what was unique about Dawkins’ work was the metaphor he used to illuminate the gene-centered view of evolution.

In order to demonstrate the explanatory power of the gene-centered view, Dawkins made the metaphor of the selfish gene. Just as selfish individuals look out for their self-interests over the interests of others, genes build and direct organisms and
groups in ways that promote their own best interests (replication) over the interests of other genes in the gene pool. In this way, genes are selfish. In making the metaphor of the selfish gene, Dawkins was not saying that genes make organisms selfish, although in many cases they do. What Dawkins was saying was that through building and shaping the behavior of organisms in ways that allow for their own replication, genes ‘act’ as if they are selfish; recognizing this fact brings great clarity to our understanding of evolution, specifically the evolution of social behavior. Using the metaphor of the selfish gene to illustrate the evolution of both cooperative and spiteful behavior in a vast array of species was one of the central themes of Dawkins’ *The Selfish Gene*.

The metaphorical nature of Dawkins’ selfish gene was lost on many, who balked at the notion that genes could be selfish (see Midgley [1979] for what is perhaps the most incredulous criticism of the selfish gene metaphor). To respond to the unduly hostile criticisms that were leveled against his metaphor of the selfish gene, Dawkins opened his next book, *The Extended Phenotype* (1982) with a discussion of Necker cubes. A Necker cube is a two-dimensional drawing that is interpreted by the brain as a three-dimensional cube. An illustration of a Necker cube is provided in Figure 1. Despite being a single drawing, the three-dimensional cube produced by the Necker cube illusion can be perceived in two different ways. Depending on how one focuses, the Necker cube produces the image of a cube that projects either down and to the left or up and to the right. Neither of the cubes that emerge represent the correct viewing of the drawing, both cubes are consistent with the two-dimensional drawing from which they emerge. The two cubes are simply different, but compatible ways of viewing the same illustration. In
making the metaphor of the selfish gene, Dawkins was attempting to use a metaphor to shift the orientation of biologists towards the evolutionary process. Dawkins used the metaphor of the selfish gene to bring out an aspect of the evolutionary Necker cube that had largely evaded scholarly focus. By using the metaphor of the selfish gene to shift the focus of biologists away from groups and organisms towards genes, Dawkins hoped to clarify a number of conceptual issues in evolutionary theory, which he was immensely successful in doing (Grafen and Ridley 2007; Ridley 2016).

Figure 1: Illustration of a Necker Cube

Enter in the organismic analogy. The experience of the organismic analogy in sociology has many similarities to the experience of the selfish gene metaphor in evolutionary biology; with the primary difference being that despite reactions against the literal interpretation of both metaphors, the selfish gene metaphor has received remarkable support among contemporary evolutionary biologists, whereas the organismic
analogy has received little acclaim from contemporary sociologists. The organismic analogy made its sociological appearance with the founding of the discipline. Early sociologists such as Comte, Spencer and Durkheim likened the organization of societies to the organization of animal bodies. Almost as soon as the organismic analogy made its appearance in sociological thought, sociologists reacted against the potential literal interpretation of the analogy; for instance, Weber argued that the organismic analogy, when interpreted too strongly, can be highly dangerous (Levine 1995).

Despite reactions against its literal interpretation, the early purveyors of the organismic analogy did not intend for a literal equivalence between organisms and societies. Instead, early proponents of the organismic analogy intended to highlight the shared organizational principles, which were found in both animal organisms and human societies. In highlighting these parallel organizational principles, early sociologists attempted to shift scholarly attention away from individuals and towards patterns of social organization. The organismic analogy was a metaphorical device for changing the orientation of scholars in the emerging discipline of sociology towards the Necker cube of human society. Unfortunately, the organismic analogy has been less successful in shifting the orientation of sociologists to the sociological Necker cube than has the selfish gene metaphor been in shifting the orientation of biologists to the evolutionary Necker cube. Although it was a mainstay of sociological theory in the classical era, throughout the 20th and early parts of the 21st centuries the organismic analogy lost favor, falling almost completely out of sociological theory.
In order for the gestalt shifting nature of the organismic analogy to be realized as many sociologists of the classical era intended, the organismic analogy must be reintroduced into sociological theorizing. At this point, some sociologists will protest, what is the point of reviving an idea that is over 100 years old simply because the idea had value to some of the discipline’s dead founders? Such thinking is infected by the bias that mathematician, Nassim Taleb calls *neomania*. Neomania involves the preference for things simply because they are new; those inflicted with the bias have the mistaken assumption that something is likely to be better in some way just because it is newer. For sociologists inflicted with neomania, the works of classical sociologists are something they studied in the first year of graduate school, before they moved on to focus on newer, and thus in their minds more accurate, sociological knowledge. Such thinking is a bias that should be avoided as it runs counter to the Lindy effect (Taleb 2012).

The Lindy effect is a theory about the longevity of non-perishable entities. The Lindy effect says that for non-perishable entities, such as technologies, cultural products, or academic works, the longer an entity has survived, the longer it is likely to survive (Taleb 2012). Applying the Lindy effect to popular music makes the nature of the effect clear. Music fans have been listening to the Beatles for over 50 years; given this longevity it is highly probable that American music fans will still be listening to the Beatles 50 years from now. If American music fans were going to stop listening to the Beatles it is likely they would have already stopped doing so. Compare this to most of the artists that are currently on the radio. Within a few years most of these artists will have completely lost the media spotlight. When applied to academic works the Lindy
effect implies that the longer an academic work has been studied, the longer it is likely to be studied. Scholars have studied the works of classical sociological theorists for over 100 years; given the longevity of these works scholars are likely to still be studying these works 100 years from now. If scholars were seriously going to stop studying the works of sociology’s classical era scholars, it is probable that they would have already stopped. On the other hand, much of the work that has come out within the last year will be forgotten by this time next year\(^1\). Thus is the nature of the Lindy effect. If the works of classical era sociologists are likely to still be around 100 years from now, whereas if most of what fills the pages of contemporary social science journals will be forgotten by this time next year, ignoring the ideas of classical sociological theorists simply because of their age seems a disastrous course for sociology to venture down.

In order to give the ideas of sociology’s classical era theorists their proper due, this dissertation will attempt to re-introduce the organismic analogy into sociological theory. In chapter 2, I will outline the organismic analogy in the history of classical sociological thought, focusing on the analogy’s appearance in the works of Comte, Spencer, and Durkheim. After outlining this history, I will then argue that throughout the 20\(^{th}\) and early 21\(^{st}\) century, sociologists have moved away from the organismic analogy due to the theoretical influences of Weber and Marx, and due to a general skepticism towards importing biological ideas into sociology. Once this history of the organismic analogy in sociology has been outlined, I will then use recent thinking in evolutionary

\(^1\) This fact may be for the better since there is substantial reason to believe that most published statistical findings in the social sciences are false positives (Ioannidis 2005; Simmons et al. 2011).
theory to provide an up-dated definition of what makes an organism an organism.

Integrating insights primarily drawn from Queller and Strassman (2009), Bouchard
(2008, 2011), and J. Scott Turner (2000), I will argue that organisms are collective
entities that feature a high level of cooperation and a minimal level of conflict among
their component parts. These features allow the organism to manifest organism-level
adaptations, which allows the organism to capture the energy from its environment
necessary for its persistence.

In chapter 3, I will utilize insights drawn from Bourke (2011) to argue that
organisms at a higher-level of complexity emerge through an evolutionary process
whereby organisms at a lower-level of complexity experience selection pressures
favoring social group formation and social group maintenance. Once groups have
formed, and mechanisms for limiting within-group conflict have evolved, a positive
feedback relationship between group size and complexity can transform this aggregate of
lower-level organisms into an integrated higher-level organism. In outlining the three-
part process through which higher-level organisms emerge, I will pay specific attention to
the role of social group formation, social group maintenance and social group
transformation in the evolution of multicellular organisms and eusocial societies. I will
then argue that starting with the divergence of humans and chimpanzees from their last
common ancestor 6 to 7 million years ago, hominins experienced selection pressures for
social group formation and social group maintenance. Due to the operation of these
selection pressures, by 50,000 years ago, humans were living in foraging groups that had
the character of simple societal organisms. With the first emergence of agriculture
around 12,000 years ago, a size-complexity feedback relationship was initiated, and this size-complexity feedback relationship would cause the organismic character of human societies to increase over the course of societal evolution.

In chapter 4, I will use ethnographic research on contemporary foragers, insights from human behavioral ecology, and archeological evidence regarding prehistoric foraging societies to piece together a picture of the foraging societies that inhabited the planet from 50,000 years ago until the dawn of agriculture. Using these sources of evidence, I will conclude that the foraging societies of the Upper Paleolithic were likely characterized by informal networks of exchange, informal systems of social control, and animistic religions. This combination of factors would allow the foraging societies of the Upper Paleolithic to capture enough energy from their environments to enable their continued persistence. Thus, I will argue, the foraging societies of the Upper Paleolithic had the character of simple organisms. With the emergence of agriculture, the organismic character of human societies would be transformed by a size-complexity feedback relationship. In order to illustrate the size-complexity feedback relationship that transformed the character of the human societal organism, I will end chapter 4 by describing the iteration model of world-system transformation presented in Chase-Dunn and Hall (1997) and Chase-Dunn and Lerro (2013).

In chapter 5, the final chapter, I will attempt to use the iteration model of world-system transformation to show how the organismic character of human societies has increased overtime, starting with the emergence of agriculture. As the climate warmed at the end of the last ice age, foraging populations began to settle into areas of local
resource abundance. As foraging populations became caged-in by this sedentary lifestyle, they would increasingly turn to cultivation to meet the needs of their growing populations. As populations grew, new levels of socio-political hierarchy would emerge and by 5,000 years ago, the world would see the appearance of the first civilizations. It would be these civilizations that would now have the character of societal organisms. As agricultural civilizations emerged, societal organisms would experience selection pressures favoring the elaboration of technologies of distribution, which could enable cooperation throughout the growing organism; and technologies of power, which could regulate conflict throughout the growing organism. In response to such selection pressures, agricultural civilizations would come to be characterized by extensive networks of exchange, complex divisions of labor, formalized legal codes, and polytheistic and monotheistic religions. With this evolutionary process, the simple societal organisms of foraging societies would be transformed into the complex societal organisms of agricultural civilizations.

As societal organisms continued to grow, one organism, the Central civilization, would come to dominate the entire planet, transforming human society into a singular, global organism. As this global societal organism evolved, it would experience continued selection pressures for the elaboration of technologies of distribution and technologies of power. In response to such selection pressures, the global societal organism would come to be characterized by global networks of exchange and a global division of labor, which could enable cooperation throughout the global organism; the societal organism would also come to be increasingly characterized by democratic forms
of governance and international peacekeeping efforts, which could act to regulate conflict in the global organism. Through this evolutionary process the complex organisms of agricultural civilizations were locked together to create one singular, global organism. Thus, not only will the present dissertation argue that human societies have all of the important characteristics of organisms, it will also argue that throughout the course of societal evolution the organismic character of human society has, in general, increased.
Chapter 2: Organisms in Biology and Sociology

INTRODUCTION

In order for the true value of the organismic analogy to be realized, the organismic analogy must be re-introduced into sociological theorizing. The present chapter will attempt to re-introduce the organismic analogy into sociological theory by first outlining the history of the analogy in classical sociological thought. After outlining the organismic analogy as it appears in the sociological theory of the classical era, the present chapter will then utilize contemporary theorizing in evolutionary biology to provide an up-to-date characterization of just what makes an organism an organism. After providing this up-to-date definition of organisms, the organismic character of human societies will be investigated in the chapters that follow.

THE ORGANISMIC ANALOGY IN SOCIOLOGY

The idea that a society is like an organism dates back at least to the times of ancient Greece and Rome. In his notebooks, which would be published as the Grundrisse, Marx ([1857] 1993) refers to the legend of Menenius Agrippa, a Roman patrician who lived from 530 to 493 BCE. According to legend, during the secession of the plebs in 494 BCE, Menenius Agrippa successfully ended the secession by persuading the plebeians to return to Rome. Agrippa convinced the plebs to end their secession by comparing the patricians to the stomach and the plebs to the limbs of a body, as both limbs and stomach are necessary for the survival of the body, both patricians and plebs were necessary for the survival of Rome. In sociology, the organismic analogy dates back to the founding of the discipline and the writings of Auguste Comte, Herbert Spencer and Émile Durkheim.
For these authors, despite the apparent differences between the two, societies were in many ways like organisms. In making such organismic analogies the sociologists of the classical era were attempting to build a heuristic device, which would shift focus away from individuals and towards large-scale social structures. Furthermore, by importing the idea of organisms from the world of biology into the world of sociology, classical era sociologists were attempting to gain legitimacy for the new field of sociology by tying sociology to the already more developed field of biology. Not every sociologist of the classical era was enamored by the organismic character of societies, however. The reification of society implied by the organismic analogy ran completely afoul of Max Weber’s methodological individualism. Although not every sociologist was convinced of the organismic analogy’s utility, the idea that societies were in many ways like organisms was a prominent feature of classical sociology.

Since the classical era, the organismic analogy has fallen out of favor in sociological theory. As sociologists turned away from evolutionary and functionalist approaches in favor of a variety of different theoretical perspectives throughout the 20th and early 21st centuries, sociologists have turned their backs on the organismic analogy. To retrace the rise and demise of the organismic analogy in sociological theory the following section will outline the organismic analogy in classical sociological theory by focusing on the analogy’s appearance in the works of August Comte, Herbert Spencer and Émile Durkheim. It will then argue that the organismic analogy was steadily rejected in sociology throughout the 20th and early parts of the 21st century for three broad reasons. First, Max Weber’s theoretical influence, more specifically, his emphasis on the
individual and his rejection of supra-individual concepts, his emphasis on *verstehen* and his appeal to value-neutrality led sociologists to reject the organismic analogy (Levine 1995). Second, throughout the 1960’s young sociologists became increasingly dissatisfied with functionalist theory and the consensus-view of society it implied. As young sociologists rejected functionalism they turned to Karl Marx, developing theories emphasizing social conflict rather than social consensus (Gouldner 1970). As sociologists moved away from functionalism, they also moved away from the organismic analogy. The third reason for the demise of the organismic analogy in sociological theory is a general skepticism towards importing ideas from biology into sociology on the part of sociologists.

As the founder of the discipline, Auguste Comte was the first to introduce the organismic analogy into sociological theory. Born in 1798 in Montpellier, France, Comte lived through seven political regimes and an era of nearly constant sociopolitical instability. Comte also lived during a time of remarkable scientific progress in France (Coser 1977). The experience of social chaos, along with the budding promise provided by the scientific endeavor motivated Comte to develop a science of society. By utilizing the rigors of the scientific method, Comte thought he could develop laws of both social order and social progress. By uncovering these laws, Comte intended to uncover the recipe for curing society’s ills and for progressing society towards a more harmonious future.

The organismic analogy provided the backbone from which Comte attempted to build his new science of society. Organisms are characterized by the order found
amongst their internal organs, which are encapsulated by a skin. A society is characterized by the order found amongst the families, classes and cities that make up the society. According to Comte, families, classes and cities are the internal organs of the social organism. These social organs are encapsulated within religious communities, linguistic communities and the division of labor, which all function as the skin, holding the social organism together (Coser 1977). Organisms achieve their order by progressing through a series of developmental stages. Societies also achieve their order by progressing through a series of developmental stages: the theological, the metaphysical and the positive stage (Coser 1977).

The organismic analogy served a dual purpose in Comte’s sociology. First, the organismic analogy allowed Comte to legitimate the new field of sociology by connecting sociology to the already established field of biology (Levine 1995). According to Comte, the sciences could be arranged in a hierarchy of decreasing generality and increasing complexity (Coser 1977). The sciences at the bottom of the hierarchy, the sciences that were the most general and least complex were the first to develop with the sciences at the top of the hierarchy following after. The most general science in Comte’s scheme was astronomy, followed by physics and chemistry. The most complex sciences were biology, followed by, of course, sociology. Throughout Comte’s lifetime, biologists were making great breakthroughs in their understanding of the biological world. As the development of the sciences proceeds in sequence from astronomy, through physics and chemistry, to biology and finally sociology, the success of biologists during Comte’s lifetime signaled the need for a new group of scholars to
apply the scientific method to society. In so doing, Comte aimed to uncover the laws, which he thought invariably structured the social organism (Coser 1977).

In developing his hierarchy of sciences, Comte made the distinction between the reductionist and the holistic sciences (Coser 1977). For Comte, astronomy, physics and chemistry were similar in their reductionist character. Astronomers, physicists and chemists were most successful when they broke their topic of study into component parts, building up theories of the physical and chemical world by building an understanding of these component parts. What set biology and sociology apart from the rest of the sciences, according to Comte, was their holistic character. The biologists of Comte’s era built their understanding of the biological world by developing laws pertaining to organic wholes. If sociologists were to have the success that the biologists of Comte’s era were having, sociologists needed to direct their attention to wholes rather parts; sociologists were to study the social whole as an entity in its own right. From the holistic character that Comte attributed to both biology and sociology, sprang Comte’s organismic analogy. By tying the development of sociology to the success of biology in the 19th century, the organismic analogy provided scientific legitimacy to Comte’s new science of sociology.

The second function of the organismic analogy in Comte’s sociology was to provide a supra-individual entity, which could serve as an object of individual devotion (Levine 1995). For Comte, religion was the skin of the social organism (Coser 1977). Religion acted as a boundary, which separated the towns, classes and cities, the organs, of one social organism from those of another. Without religion a society would fall apart as surely as would a human with no skin. Despite the importance of religion for producing
order within the social organism, French society was turning away from the religious traditions of previous eras. To rectify the moral gulf that Comte saw in this movement away from religion, Comte formulated sociology not just as an emerging science, but as the new religion of humanity. The entity to be worshiped in this new religion was not a god, gods, or any metaphysical being; the entity to be worshiped was society itself. But society could only be such an object of veneration if society was an entity that existed in its own right. By arguing that societies were like organisms, Comte was attempting to justify the objective existence of society. Existing as an objective entity, society could serve as a sacred object for Comte’s new religion of humanity (Levine 1995). For Comte, the organismic analogy served as the backbone for his science of social order and social progress. By analogizing the operation of societies to the operation of organisms, Comte provided scientific legitimacy for the science of sociology. He also provided a new object of veneration for his religion of humanity (Levine 1995).

Writing shortly after Comte and writing in England rather than France, the forever maligned Herbert Spencer developed his own version of the organismic analogy. Spencer was a general systems theorist, who attempted to outline the abstract, general principles that governed the relations among inorganic, organic, psychological and superorganic entities (Turner 1985). Spencer believed that celestial bodies, chemical compounds, organic beings, cognitions and social aggregates were all shaped by common, underlying processes. Although each type of entity was shaped by processes unique to that specific type of entity, there were common processes that shaped all types of entities (Turner 1985).
Spencer used the physics of his time to induce three principles, which encompass the common processes that structure entities at all levels of reality. For Spencer these three principles were: the principle of evolution, the principle of equilibrium, and the principle of dissolution (Spencer [1862] 1867). According to Spencer, evolution, “is definable as a change from an incoherent homogeneity to a coherent heterogeneity” (Spencer [1862] 1867: 360); this change from an incoherent homogeneity into a coherent heterogeneity involves entities first aggregating, then becoming differentiated and finally, becoming integrated into a more coherent whole. The operation of evolution pushes entities towards a state of equilibrium. Entities can only maintain such equilibrium for so long; however, eventually they will succumb to pressures of dissolution, losing their sense of integration through disaggregation. After outlining his first principles, Spencer went on to apply these principles to the biological, psychological and sociological realms of the universe. In applying his first principles to both the biological and the sociological realm, Spencer investigated the parallel principles of organization between organisms and societies, which result due to the operation of his first principles. This investigation served as the basis of Spencer’s organismic analogy.

In his essay “The Social Organism” (1860) and again in the Principles of Sociology (1897), Spencer highlights five points of similarity between organisms and societies. First, as they increase in size both types of entities experience a structural differentiation of their parts. Second, this structural differentiation leads to a corresponding functional differentiation amongst the parts, which make up an entity. Third, this differentiation of structure and function produces integration amongst the parts
through mutual dependencies. Fourth, the parts that make up both organisms and societies can be viewed as entities in their own right. And finally, fifth, the parts that make up both organisms and societies can live on after the death of the whole. Also, the whole entity can live on despite turnover of its constituent parts.

Despite these points of similarity between organisms and societies, Spencer (1860, 1897) noted points of divergence between organism and societies. First, societies and organisms are different in the degree of contact between their parts. In societies there is less direct and continuous contact between parts than there is in organisms. Second, the modes of contact between the parts of organisms and societies are different. In societies contact between parts is reliant upon symbolic and emotional communication, whereas in organisms contact between parts is reliant upon chemical communication. Third, the distribution of consciousness and volunteerism differs between the parts of an organism and the parts of a society. In societies all of the parts can be said to be conscious, goal-seeking agents. The same cannot be said of the parts, which make up an organism. In applying his principle of evolution to organisms and societies, Spencer provided the outlines for an analytical theory of societal growth and differentiation (Turner 1985). According to Spencer (1860, 1987) processes of growth lead to differentiation of both structure and function, this differentiation produces selection pressures for integration amongst the parts which make up either the organism or the society.

Along with Comte and Spencer, Émile Durkheim also made significant use of the organismic analogy in his sociological theory. Whereas the organismic analogy as found
in the work of Comte and Spencer was fundamentally connected to their theories of societal evolution, with Durkheim the organismic analogy would take on a more functionalist nature. To be sure, Durkheim’s organismic analogy did involve an evolutionary stage model, but as Durkheim’s career progressed he moved away from this stage model to focus on the normal and pathological elements of the social organism before abandoning the organismic analogy altogether as he made his religious turn. Consequently, as Durkheim’s thought progressed from *The Division of Labor in Society* ([1893] 1997) to *The Rules of Sociological Method* ([1895] 1982) and *Suicide* ([1897] 1951) the evolutionary character of his organismic analogy would recede to the background as a more functionalist focus would come to the fore.

Durkheim’s organismic analogy first appears in *The Division of Labor in Society* ([1893] 1997). For Durkheim morality was the glue, which held societies together; without a sense of shared morality, a society would fall into chaos. The sense of morality that a society had was determined by the organization of that society. Durkheim distinguished between two types of moral solidarity. The first type of moral solidarity, he termed mechanical solidarity. Mechanical solidarity was solidarity based on likeness. In societies characterized by mechanical solidarity there was no division of labor; all individuals in the society performed the same social roles. As all the members of these societies performed the same roles, the society would develop a strong collective conscience. That is, as all members of the society share the same social roles, all members of the society would have similar social experiences and this overlap in social experience would produce shared norms and expectations. Shared norms and
expectations would, in turn, keep the anti-social impulses of individuals in check. Society was maintained through a moral sense based on likeness.

According to Durkheim ([1893] 1997), human societies started from an undifferentiated state, human societies were initially characterized by mechanical solidarity. Overtime as the volume and density of a society increased these increases would set about a selective dynamic leading to increased differentiation of the division of labor. As the division of labor continued to differentiate, different individuals would come to perform drastically different social roles. Performing different social roles, individuals could no longer be bound together in moral communities based on likeness. Instead, in such a society, individuals would be bound into a moral community based on the mutual dependence created by a highly differentiated division of labor. Performing different social roles, individuals would develop different sets of norms and expectations, but as the bureaucrat depends on the farmer for food and as farmer and bureaucrat alike depend on the doctor for health and the police officer for safety, this mutual dependence would ensure the moral solidarity of the society. As the coherence of this type of society was maintained by the economic division of labor, just as the coherence of an animal body is maintained by its physiological division of labor, Durkheim ([1893] 1997) called this second type of solidarity, organic solidarity.

Durkheim proposed an evolutionary stage model based on his two types of moral solidarity. Societies began in an undifferentiated state characterized by mechanical solidarity. As increases in social volume and density set about a Darwinian selection dynamic, the division of labor became increasingly differentiated; societies evolved into a
state of organic solidarity. Just as the evolutionary character of Comte’s organismic analogy was influenced by his experience of French society, the evolutionary character of Durkheim’s organismic analogy was influenced by his own experience of French society (Gouldner 1970). For Comte, French society was full of sociopolitical instability and chaos, but by the time that Durkheim was making his organismic analogy, French society had moved on to experience an era of relative sociopolitical stability. Beyond this stability, during Durkheim’s lifetime, the industrial revolution led to increased standards of living all across Western Europe. Whereas Comte’s experience of French society motivated him to create an evolutionary typology with an eye towards progress and the future, for Durkheim, French society had reached the pinnacle stage of societal evolution. Where Comte wanted to move French society towards its ideal state by directing the course of societal evolution towards a positivist future, Durkheim thought the ideal society already stood right in front of him. All that needed to be done was to determine, which elements of the society where pathological leftovers from a prior era and then to excise these pathological leftovers (Gouldner 1970). This perspective would move Durkheim’s organismic analogy away from its original evolutionary focus towards a focus on the functional aspects of the social organism.

In *The Rules of Sociological Method* ([1895] 1982), Durkheim both justifies the existence of sociology as a discipline and presents a series of methodological guidelines for sociologists. In so doing, Durkheim gives his organismic analogy a decidedly functionalist flavor. Durkheim’s functionalist approach to the organismic analogy continues in *Suicide* ([1897] 1951), although in this work Durkheim does not mention the
organismic character of society explicitly, the organismic analogy is implied by his sociological method. In *The Rules of Sociological Method*, Durkheim makes the following common sense point; for an individual organism, health is good and sickness is bad and should be avoided. Durkheim follows this up with the less intuitive point, for a society, just as for an organism, health is good and sickness is bad. The problem comes in deciding what exactly counts as a sickness of the societal organism. According to Durkheim, if a social condition is normal for societies at a given stage of development, that social condition is healthy. If a social condition exceeds what is normal for societies at a given stage of development, that social condition is pathological and should be treated. Using these diagnostic criteria, Durkheim discusses both healthy and pathological levels of crime and healthy and pathological levels of suicide. In addressing these topics, Durkheim moved the organismic analogy away from its evolutionary roots as seen in the organismic analogies of Comte, Spencer and his own *The Division of Labor in Society*, giving the organismic analogy a more functionalist character.

The organismic analogy played a key role in the classical theories of Comte, Spencer and Durkheim. These three theorists were not the only sociologists to make use of the organismic analogy during the classical era. Scholars such as René Worms in France, Albert Schäffle in Germany and Charles Horton Cooley in America all utilized the organismic analogy in one way or another in their sociological theories (Levine 1995). Despite the prominence of the organismic analogy during the classical era, throughout the 20th and early parts of the 21st century the analogy lost influence and respect in sociological circles. To understand why the organismic analogy fell from
grace after experiencing such early promise, it is necessary to outline the sociology of another classical era theorist, Max Weber.

Weber’s sociology led to the rejection of the organismic analogy in sociology along three different fronts (Levine 1995). First, Weber rejected the notion that society should be viewed as an entity unto itself, a being, which existed beyond the lives of the individuals composing the society. According to Weber, societies were populations of individuals engaged in social action. As societies are simply populations of individuals engaged in social actions, supra-individual conceptions of society, such as the organismic analogy, obscure the true workings of social processes. In remarking on Schäffle’s organismic analogy, Weber noted that although the organismic analogy may have limited heuristic value, if it leads to a conception of society that is highly reified, the organismic analogy turns highly dangerous (Levine 1995). From Weber’s distaste for reification, the theoretical perspective of methodological individualism took hold. Methodological individualism would significantly influence American sociological theory throughout much of the 20th century. During this time many of the most influential theoretical perspectives in the discipline, such as exchange and rational choice theory, ethnomethodology, symbolic interactionism and other versions of social constructionism would all have a decidedly individualistic focus (Mayhew 1980). As methodological individualism has been a feature of much of the theoretical landscape in American sociology throughout the 20th and 21st centuries, the holistic character of the organismic analogy made it unappealing for many sociologists.
Beyond leading the way towards a more individualistically-oriented sociology, Weber argued that *verstehen*, or understanding, was the distinguishing feature of sociological knowledge (Levine 1995). For Weber, an action was a behavior to which the actor attached a subjective meaning. When this subjective meaning was oriented towards the behaviors of others, an action was social. It was by seeking to understand this subjective meaning that the sociologist should investigate the social world. Throughout the 20th century many sociologists have followed Weber’s lead and made understanding the perspectives of different social actors and social groups a key part of their sociological theory. This has spelt bad news for the organismic analogy, which offers little of use to the sociologist interested in understanding the subjective experiences of different individuals or groups.

Finally, Weber urged sociologists to conduct their scholarship from a position of value neutrality (Levine 1995). Too often has the organismic analogy, and evolutionary theory more generally, been argued to be a tool for propping up European imperialism. According to sociologists of this persuasion, the organismic analogy, along with theories of societal evolution more generally, is nothing more than a justification for the geopolitical policies of American and Western European colonial powers. If sociologists were to be value-neutral, as Weber advised, an analogy with the ideological baggage of the organismic analogy had no place in sociological theory. To the extent that Weber’s position of methodological individualism, his focus on understanding and his pleas for value-neutrality have influenced sociological theorizing throughout the 20th century there was little room for the organismic analogy in American sociology.
The organismic analogy originated in the evolutionary theories of Comte, Spencer and Durkheim. Through Durkheim’s work, and work by Schäffle and later Radcliffe-Brown, the organismic analogy moved away from its evolutionary character taking on a more functionalist nature (Levine 1995). The association of the organismic analogy with functionalism would further contribute to its rejection in much of sociological theory throughout the latter parts of the 20th century. Throughout the 1940’s and 1950’s, functionalist theories, most notably the functionalism of Talcott Parsons, reigned dominant in American sociological theory. Functionalism’s time at the top was relatively short-lived, however. By the 1960’s, socio-political events around the world would lead many young sociologists to reject the functionalist approaches of the prior decades, and the consensus view of society that functionalism implied, in favor of more Marxian, conflict-oriented approaches (Gouldner 1970). With sociologists turning away from functionalism, instead looking to Marx for their theoretical insights, interest in the organismic analogy in sociology seemed to completely dry up.

As sociologists have been increasingly influenced by the theoretical insights of Weber and Marx, and increasingly disinterested in the theoretical insights of evolutionary theory and functionalism they have had little use for the organismic analogy. Beyond the influences of Weber and Marx, a third factor accounts for the rejection of the organismic analogy in 20th century sociological theory. For many sociologists, the organismic analogy is viewed as misplaced Darwinian reasoning (Buckley 1967; Collins [1975] 2009). According to Buckley (1967), Spencer used the success of Darwinian reasoning in biology to introduce the organismic analogy into sociology. This, Buckley claimed,
was a disingenuous move as Darwinian reasoning is about species and phylogeny not organisms and physiology. Due to this fact, Buckley (1967) argues that if Darwinian reasoning is going to be used to support a metaphor between sociological and biological forms, societies should be analogized with species rather than organisms. Collins ([1975] 2009: 56) uses a similar line of reasoning to argue that the organismic analogy is a “most foolish error”. According to Collins, the organismic analogy comes from embryology, but is justified by the success of Darwinian evolutionary theory. As the organismic analogy is an embryological analogy that is justified by the success of Darwinian evolution, the organismic analogy in sociology is misapplied Darwinian reasoning (Collins [1975] 2009).

Although present in the theories of many classical sociologists, most notably Comte, Spencer and Durkheim, the organismic analogy almost completely receded from sociological theory throughout the late 20th and early 21st centuries. While there is no single cause for the abandonment of the organismic analogy in sociological theory, the combined influence of Weber and Marx, along with fears regarding the use of biological ideas in sociology likely accounts for the disappearance of the organismic analogy in sociological theory. As sociologists followed Weber’s lead, creating theoretical schemes based on methodological individualism and verstehen; as sociologists rejected the consensus view of society implied by functional approaches in favor of more Marxian approaches; and as sociologists reacted against the application of biological concepts to the social world, the organismic analogy fell from grace. As the following arguments
will attempt to show these criticisms need not apply to a re-formulated organismic analogy.

When sociologists think about the organismic analogy, they assume that organisms are well-defined and for most of the 20th century, biologists did think they had a stable understanding of what made an organism an organism. Then starting in the 1980’s, a growing recognition of the great diversity of biological organisms found on earth, as well as the discovery of what are known as *the major transitions in evolution* led biologists to question their understanding of just what makes an organism organismic. Since recognizing the ambiguities in their understanding, biologists have utilized insights from evolutionary theory to develop a new conception of what it is that makes an organism an organism. This new understanding can be used to re-introduce the organismic analogy into sociological theory in a way that avoids the criticisms of the organismic analogies of sociology’s past.

When this new definition of organism is used as the basis for the organismic analogy the criticisms that led to the analogy’s disappearance in sociology no longer apply. In stressing methodological individualism Weber wanted sociologists to avoid supra-individual concepts that minimized the role of the individual in society. More specifically, Weber was worried that building theories of society through the use of supra-individual concepts would lead sociologists away from understanding the actions of individuals at the level of subjective meaning. The sociologists who took American sociology in a more Marxian direction in the mid-20th century were dissatisfied with the focus on consensus and the lack of conflict implied by functionalism and the organismic
analogy. Evolutionary biologists now recognize that organisms are themselves populations of lower-level organisms, populations that exist in a perpetual tug-of-war between selection pressures favoring internal cooperation and selection pressure favoring internal conflict. For organisms to exist they must feature high levels of cooperation among the component parts that make up the higher-level whole, and they also must feature mechanisms, which operate to regulate conflict amongst these component parts (Maynard Smith and Szathmáry 1995; Michod 1999; Bourke 2011). In applying this new conception of organism to societies, the ways that societies manage both cooperation and conflict by attempting to link the interests of individuals with the interests of the larger society is brought to the fore. This is neither the holism rejected by Weberians, nor the consensus-obsessed functionalism rejected by Marxians.

Using this new, evolutionary understanding of organisms to re-introduce the organismic analogy into sociology also avoids the potential pitfalls of ideological bias that critics of the organismic analogy have been quick to level. The organismic analogy, as it will be re-interpreted, will argue that to the extent that a society can mobilize cooperation and minimize conflict amongst its members, so that the society can capture, store and use the energy required for its persistence, the society is an organism. Evolutionary biologists now recognize that the organismic character of an organism is a matter of degree. Some organisms are more organismic than others (Queller and Strassmann 2009; Strassmann and Queller 2010; Herron et al. 2013; Clarke 2013). This means, that some societies will be more organismic than others; the societies that are better at mobilizing cooperation and controlling internal conflict in order to capture, store
and use more and more energy from their environment, are more organismic than the societies that are less well-off in these areas.

A general finding from biology is that entities that have the character of organisms can use the advantages in foraging and in territorial defense that come from their high level of internal cooperation and low level of internal conflict to dominate other entities in their habitat that lack such an organismic character (Wilson and Hölldobler 2005; Hölldobler and Wilson 2008; Duffy and Macdonald 2011). For instance, eusocial species are more organismic than species that are not eusocial. Due to this organismic character, eusocial species have advantages when it comes to both territorial defense and foraging compared to non-eusocial species, which eusocial species use to achieve ecological dominance. Although ants and termites make up only about 2% of the over 900,000 species of insects found on earth, due to the ecological dominance afforded by their eusocial nature, ants and termites account for over half the insect biomass on earth. Moreover, in any particular habitat, eusocial insects occupy the central, more stable areas of the habitat, pushing solitary insect species to the peripheries of the habitat (Wilson and Hölldobler 2005; Hölldobler and Wilson 2008). A similar dynamic is seen in shrimp, where eusocial species of shrimp are more abundant and occupy broader ranges than do solitary species of shrimp (Duffy and Macdonald 2011). These findings from biology shed light on why societies that are more organismic often dominate the societies that are less organismic in their world-system.

A general finding that has emerged from studies of global social change is that the societies that are more developed (societies that use more energy) push the societies that
are less developed (societies that use less energy) to the margins of their world-system (Chase-Dunn and Hall 1997; Chase-Dunn and Lerro 2013). As societal evolution has unfolded, agricultural societies have been able to dominate foraging societies. Both agricultural societies and foraging societies have been dominated by industrial societies. As the following chapters will make clear, societies that use more energy require higher levels of internal cooperation and lower levels of internal conflict than do societies that use less energy. Due to this fact, societies that use more energy can be seen as more organismic than societies that use less energy. Just as eusocial species, due to their more organismic character, are able to push non-eusocial species to the peripheries of an ecological habitat, societies that use more energy are able to push societies that use less energy to the margins of their world-system. In linking the world-system dominance of more developed societies (more organismic societies) to the ecological dominance of eusocial species (more organismic species), the organismic analogy provides a general, cross-species explanation for the patterns of domination and exploitation that have characterized the evolution of world-systems throughout human history and prehistory. If the current incantation of the organismic analogy can provide a general explanation of both the ecological dominance of eusocial species, as well as the world-system dominance of industrial societies, the current version of the organismic analogy cannot, justly, be considered biased by some presumed political ideology. Now that the history of the organismic analogy in sociology has been outlined, it is possible to embark on the quest to re-introduce the organismic analogy into sociological theorizing. The first step
in this process is to bring sociological knowledge of what makes an organism an organism up-to-date with contemporary evolutionary theory.

**REDEFINING THE ORGANISMIC ANALOGY**

Throughout the 20th century, a growing understanding of the diverse characteristics of the millions of species of organisms on earth led to the realization that exceptions can be found for all of the characteristics that had been used to distinguish organisms from non-organisms. Santelices (1999) illustrates this point by outlining the classical attributes of organisms, then highlighting organisms, which do not possess these attributes. The classical attributes used to define organisms are genetic uniqueness, genetic homogeneity, physical unity and functional autonomy. According to the classical attributes, organisms must be genetically unique, meaning they have genomes that are unique from those of any other organism. Organisms must also be genetically homogenous. This means that all of the cells, which compose an organism, must have the same genomes. The third classical attribute of organisms is physical unity; the cells that make up an organism must be connected to each other. The final attribute of organisms is that they exhibit functional autonomy, which means that the organism directly and individually interacts with its environment to survive and reproduce. When a biological entity exhibits these four properties the entity is an organism, according to the classical criteria. As will be

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2 Santelices (1999) refers to individuals rather than organisms. Many of the authors addressing the question of what makes an organism an organism use the terms individual and organism somewhat interchangeably. To maintain consistency, the present work will refer to organisms rather than individuals throughout.
seen, many biological entities, which appear to be organisms, do not meet these four criteria.

Asexual organisms violate the requirement of genetic uniqueness (Santelices 1999). While individuals that reproduce sexually will have unique genomes, the genomes of organisms that reproduce asexually by producing clones will not exhibit this uniqueness. As numerous clones all share the same genome, organisms that can reproduce asexually, such as aphids, violate the criteria of genetic uniqueness. Examples of organisms that violate the criteria of genetic homogeneity are also easy to find. Santelices (1999) traces the criterion of genetic homogeneity back to Weismann and his doctrine of germ-soma specialization. For unitary organisms, like humans, the criterion of genetic homogeneity applies. Mutations occur in the somatic cells of unitary organisms, while these mutations may accumulate overtime, such mutations are not inherited due to the segregation of the germ-line. A unitary organism’s gametes exhibit genetic homogeneity, despite any somatic mutations that the organism has acquired. In many organisms, such as plants, fungi and even some animals, Weismann’s doctrine does not apply (Buss 1983). In plant species with modular growth, if a somatic mutation occurs in a module and this mutation affects meristematic cells in that module, the cells derived from the meristem will carry this mutation. This process can lead to considerable genetic heterogeneity amongst the cells of modular plants (Santelices 1999). Organisms that do not feature a germ-soma separation, such as modular plants, violate the criteria of
genetic homogeneity. Although not addressed by Santelices (1999), genetic chimeras\textsuperscript{3} also call into question the idea that organisms must be genetically homogenous (Pineda-Krch and Lehtilä 2004).

The final two classical attributes of organisms are functional autonomy and physiological unity. It is colloquially accepted that individuals can act independently in their environments responding in ways that allow them to both survive and reproduce, but multiple organisms exist that call this notion into question. According to Santelices (1999) social insects that live in colonies show that functional autonomy and physiological unity are not requisite criteria for individuality. Social insect colonies have non-reproductive castes where some individual insects work to maintain and protect the colony, while only a few members of the colony will reproduce passing their genes on to the next generation. Due to the reproductive division of labor found in social insect colonies, worker insects can act independently in respects to their own survival, but they are unable to reproduce independently. Aggregates of red algae can also develop a reproductive division of labor, thereby lacking the physiological unity and functional autonomy required by the classical attributes of organisms. Red algae spores can come together forming large aggregates. When red algae spores fuse, forming a large aggregate, the spores at the center of the aggregate will feature faster rates of development than the spores in the periphery of the aggregate. Due to the disparity in rates of development among the red algae spores, the spores near the center will

\textsuperscript{3} Genetic chimeras are organisms that result from the fusion of two zygotes \textit{in utero}. This results in organisms where different cells may have different genomes (Dupré 2010).
reproduce whereas the spores at the periphery will remain sterile (Santelices 1999).

Given this emergent reproductive division of labor, individual red algae spores that have clumped into aggregates lack the physiological unity and functional autonomy required by the classical attributes of organisms. As Santelices (1999) clearly demonstrates, exceptions exist for all of the classical attributes, which have been used to ground the distinction between organisms and non-organisms.

The understanding of what makes an organism and organism was also upset by the discovery of what are known as the major transitions in evolution. A developing understanding of the major transitions in evolution has led biologists to conclude that organisms exist at many different levels of biological complexity (Maynard Smith and Szathmáry 1995; Queller and Strassmann 2009; Strassmann and Queller 2009). Starting with the work of Bonner (1974, 1988) and Buss (1987), a number of biologists and philosophers of biology (Maynard Smith and Szathmáry 1995; Michod 1999; Queller 1997, 2000; Okasha 2006; Godfrey-Smith 2009; Bourke 2011) have argued that the process of evolution by natural selection has led to the emergence of a hierarchy of increasingly complex types of biological beings, where the biological beings at one level of complexity are composed of an integrated population of beings, which exist at a lower-level of complexity. New levels of complexity in the biological hierarchy emerge as ecological factors create pressures for group formation and cooperation amongst entities at one-level of complexity. As pressures for cooperation increase and groups develop mechanisms for generating high levels of cooperation, the entities that were once capable of independent survival and reproduction lose this individual ability, thereby becoming
dependent on the group to survive and reproduce (Maynard Smith and Szathmáry 1995). When such a process happens and a new level of biological complexity emerges, it is known as a major transition in evolution (Maynard Smith and Szathmáry 1995) or an evolutionary transition in individuality (Michod 1999).

When an evolutionary transition happens, a new level of biological organization is created through the aggregation and integration of lower-level entities. Different biologists have different lists regarding the major transitions that have taken place on Earth. For instance, Maynard Smith and Szathmáry (1995) outline eight major transitions; Bourke (2011) outlines six major transitions; Michod (1999) and Okasha (2006) both outline five transitions. Despite differences amongst different biologists, a number of transitions are acknowledged by all. Those transitions acknowledged by all are the evolution of gene networks from solitary genes; the evolution of bacteria-like cells from gene networks; the evolution of eukaryotic cells; the evolution of multicellular organisms; lastly, the evolution of eusocial societies. Regardless of the exact number of transitions that have taken place, the discovery of the major transitions in evolution shows that living beings with the integrated character of organisms exist at multiple levels of biological complexity. As growing knowledge of both biodiversity and the major transitions in evolution has called into question just what it is that makes an organism an organism, biologists have used evolutionary theory to create a more robust understanding of the features, which distinguish organisms from non-organisms.

In their efforts to produce a definition of the organism that is grounded in evolutionary theory, biologists have focused on three broad and interlinked features of
organisms: reproduction, fitness and adaptation. For some theorists, what makes an organism an organism is the alignment of reproductive interests amongst the lower-level entities that compose the higher-level organism (Maynard Smith and Szathmáry 1995; Dawkins 1982, 2004; Godfrey-Smith 2009, 2014). For an organism to maintain its coherence, the entities that make up the organism must forgo their own self-interest in order to engage in cooperative actions, which benefit the larger organism. According to the aforementioned authors this will happen when the reproductive interests of the multiple entities that compose the organism align. One way such alignment may occur is through genetic homogeneity. When the entities that compose an organism all share the same genes, self-interested behavior will also serve the best interests of the organism. In many species of organism, genetic homogeneity is produced by a unicellular bottleneck stage of the life cycle (Dawkins 1982, 2004). The alignment of reproductive interests ensures that the lower-level entities that make-up an organism cooperate on behalf of the higher-level organism. Due to this role, an alignment of reproductive interests among the lower-level parts, which make up the higher-level whole, is a defining feature of organisms (Maynard Smith and Szathmáry 1995; Dawkins 1982, 2004; Godfrey-Smith 2009, 2014).

Rather than focus on an alignment of reproductive interests, Michod (1999, 2005, 2007) argues that fitness is the defining characteristic of organisms. Although biologists have often disagreed about what fitness is and how fitness is best represented in evolutionary theory (see Hamilton 1964; Dawkins 1982; Rosenberg 1985; Van Valen 1989; Michod 1999; Ariew and Lewontin 2004; Bouchard and Rosenberg 2004;
Bouchard 2008, 2011; Abrams 2009), fitness is broadly defined as an operational measure of reproductive success. According to Michod (1999, 2005, 2007), fitness is the defining feature of organisms because organisms have fitness, whereas the component parts that make up the organism do not. Organisms are integrated ensembles that feature mechanisms, which motivate cooperation and mediate conflict amongst the component parts of the organism. In promoting cooperation and mediating conflict amongst the component parts of the organism, these mechanisms export fitness from the organism’s parts to the organism as a whole. Michod (1999, 2005, 2007) uses the evolution of the reproductive division of labor in multicellular volvocine algae species to demonstrate how mechanisms, which promote cooperation and mediate conflict transfer fitness from the parts of the organism to the organism itself, thereby giving the organism its defining character.

Volvocales are an order of green algae in which there are both unicellular and multicellular species. Amongst multicellular volvocales, a range of species exist from those with no differentiation amongst cells to those with complete germ-soma separation (Michod 2005). In some ecological situations there will be pressures for algae spores to form groups, as forming groups of increasing size allows the algae to defend against predation and to more efficiently maintain homeostasis (Michod 1999, 2005, 2007). The cells, which group together maximize their fitness by engaging in both survival and reproductive tasks. In some situations, selection for viability may also optimize reproduction, but in other situations selection for viability may come into conflict with selection for reproduction.
Flagellar motility is an example of investment in a trait which produces a conflict between viability and reproduction in volvocales (Michod 1999, 2005, 2007). According to Michod (1999, 2005, 2007), flagellar motility is critical. Volvocales are denser than water, thus to avoid sinking and to find nutrients volvocales must engage in daily migrations up the water column. This contributes to the viability of the algae, but it decreases the algae’s fecundity. Investments in flagellar motility decrease the reproductive ability of the algae as investments in flagellar motility detracts from cell division (Michod 1999, 2005, 2007). In unicellular volvocales, such as *C. reinhardtii*, the conflict between investments in flagellar motility and reproduction can be alleviated by producing a level of motility that optimally balances the needs of viability and reproduction. For cells in multicellular species of volvocales, such as *V. carteri*, an optimal balance between time invested in viability and time invested in reproduction is not possible (Michod 1999, 2005, 2007).

In *V. carteri*, larger size means that more resources must be invested in reproduction. This relationship, where increases in size necessitates increased investment in reproduction, produces a situation where individual cells cannot optimize the trade-off between investments in viability and investments in reproduction. In these situations, the only way to optimize fitness is for cells to specialize, becoming either somatic or germ cells (Michod 1999, 2005, 2007). Once cells are specialized for either somatic or reproductive functions, the high costs of reproduction in large, multicellular volvocales can be offset. However, individual cells are now completely dependent upon the multicellular group as no cell possesses the ability to survive and reproduce on its own.
When cells specialize in a reproductive division of labor they forfeit their own fitness, which exports fitness to the level of the multicellular organism. The transfer of fitness from the parts to the whole, as illustrated by the evolution of a reproductive division of labor in certain species of volvocine algae, is the defining feature of organisms, according to Michod (1999, 2005, 2007).

Moving away from fitness, a number of biologists have argued that evolutionary individuals are integrated by their adaptations (Wilson and Sober 1989; Wilson and Wilson 2007; Gardner 2009; Gardner and Graffen 2009). Wilson and Sober (1989) and Wilson and Wilson (2007) argue that the hallmark of organisms is functional, or adaptive, organization. These authors use multi-level selection theory to explain the genesis of such functional organization, arguing that adaptations at the level of the whole arise due to a preponderance of between group-selection pressures, which over-ride the force of within-group selection pressures. When selection pressures between groups over-take the force of selection pressures acting within groups, groups will develop adaptations that assist in the survival and the reproduction of the group (organism), rather than component parts of which the group is composed. Gardner (2009) and Gardner and Graffen (2009) also focus on adaptation as the defining feature of organisms. These authors use inclusive fitness theory rather than multi-level selection theory to explain adaptation in biological organisms. According to Gardner (2009) and Gardner and Graffen (2009), natural selection produces entities with design features that have a proven track record of success in certain environments. For these authors success is defined as the maximization of one’s inclusive fitness. The design features, which
function to maximize an entity’s inclusive fitness are adaptations. Following this logic, organisms are the entities, which feature adaptations for maximizing their inclusive fitness. Both the evolution of unicellular bottlenecks and the evolution of a reproductive division of labor in multicellular organisms are adaptations, which serve to maximize the inclusive fitness of the organism as a whole rather than maximizing the fitness of the component parts of the organism.

While the above attempts to define the distinguishing features of organisms have focused on singular aspects of the organism, there have been numerous attempts to integrate the three aforementioned perspectives. Folse and Roughgarden (2010) integrate the above approaches, arguing that three features define organisms. According to Folse and Roughgarden (2010) organisms feature an alignment of reproductive interests among their component parts; organisms exhibit fitness, whereas the parts that make up the organism do not; and lastly, organisms feature adaptations at the level of the organism. Clarke (2013) also integrates these insights into a definition of what makes an organism an organism, while also giving her definition an explicitly functional focus. According to Clarke (2013), organisms are entities that feature two types of individuating mechanisms. Organisms feature mechanisms, which either limit the organism’s capacity to undergo within-organism selection, or promote the organism’s capacity to undergo between-organism selection. By limiting an organism’s ability to experience within-organism selection and by promoting an organism’s ability to experience between-organism selection, these mechanisms work to promote cooperation and limit conflict amongst the component parts of the organism. It is on intra-organism cooperation and conflict that
Queller and Strassmann focus their discussion of the defining feature of organisms (Queller and Strassmann 2009; Strassmann and Queller 2010).

For Queller and Strassmann it is all about cooperation and conflict (Queller and Strassmann 2009; Strassmann and Queller 2010). Organisms are integrated by mechanisms that ensure a maximal amount of cooperation and a minimal amount of conflict amongst the component parts of the organism. When organisms have mechanisms that produce high levels of cooperation and low levels of conflict amongst their component parts these mechanisms ensure that adaptations are manifest at the level of the organism (Queller and Strassmann 2009; Strassmann and Queller 2010). While Queller and Strassmann use a minimal level of within-organism conflict as a defining feature of organisms, they do not argue that an organism must have absolutely no conflict amongst its component parts. What they do argue is that any conflict realized amongst the component parts of the organism cannot be so severe that it disrupts adaptive function at the level of the organism. The presence of selfish genetic elements, such as transposable elements, in paradigmatic organisms like humans demonstrates this fact (Queller and Strassmann 2009; Strassmann and Queller 2010).

Transposable elements are genes that are able to move from one location in the genome to another. By moving around the genome, transposable elements increase their chance of being passed into a gamete relative to other genes. Research on transposable elements has found that they are the most common kind of genetic material and that in some organisms upwards of 80% of the genome may consist of transposable elements (Ågren 2014). Transposable elements have the potential to disrupt the adaptive
functioning of organisms and some do just that, transposable elements have been implicated in some forms of human cancer (Burt and Trivers 2006). Despite their role in some cancers and despite the high frequency with which they are found in the genomes of many species, most transposable elements appear to be inactive or silenced, thus they do not disrupt the adaptive function of organisms (Queller and Strassmann 2009; Strassmann and Queller 2010; Ågren 2014). As the example of transposable elements demonstrates, organisms need not feature a complete absence of conflict amongst their component parts; instead, potential conflict must be regulated, so that conflict is not able to disrupt adaptive functioning at the level of the organism.

Along with providing a definition of the organism, Strassmann and Queller (2010), also outline the conditions that cause populations of entities to come together to form organisms. Organisms are characterized by their high level of cooperation and their low level of conflict. High levels of cooperation will evolve when cooperation has synergistic advantages, such as when cooperating entities are afforded more protection in large groups or when cooperating entities are organized into a division of labor (Strassmann and Queller 2010). High levels of cooperation may also evolve when the reproductive interests of the different entities are completely aligned. This type of cooperation is most likely to occur when entities are genetically identical, such as the cells of a human body, or when entities have high levels of relatedness, such as in many eusocial insect species (Strassmann and Queller 2010). As cooperation through shared reproductive interests is most likely to occur when individuals share high levels of genetic relatedness and as human society requires large amounts of cooperation among
genetically unrelated individuals, cooperation through synergy rather than cooperation through the alignment of reproductive interests should be more important in facilitating cooperation in the human societal organism.

Cooperation is only part of the story; an organism must also have mechanisms to minimize conflict amongst its component parts. In order to explain how organisms evolve mechanisms to limit conflict amongst their component parts, Strassmann and Queller (2010) utilize a sort of societal metaphor. Strassmann and Queller state, “an organism is like a congress, with parties, where all the work is done in committees” (2010: 613); a typical multicellular organism can be seen as a one-party congress of cells. By making this societal metaphor to explain how conflict is minimized, Strassmann and Queller intend to highlight the fact that conflict can be minimized through a process of majority rule among the component parts of the organism. For instance, selfish genetic elements have the potential to disrupt the functioning of the organism. As selfish genetic elements can be detrimental to the functioning of the organism, all genes in the organism that are unlinked with the selfish genetic elements will experience selection pressures favoring the evolution of mechanisms that can suppress the selfish genetic elements. For instance, multicellular organisms have evolved mechanisms that can epigenetically silence transposable elements, taking away their ability to effectively move about the genome (Gross 2006; Ågren 2014). Through the evolution of mechanisms, which suppress self-oriented behavior amongst the entities that make-up the organism, organisms are able to maintain the low level of conflict necessary for exhibiting adaptations at the organismic level.
By defining organisms as entities that exhibit high levels of cooperation and low levels of conflict, Queller and Strassmann provide an account of the defining features of organisms that can be clearly applied to human societies. Whereas Queller and Strassmann’s account of organisms maintains the fidelity of the definitions discussed above (alignment of reproductive interests, fitness, and adaptation), it is framed in language abstract enough to allow for its application to human societies. In fact, Queller and Strassmann apply their organism concept to human societies, concluding that human societies do not exhibit the necessary levels of cooperation and conflict to be considered organisms (Queller and Strassmann 2009; Strassmann and Queller 2010). Whereas human societies can exhibit extremely high levels of cooperation, they also can exhibit high levels of conflict and this conflict destroys the organismic character of human societies according to their account. Other biologists who have investigated the organismic character of human societies have also concluded that human societies have too much conflict to be considered organisms (Stearns 2007; West et al. 2015). While it is true that a human society can exhibit high levels of intrasocietal conflict it is not immediately clear why such conflict should necessarily disqualify human societies from being considered organisms; especially when one considers that the presence of transposable elements in the genomes of animals, or the fact that animals sometimes die from cancer does not disqualify animals from being considered organisms.

In their discussion of transposable elements, Queller and Strassmann highlight the fact that while transposable elements hold the potential to create genetic conflicts in organisms, often times the presence of transposable elements does not disrupt the
adaptive functioning of the organism because such conflict is minor, temporary or well controlled (Queller and Strassmann 2009; Strassmann and Queller 2010). Although the conflict found in human societies may not appear to be minor, temporary or well-controlled from the perspective of the individuals affected by such conflict, in many cases such intrasocietal conflict does not disrupt the adaptive functioning of the society as a whole; from the perspective of the society, such conflict may very well be minor, temporary or well controlled. Conflict may be disruptive for the individuals who experience such conflict in their everyday lives, but from the perspective of the society as a whole, such conflict is usually not too disruptive. If the intrasocietal conflict present in a society does not necessarily disrupt a society’s adaptive functioning, there is no reason to conclude a priori that societies have too much conflict to be considered organisms. To see how intrasocietal conflict need not disrupt a society’s adaptive functioning, it is necessary to take a macro-sociological view, viewing societal conflict in reference to its effect on societal-level adaptations. To do this it is first necessary to define what is meant when discussing societal adaptations.

Adaptation has a precise meaning in evolutionary biology and this meaning can be used to build up a definition of societal-level adaptation. Adaptations are characteristics of organisms, or ‘design features’, which function to maximize an organism’s inclusive fitness (Gardner 2009). An organism’s inclusive fitness is the sum of its direct fitness and its indirect fitness. An organism’s direct fitness is the fitness gains or losses experienced as a direct effect of the organism’s own social behavior; an organism’s indirect fitness is the fitness gains or losses experienced due to the effects of
the organism’s social behavior on others with whom it shares a proportion of genes (Bourke 2011). As this definition indicates, adaptations are design features, which function to maximize an organism’s inclusive fitness. Fitness is an operational measure of an organism’s reproductive success, so adaptations are ‘design features’, which maximize the reproductive success of an organism. This definition of adaptation poses a problem for building a definition of societal-level adaptations since societies do not reproduce as do biological organisms (Turner 2010). Whereas the evolution of biological organisms is driven by the reproduction of these organisms, the evolution of societies is driven by the persistence of social forms across time and space. Substituting persistence for reproduction, societal-level adaptations should be the ‘design features’ of a society, which facilitate the persistence of that society. While re-orienting the definition of adaptation to focus on persistence rather than reproduction, in order to facilitate the application of the concept of adaptation to human societies may seem like biological heresy, there are a handful of biologists and philosophers of biology who argue that persistence is more fundamental to fitness than is reproduction (Cooper 1984; Bouchard 2008, 2011; Bourrat 2013; Doolittle 2014).

To understand why persistence is more fundamental to the notion of fitness than is reproduction, it is necessary to look at the function of reproduction. The function of reproduction is to create a new organism, who shares all or some of the same genes as the parent organism. This allows the information contained in the genes that exist in the parent generation to continue to exist, to persist, into the offspring generation. Organisms grow old and die, this spells the end for the genes contained within the organism. As
genes are wrapped up in organisms that grow old and die, the only way genes can ensure
the persistence of the information contained within the genes is by being copied into a
new organism. Eventually this new organism will grow old and face the specter of death,
so to ensure the persistence of information, the genes in this organism will again need to
be copied into yet another new organism. If the genes are successful, this process will
repeat over and over and over again. The information contained in genes persists through
time and space, reproduction is simply one strategy that genes may use to persist when
they are constrained by the limitations that come with being wrapped up in the bodies of
short-lived, mortal organisms (Bouchard 2008, 2011). As the information in genes is
driven to persist, and as reproduction is simply one method for persisting, by maximizing
their reproductive success organisms are simply maximizing the persistence of the
information contained within their genes.

Bouchard (2008, 2011) uses the example of the quaking aspen to illustrate how
large, long-lived organisms experience selection pressures for maximizing persistence
rather than for maximizing their reproductive fitness. Quaking aspen are giant clonal
organisms; what may look like a forest of hundreds or thousands of distinct trees will
actually be an interconnected network of trees, which have all grown from a common
root system (Bouchard 2008, 2011; Godfrey-Smith 2009). The largest quaking aspen in
the world is believed to be in Utah, nicknamed Pando it contains over 47,000
interconnected tree trunks covering over 106 acres. Pando is estimated to be over 80,000
years old; quaking aspen can live to be over 1 million years old (Bouchard 2008, 2011).
Quaking aspen can reproduce by producing seeds, or they can grow bigger by sending
out runners below ground, which then produce what appear to be new trees, but, which are in actuality just branches. Due to a lack of water or sunlight most seeds die before they are able to germinate, but the new branches, which grow from underground runners are able to use the nutrients they receive from their already well-established root systems to survive. Also a single, large integrated clone can out-compete a forest full of separate seedlings because of the advantages provided by its integrated root system. Due to this fact, quaking aspen often devote their resources towards sending out runners to produce new branches, which can replace the branches that die rather than devote their resources to the production of seeds. In quaking aspen, selection pressures for persistence have led aspen to allocate few resources to reproduction, while allocating a significant amount of resources to the production of new branches, which more effectively allows for the continued persistence of the aspen (Bouchard 2008, 2011). Given examples such as the quaking aspen, Bouchard (2008, 2011) argues that fitness should be measured by persistence rather than reproductive success.

While many philosophers of biology are willing to concede that some types of organisms experience selection pressures to maximize persistence rather than reproduction, they reject the idea that selection for persistence can lead to adaptive evolution (Okasha 2006, Godfrey-Smith 2009). If organisms do not reproduce, populations of these organisms will lack the variation necessary for selection to produce adaptations. Instead, the population will simply get progressively smaller and smaller as the less fit (less persistent) organisms die off (Godfrey-Smith 2009). While this argument sounds convincing, it overlooks a key fact about organisms. Populations of organisms
require variation for natural selection to produce adaptations, but organisms themselves are populations of lower-level entities. Because organisms themselves are populations of lower-level entities, selection amongst these lower level entities can lead to the evolution of adaptations even if the total organism never reproduces. For instance, by continuously devoting resources toward the replacement of the lower-level entities that die, organisms can persist without reproduction. If variation occurs in the lower-level entities that organisms produce to replace those entities that die, some of these variants are more likely to help the organism survive in its environment than will other variants. As more and more of the survival enhancing variants accumulate in an organism, the more will the continued persistence of the organism be due to these survival enhancing variants. Because of this fact, the survival enhancing variants can be considered adaptations, which function to support the continued persistence of the larger organism (Doolittle 2014). This is exactly what happens with quaking aspen (Bouchard 2008, 2011) and with societies (Turner 2010). By continuously sending out new runners, which grow into branches, quaking aspen are able to replace the branches that die. Phenotypic variation caused by mutations in the meristem cells of runners causes some branches to do better in their environment than others. As the composition of the quaking aspen becomes more structured around these successful variants, the quaking aspen’s continued survival is more and more a result of these successful variants. By continuously replacing branches through the production of runners, rather than reproducing new trees through the production of seeds, quaking aspen evolve adaptations, which function to maximize the aspen’s fitness (persistence) in its environment.
As the example of the quaking aspen show, persistence is a fundamental component of fitness and certain organisms, specifically organisms that are long-lived and that reproduce slowly and ineffectively like the quaking aspen or human societies, will experience selection pressures to maximize persistence through survival rather than through reproduction. If it is accepted that persistence is a fundamental component of fitness then adaptations can be defined as ‘design features’ of organisms, which maximize the persistence of the organism. Applying this definition of adaptation to processes of societal evolution, societal adaptations are the ‘design features’ of a society, which maximize the persistence of that society.

Further specificity can be added to this definition by looking at what organisms must do to persist. From a physical perspective, organisms are “transient ‘pools’ of low entropy”, which persist “only by disordering the universe in which they exist” (Turner, J. Scott 2000: 12). Organisms are temporary pools of high order (Turner, J. Scott 2000). For organisms to maintain their status as transient pools of low entropy, organisms must manage the flow of energy in their environment. As entropy increases over time, organisms are constantly losing the order-producing energy they need to persist. To counteract this loss of energy, organisms must manipulate their environment, so as to produce a flux of energy into the organism. For instance, humans eat energy-dense foods, which replace the energy that humans lose as they go about their daily activities. As long as organisms are able to manage the flow of energy in their environment in a way that allows them to maintain their state of low entropy, organisms will persist. Just as biological organisms must capture energy from their environment to persist; human
societies must also capture energy from their environment in order to persist (White 1943; Morris 2013, 2015). Indeed, just as are biological organisms, human societies are transient ‘pools’ of low entropy, which persist only by disordering the universe in which they exist. As the persistence of both organisms and societies depends on their ability to capture energy from their environment, adaptations function to maximize persistence by facilitating the ability of an organism to capture, store and use energy in its environment. Following from this logic, societal adaptations are those ‘design features’ of a society, which maximize the society’s persistence by allowing the society to capture, store and use the energy in its environment.

Bringing the discussion back to Queller and Strassmann’s definition of organisms, a handful of conclusions are warranted. Organisms are populations of lower-level entities, which feature high levels of cooperation and low levels of conflict among the entities making up the organism. In featuring high levels of cooperation and low levels of conflict, organisms exhibit adaptations. Although organisms need not have a complete and total absence of conflict, organisms must be able to suppress conflict, so that any conflict present within the organism does not disrupt the organism’s adaptive functioning (Queller and Strassmann 2009; Strassmann and Queller 2010). Given these criteria, Queller and Strassmann as well as others (Stearns 2007; West et al. 2015) argue that human societies are not organisms due to the high levels of conflict that societies can exhibit. Despite their claim that societies have too much conflict to be considered organisms, these authors never explore when and how conflict in a society actually disrupts the adaptive function of the society; they simply declare outright that societies
have too much conflict to be organisms. When the above definition of societal adaptation is used to assess the adaptive functioning of a society it becomes clear that the conflicts that take place within a society, do not necessarily disrupt the ability of the society to capture, store and use energy in its environment.

Of course there are cases when intrasocietal conflicts may disrupt the ability of a society to capture, store and use energy. For instance, as rival chiefs continuously competed with each other to build the most impressive monuments on Easter Island, this status competition helped contribute to the deforestation of the island. As the island became deforested its inhabitants lost a precious source of energy, which contributed to the eventual collapse of Polynesian society on Easter Island (Redman 1999; Diamond 2004). Whereas intrasocietal conflict can lead to the disruption of a society’s adaptive functioning, in many cases such conflict does not disrupt the society’s ability to capture, store and use energy. This is because societies feature complex regulatory mechanisms, which have evolved to suppress intrasocietal conflict. Due to the presence of such regulatory mechanisms, which operate to control the harmful societal-level effects of conflict, instances of conflict within a society do not require rejecting the organismic character of human society outright; just as the potential conflict created by the presence of transposable elements in the genomes of multicellular organisms does not require one to reject the organismic character of animals outright.

Furthermore, many biologists and philosophers of biology recognize that organismality is not a dichotomous variable, where populations of lower-level entities are either organisms or they are not. Organisms exist along a continuum, whereby
populations of cooperating entities can be seen as more or less organismic; organismality is a matter of degree (Queller and Strassmann 2009; Strassmann and Queller 2010; Godfrey-Smith 2009; Herron et al. 2013; Clarke 2013). For instance, a mouse is more organismic than a slime mold, which itself is more organismic than a yeast floc (Queller and Strassmann 2009). As organismality is a matter of degree, societies may be more organismic than they are not, even if they have too much conflict to be considered paradigmatic organisms. Finally, the evolution of functionally integrated organisms from the starting point of separate, lower-level entities is a slow evolutionary process. Due to the slow nature of this process, human societies may be on their way to becoming organisms, even if they are not yet fully organismic. Thus, different societies should exhibit different degrees of organismality. Recognizing that organismality is a matter of degree and recognizing that evolution towards organismality is a slow process provides two additional reasons why the organismic character of human societies should not be rejected a priori.

As the above arguments have attempted to demonstrate, societies can and do have the character of organisms. Societies can have high levels of cooperation. Societies can also have sophisticated regulatory mechanisms, which function to suppress internal conflict. In featuring high levels of cooperation and mechanisms that suppress internal conflict, societies are able to manifest adaptations, which allow these societies to capture the energy necessary for their continued persistence. To illustrate the organismic character of human societies the next chapter will start by outlining the three-part process by which higher-level organisms emerge from aggregations of lower-level entities.
Higher-level organisms begin to emerge as aggregations of lower-level entities experience selection pressures for social group formation and social group maintenance. Once groups have formed, when increases in group size lead to increases in complexity, which in turn enable further increases in group size, a social transformation happens and a higher-level organism emerges from the aggregation of lower-level entities (Bourke 2011). After outlining this process in the abstract, the next chapter will then show how this three-part process led to the emergence of multicellular organisms and eusocial societies before finally showing how this process led to the emergence of the human societal organism.

According to the argument that follows, by 50,000 years ago selection pressures for social group formation and maintenance had endowed foraging societies with the basic characteristics of organisms. Archeological evidence on prehistoric foraging populations and ethnographic evidence from contemporary foraging populations suggests that the foraging societies of the Upper Paleolithic were likely to have featured informal social systems for motivating cooperation and for regulating conflict. Such informal systems would have allowed these foraging societies to capture the energy from their environment that was necessary for their persistence. From around 50,000 years ago until the Neolithic revolution, the globe was dominated by these foraging societies; societies, which I will argue had the character of simple organisms. With the emergence of agriculture, a size-complexity feedback relationship was initiated, which would transform the simple organisms of foraging societies into the complex organisms of agricultural and industrial civilizations.
This size-complexity feedback relationship is outlined by the iteration model of world-system transformation presented by Chase-Dunn and Hall (1997) and Chase-Dunn and Lerro (2013). The iteration model is depicted in Figure 2. According to the iteration model, which will be more fully elaborated in the following chapters, as human societies grow in size, the problems associated with population growth initiate selection pressures, which favor migration, the formation of hierarchies and technological development. These structures in turn enable future population growth. The iteration model is a recursive model, where increases in size create selection pressures favoring increases in complexity; complexity, in turn, enables further increases in size.

![Figure 2: The Iteration Model of World-System Transformation (Chase Dunn and Hall 1997; Chase Dunn and Lerro 2013)](image)

As the following chapters will attempt to demonstrate, with the emergence of agriculture starting sometime around 12,000 years ago, the size-complexity feedback relationship outlined by the iteration model was initiated, and by 5,000 years ago, the
simple organisms of foraging societies had been transformed into the complex organisms of agricultural civilizations. Whereas the simple organisms of foraging societies were characterized by informal networks of cooperation and by informal systems of conflict regulation, when the emergence of agriculture allowed populations to grow, such population growth created selection pressures favoring the elaboration of technologies of distribution⁴, which could facilitate the cooperation necessary to sustain the growing societal organism. Such population growth would also create selection pressures favoring the elaboration of technologies of power⁵, which could regulate conflict within the growing societal organism. Due to the operation of such selection pressures, agricultural civilizations would come to be characterized by increasingly differentiated divisions of labor and increasingly complex networks of both within and between community exchanges; such developments represent the elaboration of technologies of distribution. Agricultural civilizations would also come to be characterized by formal systems of law, and by monotheistic and polytheistic religions; such developments represent the elaboration of technologies of power.

As societal evolution unfolded and agricultural organisms continued to expand, civilizations would increasingly come into conflict and by the mid-19th century one specific societal organism, the societal organism that Wilkinson (1987, 1992, 1993) calls

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⁴ Integrating insights from Mann (1986), Turner (2010) and Chase-Dunn and Lerro (2013), I define ‘technologies of distribution’ as socio-cultural structures, which facilitate the movement of matter, energy and information throughout the societal organism.

⁵ Integrating insights from Mann (1986), Turner (2010) and Chase-Dunn and Lerro (2013), I define ‘technologies of power’ as socio-cultural structures, which facilitate the coordination and control of the various entities that compose the societal organism.
the Central civilization, would come to violently engulf all of the other societal organisms inhabiting the planet. Along with violently engulfing all of the other societal organisms on the planet, during the 19th century a handful of the societies that made up the Central civilization would revolutionize methods of energy capture, becoming increasingly reliant on the energy provided by fossil fuels. As the Central civilization grew to encompass the entire globe, and as more and more of the Central civilization came to rely on the energy provided by fossil fuels, selection pressures would continue to operate on what was a now a global societal organism. Such selection pressures would favor the further elaboration of both technologies of distribution and technologies of power. In response to selection pressures for the elaboration of technologies of distribution, the global societal organism would come to be characterized by globalized networks of exchange and a globalized division of labor. In response to selection pressures for the elaboration of technologies of power, the global societal organism would come to be increasingly characterized by democratic forms of governance and by the formation of international peacekeeping agencies, such as the United Nations. The following chapters will trace this evolutionary story in more detail, paying specific attention to how as societal organisms grew in size and scope overtime, selection pressures acted on these societal organisms favoring the elaboration of technologies of distribution and technologies of power.

CONCLUSION

The organismic analogy dates back to the founding of the discipline. During the classical era of sociological theory, the organismic analogy found its way into the theoretical
schemes of Comte, Durkheim and Worms in France, of Schäffle in Germany, of Spencer in England, and of Cooley in America. Despite the prominence of the organismic analogy in classical sociological theory, the analogy was not without its classical era critics. Most notably, Weber rejected the reification of society, which pervaded the organism metaphor. Despite its early popularity, throughout the 20th and early part of the 21st century the organismic analogy fell out of favor within sociological theory. Associated with excessive holism, functionalism and the potential pitfalls of importing biology into sociology, the organismic analogy has receded into the background of sociological theory. At the same time that sociologists have been abandoning discussion of the organismic character of human society, evolutionary theorists have been devoting more and more attention to uncovering just what it is that makes an organism an organism. Organisms are entities that feature high levels of cooperation and low levels of conflict amongst their component parts; organisms are entities that feature adaptations (Queller and Strassmann 2009; Strassmann and Queller 2010).

Using this new definition of organisms, the organismic analogy can be re-introduced into sociological theory. The following chapters will attempt to do just that. After first outlining how organisms evolve from aggregations of lower level entities, I will argue that by 50,000 years ago small bands of foragers had the characteristics of simple organisms. I will then outline a theory of societal evolution based on the iteration model of Chase-Dunn and Hall (1997) and Chase-Dunn and Lerro (2013). This theory of societal evolution will be used to argue that as societal evolution has unfolded, the organismic character of human societies has been transformed. Over the long course of
societal evolution human society has, in general, become more organismic. As societal evolution has transpired, selection pressures favoring elaborations of technologies of distribution have led to an increasingly complex and global division of labor. Such selection pressures have also led to increasing levels of global commercialization over time (Sanderson 1999; Chase-Dunn and Hall 1997; Chase-Dunn and Lerro 2013). At the same time, selection pressures favoring elaborations of technologies of power have led to the elaboration of regulatory institutions, such as religion and law, which suppress societal conflict (Lenski and Lenski 1987; Turner and Maryaslnski 2008; Morris 2014). As levels of cooperation have increased and as societies have developed increasingly sophisticated mechanisms for suppressing conflict, the ability of societies to capture, store and use the energy in their environments has expanded dramatically (Morris 2013; Fischer-Kowalski et al. 2014; Ellis 2015). As societal evolution has unfolded, societies have become, in general, more organismic.
Chapter 3: Parallel Principles of Organization

INTRODUCTION

The prior chapter outlined the history of the organismic analogy in classical sociological theory and developed a definition of the organism grounded in evolutionary theory. Organisms are collective entities that feature high levels of cooperation and low levels of conflict. In featuring high levels of cooperation and low levels of conflict, organisms are able to adaptively control flows of energy in their environment, which enables the organism’s continued persistence. Moreover, organisms emerge through processes of evolution. This chapter will analyze the time period between the divergence of humans and chimpanzees from their last common ancestor around 6 to 7 million years ago until the Middle/Upper Paleolithic transition around 50,000 years ago in an attempt to illustrate the general evolutionary processes that endowed prehistoric foraging societies with the character of simple organisms. In so doing, the present chapter will use the three stages of an evolutionary transition in individuality outlined by Bourke (2011) to explain how, in the matter of a few million years, evolution made a higher level organism out of populations of individualistic primates with a propensity for weak social ties. By using Bourke’s (2011) model to show how evolutionary processes produced the organismic character of human societies, the evolution of the human societal organism will be conceptually tied to the evolution of both multicellular organisms and eusocial societies. In tying the evolution of the human societal organism to the evolution of multicellular organisms and eusocial societies this chapter will attempt to illustrate how parallel
principles of organization structure the shape of life at all levels of complexity, a point recognized by Herbert Spencer over 100 years ago.

THE EMERGENCE OF A HIGHER LEVEL ORGANISM

The evolution of an organism at a higher level of biological complexity, an evolutionary transition in individuality, involves three processes: social group formation, social group maintenance, and social group transformation (Bourke 2011). This section will illustrate the operation of these three processes at an abstract level, while attempting to show how these processes shaped the evolutionary emergence of both multicellular organisms and eusocial animal societies. The following section will illustrate how these same exact evolutionary processes shaped the evolutionary emergence of the most complex organism on the planet earth – the human societal organism.

The origin of multicellular organisms involved the aggregation of multiple unicellular organisms into groups and the transformation of these groups into an integrated whole. The emergence of multicellular organisms from unicellular organisms happened independently 25 times (Grosberg and Strathmann 2007). In prokaryotic organisms, multicellularity evolved at least 3,500 million years ago (Schopf 2006); in eukaryotic organisms, multicellularity evolved as early as 490 million years ago in cellular slime molds (Bonner 2009), as early as 234 million years ago in volvocine algae (Herron and Michod 2008), and as early as 1,450 million years ago in animals (Hedges et al. 2004).

The origin of eusocial societies involved the aggregating of individual organisms into societies characterized by a reproductive division of labor, overlap of generations
and cooperative brood care (Wilson 1987). Eusociality evolved independently at least 24 times and occurs primarily in insects, but it is also found in shrimps and at least one species of mammal – mole rats (Bourke 2011). Although many biologists argue that eusocial societies require an irreversible reproductive division of labor, some biologists argue that a temporary reproductive division of labor is sufficient for a species to be considered eusocial (Sherman et al. 1995). When this broader definition of eusociality is used many species of cooperatively breeding birds and fish and some species of mammals, such as wolves and wild dogs can be considered eusocial as well. Some authors even argue that humans and some species of whales are eusocial (Foster and Ratnieks 2005; Crespi 2014; McAullife and Whitehead 2005). Both human women and female whales go through menopause after which they spend the remainder of their adult life sterile. When this happens females focus their energy on providing assistance and information to younger group members rather than on their own reproduction. This division between reproductive and non-reproductive females living within the same society is a reproductive division of labor, therefore humans and whales both have this major characteristic of eusociality (Foster and Ratnieks 2005; Crespi 2014; McAullife and Whitehead 2005). Regardless of whether a broad or a narrow definition of eusociality is used, the earliest estimate for the evolutionary emergence of eusociality is 170 million years ago (Bourke 2011).

The first step in the evolution of an organism at a higher level of complexity is social group formation, which is brought about by the interaction of ecological, synergistic, and genetic factors (Bourke 2011). Ecological factors involve features of the
external environment, which encourage individuals to come together into social groups. A number of ecological factors encourage the formation of social groups at varying levels of biological complexity. Groups may form due to environmental stresses and shortages of food, or because of variability in the availability of food. In multicellular organisms, environmental stress creates selection pressures for group formation as the formation of groups allows some cells to be protected within layers of other cells (Bourke 2011). This was demonstrated by experiments with budding yeast (*Saccharomyces cerevisiae*). In a liquid medium, when a toxin was introduced into the medium, budding yeast cells formed multicellular clusters, which protected the cells at the center of the cluster from the harmful effects of the toxin that had been introduced into the medium (Smukalla et al. 2008). In multicellular organisms, shortages of food also create selection pressures for larger size, which allows more nutrients to be stored by the multicellular organism as these nutrients can be realized through the self-sacrifice of cells during times of food shortage (Bourke 2011). For instance, in multiple species of bacteria, autolysis, which releases nutrients as cells breakdown, is induced when resources are limited (Lewis 2000; Nedelcu et al. 2010).

In eusocial societies, environmental stress creates selection pressures for group life as a buffer against times of resource shortage (Bourke 2011). Across species of African mole-rats, the degree of eusociality is negatively associated with the density of food and positively associated with variability in rainfall (Faulkes et al. 1997; O’Riain and Faulkes 2008). Also in eusocial societies, variability in food supply creates selection pressures for non-dispersal from sites with high-quality resources (Bourke 2011). For
instance, experiments on Carrion crows (*Corvus corone*), have found that experimentally adding resources to territories increased the level of non-dispersal and helping observed by offspring (Baglione et al. 2006). In eusocial societies, social group formation is also encouraged by selection pressures that act when there are limited nesting sites in the environment. When all suitable nest-sites are occupied, the members of eusocial societies will experience selection pressures favoring non-dispersal. For instance, in experiments on the dispersal patterns of allodapine bees (*Exoneura nigrescens*), female bees were more likely to remain in their initial nests when other nest-sites were experimentally removed from the environment (Langer et al. 2004).

Along with environmental stress, shortages of food and open nest-sites, predation is another ecological factor that creates selection pressures for group formation. In multicellular organisms, the presence of predators creates selection pressures for multicellularity as multicellular groups are better able to defend themselves against predation (Bourke 2011). In experiments on cellular slime molds (*Dictyostelium discoideum*), multicellular aggregations, but not singular amoebae were able to escape predation from experimentally added nematodes (Kessin et al. 1996). Additionally, it has been shown that among volvocine algae, multicellular but not unicellular species are above the size threshold for being preyed upon by filter feeders (Kirk 1998). Similarly, in eusocial societies the presence of predators creates selection pressures for group formation as groups are able to better defend against predation than are solitary individuals. For instance, in cooperatively breeding cichlid fish (*Neolamprologus pulcher*), the experimental addition of predators reduced the dispersal of fish from
habitats where these fish acted as helpers (Heg et al. 2004); the addition of predators has also been shown to increase the amount of intragroup affiliation behavior observed in groups of cichlids after conflict with the predator has ended (Bruintjes et al. 2016).

Furthermore, collective defense of nest-sites played a vital role in the evolution of eusociality in ants (Wilson and Hölldobler 2005; Hölldobler and Wilson 2008).

Just as ecological factors create selection pressures favoring social group formation, the organizational structure of social groups can also create selection pressures favoring social group formation. These internal factors are what Bourke (2011) calls synergistic factors of group formation. The benefits of group foraging can create selection pressures favoring social group formation. In multicellular organisms, group foraging allows the organism to reach and digest food that is either inaccessible or indigestible to unicellular organisms (Bourke 2011). For instance, in the cellular slime mold *Dictyostelium discoideum*, amoebae that are shed from migrating slugs can reach food that is inaccessible to singular amoebae (Kuzdzal-Fick et al. 2007); and aggregations of myxobacteria collectively produce beneficial digestive compounds that are not produced by singular myxobacteria (Velicer and Vos 2009). In eusocial societies, group foraging increases the probability of successful acquisition of food, it also allows for more efficient foraging (Bourke 2011). For instance, in African wild dogs (*Lycaon pictus*) prey size, capture probability, and per capita net rate of energy intake all increased with increases in group size (Rasmussen et al. 2008). Furthermore, the advantages of group foraging, just as did the advantages of collective nest defense, also played a vital
role in the emergence of eusociality in eusocial ant species (Wilson and Hölldobler 2005; Hölldobler and Wilson 2008).

Another synergistic factor that creates selection pressures favoring group formation is a division of labor. Some vital processes cannot occur simultaneously within a cell, or be performed simultaneously by an individual within a eusocial society. In multicellular organisms, a division of labor allows for the separate performance of incompatible biochemical or mechanical processes (Grosberg and Strathmann 2007; Bourke 2011). For instance, photosynthesis interferes with nitrogen fixation. Due to this fact unicellular species of cyanobacteria must either forgo nitrogen fixation all together, or they must divide their time, spending the day photosynthesizing and the night fixing nitrogen. Multicellular species of cyanobacteria have evolved a specialized cell type, which fixes nitrogen. This allows multicellular species of cyanobacteria to divide the functions of photosynthesis and nitrogen fixation spatially rather than temporally, which is a more efficient arrangement (Grossberg and Strathmann 2007). Similarly, unicellular species of volvocine algae are unable to simultaneously swim and reproduce. Multicellular species of volvocine algae have evolved a germ-soma differentiation, which allows some cells to specialize in cell division, while other cells specialize in flagellar motility (Michod 2005; Grosberg and Strathmann 2007).

In eusocial societies a division of labor allows the group to perform tasks in parallel that a solitary individual would only be able to perform in a series, which increases the efficiency of the tasks performed (Bourke 2011: Goldsby et al. 2012). For instance, among carpenter bees (Xylocopa sulcatipes), social nests were more productive
than solitary nests. In social nests some bees could focus on foraging, while others focused on guarding the nest. In solitary nests, this division of labor was not possible, which limited the productivity of these nests (Bourke 1997). Similarly, in eusocial shrimp (*Synalpheus regalis*), a division of labor between large males, small juveniles and the queen allows both juveniles and the queen to move about the colony’s host sponge to feed, while large males engage in colony defense (Duffy and Morrison 2002). This division of labor in nest defense along with a coordinated group response to intruders has allowed eusocial shrimp to occupy a larger fraction of habitats, use a wider range of resources and enjoy a greater local abundance than do non-eusocial species of shrimp (Duffy and Macdonald 2010).

As ecological factors and synergistic factors create selection pressures favoring the formation of social groups, solitary individuals will aggregate into social groups. For the selection pressures created by ecological and synergistic factors to produce viable social groups, these selection pressures must work in concert with genetic selection pressures (Bourke 2011). The behavior of living entities is oriented towards the perpetuation of the information contained within the genes of these living entities (Dawkins 1976, 1982; Bourke 2011). Due to this fact, selection has favored organisms that cooperate only in specific situations. Organisms have been selected to engage in cooperative behaviors when such cooperation, throughout the evolutionary history of life on earth, has perpetuated the information contained within the genes of the cooperative organism. This means that organisms will cooperate when cooperation benefits individuals with whom they share the genes for cooperation. In this case cooperation is
selected for due to indirect fitness benefits (Sachs et al. 2004; Lehmann and Keller 2006; West et al. 2007, 2011; Bourke 2011). Organisms will also cooperate when cooperation leads them to experience some return benefit through mutualism, reciprocal benefits, or benefits enforced through punishment and policing. In this case cooperation is selected for due to direct fitness benefits (Sachs et al. 2004; Lehmann and Keller 2006; West et al. 2007, 2011; Bourke 2011). When organisms cooperate with non-relatives and when these interactions lack direct fitness benefits for the organism performing the cooperative behavior, such cooperation will be unstable. In this way, genetic factors limit the viability of the social groups that are formed as a result of the operation of ecological and synergistic factors. Not only must ecological and synergistic factors create selection pressures favoring the formation of social groups, the individuals within the newly formed social groups must also be interacting with genetic relatives, or they must be interacting in situations where their cooperative behavior provides them with a direct fitness benefit. When such an arrangement takes place, leading to the successful formation of social groups, the newly formed social groups must then maintain their unified character. Social group maintenance is the second process involved in the evolution of a higher-level organism (Bourke 2011).

The existence of a social group depends upon the members of that social group engaging in cooperative, group-oriented behaviors. Individuals must pay a cost to be a part of a group, but they also receive benefits from their group membership. This situation creates selection pressures for individuals to free-ride, to receive the benefits of group life without paying the costs of group membership. For group existence to be
maintained in the face of selection pressures favoring free-riders, the selection pressures favoring group-living must lead to the evolution of mechanisms that operate to suppress conflict within the social group. This process is what Bourke (2011) calls social group maintenance. Social groups may fall prey to exploitation from entities both inside and outside of the social group, so because of this, if groups are to persist they must evolve mechanisms, which can limit exploitation from both inside and outside of the group. To limit exploitation from outsiders, social groups must evolve methods for distinguishing between group and non-group member, so that benefits can be withheld from entities outside of the group. To limit exploitation from insiders, social groups must evolve mechanisms for coercing group-oriented behavior, thereby limiting individually-oriented behavior and free-riding.

Multicellular organisms have evolved multiple mechanisms for distinguishing between cells that are a part of the organism and cells that come from outside of the organism. A variety of organisms including bacteria, social amoebae, plants and colonial marine invertebrates have been shown to have allorecognition systems, which allow these organisms to distinguish self from non-self and react accordingly (Rosengarten and Nicotra 2011). Vertebrates have complex immune systems, which allow these organisms to distinguish between cells that are a part of the self and cells that are not (Pancer and Cooper 2006). Finally, the harms posed to multicellular organisms by malignant tumors likely played a role in driving selection for immune response through the major histocompatibility complex in jawed vertebrates (Murgia et al. 2006). Eusocial societies also have evolved a variety of mechanisms for discriminating between nestmates and
non-nestmates. For instance, eusocial shrimps, ants, bees, and mole-rats have all been shown to not only recognize nestmates, but to also act aggressively towards non-nestmates (Duffy and Morrison 2002; Hölldobler and Wilson 2008; Bos and d’Ettorre 2012; Breed 1983; O’Riain and Jarvis 1997). By distinguishing between cells that are a part of the self and cells that are not, and by recognizing nestmates and acting aggressively towards non-nestmates, the cells in multicellular organisms and the individuals in eusocial societies are able to restrict the benefits of group membership to those individuals who are actually members of the group; a key process in social group maintenance (Bourke 2011).

Along with evolving mechanisms for limiting exploitation from outsiders, multicellular organisms have also evolved a variety of mechanisms for limiting exploitation from individuals within the group. Many multicellular organisms are characterized by both a germ-soma separation and a reproductive bottleneck. Both of these features limit exploitation by selfish cell lineages and by selfish genetic elements (Dawkins 1982, 2004). Multicellular organisms have also evolved mechanisms to enforce the fairness of meiosis, which limits exploitation by selfish genetic elements (Burt and Trivers 2006; Bourke 2011). Eusocial societies have evolved a variety of mechanisms for limiting exploitation from within the group. For instance, in the ant species *Dinoponera quadriceps*, when a beta female challenges an alpha female, which could have disruptive consequences for the entire nest, the alpha will mark the beta female with a chemical secretion. The presence of this secretion then induces low-ranking workers to physically immobilize the beta female, which serves to punish her for
her selfish actions (Monnin et al. 2002). This is an example of using punishment to quell self-oriented behavior in eusocial societies. Along with punishment, eusocial societies have also evolved policing mechanisms to suppress self-oriented behavior. For instance, in eusocial species of the order hymenoptera workers have been found to both eat the eggs laid by other workers and to attack workers with activated ovaries. Such policing discourages workers that are not the queen from laying eggs (Ratnieks et al. 2006). By limiting the ability of selfish individuals to gain from their selfish behavior, both multicellular organisms and eusocial societies are able to maximize the benefits of group existence. As ecological, synergistic and genetic factors create selection pressures favoring group formation, and as these selection pressures lead to the evolution of mechanism for limiting exploitation the stage is set for social group transformation.

Finally, once individual entities have aggregated into social groups, and once these groups have evolved mechanisms for limiting exploitation from both within and outside of the social group, the group must be transformed into a coherent individual in its own right. The group must become an organism. Bourke (2011) calls this process social group transformation and it is the final step in an evolutionary transition in individuality. Bonner (1988), re-inventing an idea that was known to Comte, Spencer, and Durkheim over 100 years earlier, argued that there is a fundamental relationship between the size of an organism and its internal complexity. According to Bonner (1988) there is a rough correlation between the size of an organism and the complexity of the organism. As the number of cells in an organism increases, the number of differentiated cell types increases as well. Building off of Bonner’s (1988) size-complexity rule,
Bourke (2011) provides the size-complexity hypothesis. According to this hypothesis, an association between size and complexity can lead to a positive feedback relationship between the two variables. When this happens increases in size will lead to increases in complexity, which will enable further increases in size. When ecological and synergistic factors create selection pressures for increased group size, increases in group size will create selection pressures favoring the evolution of both reproductive and non-reproductive divisions of labor. When reproductive and non-reproductive divisions of labor emerge as a result of selection pressures created by increasing group size, the existence of such divisions of labor will encourage further increases in group size, initiating a spiral of increasing group size and complexity. The operation of this positive feedback relationship between size and complexity accounts for the process by which groups of organisms are transformed into a singular, individual organism (Bourke 2011).

In multicellular organisms the size-complexity hypothesis explains the emergence of complex multicellularity from simple multicellular organisms (Bourke 2011). Simple multicellular organisms are multicellular organisms with a low degree of reproductive division of labor, a low degree of non-reproductive division of labor, and a relatively few number of cells as far as multicellular organisms are concerned (Bourke 2011). Complex multicellular organisms feature both reproductive and non-reproductive divisions of labor; they also feature a relatively high number of cells (Bourke 2011). Simple multicellular organisms include cellular slime molds and some of the smaller, multicellular species of volvocine algae. Complex multicellular organisms include many species of plants, animals and fungi (Bourke 2011). Consistent with the size-complexity
hypothesis, among eukaryotic organisms there is a positive association between the size of the organism and the presence of a morphologically distinct germ-line. Furthermore, there is also an association between number of cells and number of somatic cell types in multicellular organisms (Bonner 1988; Bourke 2011). In eusocial societies, the size-complexity hypothesis explains the emergence of complex eusociality from simple eusocial societies (Bourke 2011). Just as with multicellular organisms, simple eusocial societies have a low degree of both reproductive and non-reproductive division of labor. They are also smaller than are complex eusocial societies. Complex eusocial societies feature highly developed reproductive and non-reproductive divisions of labor; they also are much larger than are simple eusocial societies (Bourke 2011). Simple eusocial species include alldapine and halictid bees, and other cooperatively breeding vertebrates. Complex eusocial species include eusocial ant and termite species. Consistent with the size-complexity hypothesis, among eusocial societies there is a positive correlation between the size of the society, the existence of morphologically distinct reproductive castes, and the number of worker castes (Bourke 2011; Ferguson-Gow et al. 2014).

As the above discussion has outlined, an evolutionary transition in individuality, or the emergence of a higher-level organism, requires the operation of three processes. First, ecological, synergistic, and genetic factors must interact to create selection pressures favoring the formation of social groups. Second, selection pressures acting on social groups must override the selection pressures acting on individuals within groups, leading to the emergence of mechanisms that limit exploitation from both inside and
outside of the social group. Third, selection pressures acting on social groups must initiate a positive feedback relationship between size and complexity, which causes the group to become transformed into a coherent individual. Now that these three processes and their role in the evolution of multicellular organisms and eusocial societies has been outlined, the role of these processes in the evolution of the human societal organism can be outlined in order to illustrate the parallel organizational processes, which have governed the emergence of these three types of organisms.

THE EMERGENCE OF THE HUMAN SOCIETAL ORGANISM

The first step in the evolution of a higher level organism, the first step in an evolutionary transition in individuality, is social group formation (Bourke 2011). As the previous section outlined, the formation of social groups is an outcome of selection pressures created by the confluence of ecological, synergistic, and genetic factors acting on populations of organisms. These selection pressures were probably already beginning to be experienced with the appearance of the first hominins 6 to 7 million years ago. Primates evolved in the warm and wet forested environments that characterized the late Paleocene and early Eocene (Jablonski 2005; Turner and Maryanski 2008). By the early Miocene, around 23 million years ago, apes and monkeys had diverged into two separate taxa, with both apes and monkeys migrating into different ecological niches (Jablonski 2005; Turner and Maryanski 2008). By the middle Miocene, apes were thriving in the forested environments of the epoch, but beginning around 13 million years ago the world entered a period of rapid cooling. During this period of rapid cooling, the global climate became dryer, rainfall became more seasonable and more variable, and the forested areas
that supported ape populations began to retreat being replaced by wooded grasslands (Jablonski 2005; Turner and Maryanski 2008). As forests receded, changing environments would initiate a series of selection pressures, which would lead to the extinction of most ape species. Despite the extinction of most species of ape during this time period, by 6 to 7 million years ago hominins and chimpanzees would diverge from their last common ancestor (Jablonski 2005; Turner and Maryanski 2008). As hominins diverged from their last common ancestor with chimpanzees a series of selection pressures would favor those hominins who began to aggregate together into social groups, setting in motion the dynamics that would produce a higher level organism – the human societal organism.

Not much is known about the last common ancestor (LCA) of humans and chimpanzees, but what is known about the LCA suggests that as humans and chimpanzees diverged during the late Miocene, hominins would have experienced intense selection pressures favoring social group formation. Cladistic analysis of apes and a representative sample of Old World monkey species reveals that the LCA of humans and chimpanzees was likely a solitary primate with a preference for weak social ties and a high level of mobility (Turner 2000; Turner and Maryanski 2008). Despite the individualistic nature of the human and chimpanzee LCA, fossil remains of *Ardipithecus ramidus* dated to around 4.4 million years ago suggest that hominin populations were already experiencing selection pressures to become less socially aggressive and more socially cooperative by this time. These changes indicate an increasing importance of
living in close proximity with conspecifics in hominins by as early as 4.4 million years ago (Suwa et al. 2009; Lovejoy 2009; White et al. 2015).

One ecological factor that was likely creating selection pressures for group formation in early hominins was predation from the many large carnivores that inhabited the African wilderness. Early hominins were slow moving primates (Turner 2000; Turner and Maryanski 2008). Analysis of the fossil remains of *Ardipithecus ramidus* suggests that members of this early hominin species got around the trees by slowly climbing and clambering about, rather than by engaging in the more acrobatic suspensory locomotion that characterizes the arboreal movements of chimpanzees (Lovejoy 2009; White et al. 2015). On the ground, just as it was in the trees, *Ardipithecus ramidus* was slow. *Ardipithecus* appears to have engaged in bipedal locomotion; however, the efficiency of this early form of bipedalism was restricted by adaptations for climbing that were still present in its post-cranial skeleton (Lovejoy 2009; White et al. 2015). Not only were early hominins slow, they were also noisy. African apes give off loud responses when aroused and these responses appear to be outside of the apes’ cortical control, which suggests that the LCA of humans and chimpanzees also lacked the ability to regulate its noisy nature (Turner 2000; Turner and Maryanski 2008). Slow and noisy, as forests receded and hominins spent more time in open habitats they would be easy prey for hungry carnivores. The danger posed to hominins by predation would have created intense selection pressures favoring those individuals that aggregated together in to social groups for defense.
Just as predation creates selection pressures favoring group formation, other ecological factors, such as harsh, variable environments and food shortages create selection pressures for group formation as group living can act as a buffer against these factors (Bourke 2011). Hominins and chimpanzees diverged from their LCA during a time when the climate was, overall, getting cooler and dryer, which led to a progressive reduction in forest cover (Jablonski 2005; Turner and Maryanski 2008). Not only was the climate tending to get cooler and dryer during this time period, this overall cooling and drying trend was characterized by long periods of climate stability punctuated by shorter periods of intense climate variability (Potts 2013; Antón et al. 2014). As hominins evolved through the Pliocene and Pleistocene, rainfall would become more seasonal; also the timing and intensity of rainfall would become more variable and unpredictable (Potts 2013; Antón et al. 2014). These changes in climate, a general cooling and drying trend combined with periods of stability followed by periods of instability would create an environment of resource unpredictability and uncertainty for early hominins (Potts 2013; Antón et al. 2014). Antón et al. (2014) provide an empirical illustration of the high level of environmental variability that characterized the habitats of early *Homo*. These authors report that as African forests gave rise to wooded grasslands, grasslands could account for anywhere from 5% to 80% of woodland areas. Such a variable environment would create selection pressures favoring adaptations, which would allow hominins to survive and reproduce in the face of habitat variability (Potts 2013; Antón et al. 2014). Fossil evidence suggests that early hominins evolved a variety of strategies for dealing with the unpredictability and uncertainty that characterized the
environments of the Pliocene and Pleistocene. Dental evidence suggests that during this time, hominins began to consume a broader range of foods, which would offset the challenges of fluctuating resource regimes (Antón et al. 2014). Fossil evidence also suggests that hominins increasingly relied on changes in social organization to deal with the selection pressures caused by the operation of these ecological factors (Antón et al. 2014).

As ecological factors created pressures for social group formation in early hominins, the existence of these initial social groups would lead to selection pressures for group formation due to the operation of synergistic factors. It is likely that hominins had started to live in social groups by the appearance of *Homo erectus*. From the divergence of hominins and chimpanzees from their LCA to the time of *Homo erectus*, hominins appear to have experienced a good deal of increase in both body and brain size. In terms of body size increase, Aiello and Dean (2002) estimate that *Australopithecus afarensis* weighed around 50 kg, whereas they estimate that *Homo erectus* weighed around 59 kg. In terms of brain size increase, *Ardipithecus ramidus* had an estimated brain size of between 300 and 350 cm$^3$, *Australopithecus afarensis* had an estimated brain size of around 478 cm$^3$, and *Homo erectus* had an estimated brain size of up to 863 cm$^3$ (Suwa et al. 2009; Antón et al. 2014). Furthermore, it appears that *Homo erectus* ontogeny, while being faster than *Homo sapiens* ontogeny, was slower than it was in *Australopithecus*. In humans, selection for relatively large size is typically found in environments with adequate nutrients and selection for slower maturation is typically found in environments with a relatively low extrinsic mortality risk (Antón et al. 2014). Given these facts, the
increase in brain and body size along with the prolonged life history seen in *Homo erectus* makes it likely that by 2 million years ago hominins had discovered ways to ameliorate the strains of malnutrition and predation. Comparative research on cooperation in mammalian carnivores has found that larger bodies and brains and slower patterns of development are generally found in species that have relatively high levels of parental investment in offspring, including alloparental care, and in species that engage in cooperative, cursorial hunting (Smith et al. 2012). This suggests that by 2 million years ago hominins were increasingly organizing their behaviors around the demands of both cooperative hunting and cooperative breeding (Isler and van Schaik 2012; Smith et al. 2012; Antón et al. 2014).

If hominins were engaging in both cooperative breeding and cooperative hunting by the time of *Homo erectus*, these social arrangements would have allowed synergistic factors to create further selection pressures favoring social group formation. When group living increases the probability of successful foraging, this scenario will create selection pressures for social group formation (Bourke 2011). By coordinating their foraging efforts, early hominins would have first been able to engage in confrontational scavenging, whereby through coordinating their efforts they would have been able to drive larger predators away from kills, usurping the carcass in all of its bounty. As hominins gained cooperative proficiency, they would be able to move away from the strategy of confrontational scavenging towards the active hunting of large prey. Along with being supported by comparative studies of mammalian carnivores, the fact that hominins were engaged in cooperative hunting by the time of *Homo erectus* is supported
by fossil evidence dating to around 2 million years ago, which suggests that hominins during this period had persistent access to small animal carcasses and occasional access to larger, wildebeest-sized carcasses (Ferraro et al. 2013).

When group living allows for a division of labor, this scenario will also create selection pressures favoring social group formation (Bourke 2011). When hominins came to rely on cooperative hunting and cooperative breeding, it would allow for the emergence of a sexual division of labor. As will be outlined more fully in the chapter on the foraging organism, hunting is largely incompatible with breastfeeding (Kelly 2013). Hunting requires hunters to track prey over long distances, in relative silence; tracking prey in silence over long distances is impossible with dependent children in tow, especially if one must take frequent breaks to nurse a hungry child. Breastfeeding is vital for the health of newborns. Breastfeeding helps in the development of an infants’ immune system, it has a positive influence on psychomotor and neural development, it leads to a long-term reduction in children’s stress hormone levels, and it is important for building a mother-child bond (Quinlan and Quinlan 2008). Despite the vital importance of breastfeeding for the health and development of newborns, beyond 6 months breastfeeding cannot support the nutritional needs of a human infant all on its own (Quinlan and Quinlan 2008). As both breastfeeding and other sources of nutrition are needed to support dependent offspring (Quinlan and Quinlan 2008) and as nursing is incompatible with hunting and lowers foraging efficiency (Kelly 2013), a sexual division of labor between males and females had likely emerged by the time of Homo erectus to meet the demands of this situation. As a pro-longed life history, which was already
occurring by the time of *Homo erectus* required offspring to be provisioned by both mothers and fathers, the coupling of the low-risk, low-reward gathering work provided by women, with the high-risk, high reward hunting work provided by men would produce a synergistic selection pressure favoring social group formation.

As hominins continued to evolve throughout the Pleistocene, the sexual division of labor that emerged with *Homo erectus* would be accompanied by the evolution of a reproductive division of labor. By the middle Pleistocene hominins would be cooperating around central hearths and shelters (Antón et al. 2014) and by 160,000 years ago archaic *Homo sapiens* had already started to evidence a developmental pattern similar to that of modern humans (Smith et al. 2007). Furthermore, by this time brain size had increase to around 1,300 cm$^3$ (Aiello and Dean 2002). Increasing brain size and prolonged development would require more parental investment in offspring. Also by this time, relatively short birth-intervals along with cooperation around a central hearth or shelter would create a situation where parents would be required to provision dependent offspring of different ages. Taking care of juveniles of differing ages creates challenges for parents because children of different ages have different needs. Infants require their mother’s milk to survive; young children need calorie-rich, but easily digestible foods; and older children require training and education to become functioning members of the social group (Kramer 2010). Due to the challenges posed by the presence of multiple dependent offspring of different ages, hominins were under increasingly strong selection pressures for alloparental care. These selection pressures would lead to the emergence of grandmothers, individuals who had gone through menopause and thus could no longer
reproduce, but who were still able to provide material and informational resources for their kin. The emergence of grandmothers represents a reproductive division of labor, thus it marks the emergence of eusociality in human societies (Foster and Ratnieks 2005; Crespi 2014). Although the grandmother hypothesis suggests that selection had led to the existence of grandmothers as early as *Homo erectus* (Hawkes and Coxworth 2013), fossil evidence finds only limited support for the existence of grandmothers during the time of *Homo erectus*; instead, fossil evidence suggests that grandmothers became prominent in human evolution during the Middle/Upper Paleolithic transition around 50 thousand years ago (Caspari and Lee 2004). With the emergence of grandmothers, the reproductive division of labor would act as a further synergistic factor creating selection pressures favoring group formation in *Homo sapiens*.

Finally, for the aforementioned ecological and synergistic factors to create selection pressures for group formation, these factors must coincide with genetic factors. As organisms guided by the perpetuation of the information contained in their genes, humans will only cooperate in specific contexts. Humans and other organisms have a tendency to cooperate when such cooperation provides either a direct or indirect fitness benefit (Lehmann and Keller 2006; West et al. 2007, 2011; Bourke 2011). For cooperation among hominins to evolve, the structure of early hominin social groups must have provided contexts, which endowed cooperative behaviors with either direct or indirect fitness benefits. Looking first at cooperation favored by indirect fitness benefits, it is clear that the structure of early hominin social groups would have allowed certain
cooperative behaviors to be favored by natural selection due to their indirect fitness benefits.

Contemporary foragers reside in camps of between 14 and 60 individuals (Binford 2001; Kelly 2013). Recent analysis of 32 contemporary foraging groups found that among those groups studied most of the individuals within each group were genetically unrelated (Hill et al. 2011). Due to this fact, Hill et al. (2011) conclude that the high levels of cooperation observed in foraging societies are unlikely to be the result of cooperation favored because of its indirect fitness benefit. While this might be true for the some of the cooperation observed within foraging societies, such as food sharing outside of the family group, a large fraction of the cooperation observed in contemporary foraging societies occurs between breeding pairs and their offspring (Kelly 2013; Kurzban et al. 2015). In fact, even in contemporary industrial societies, much of the cooperation that takes place happens between genetic relatives (Henrich and Henrich 2007; Burton-Chellew and Dunbar 2014). In human societies, breeding pairs cooperate to raise their offspring, provisioning their offspring for an extensive period of adolescence; furthermore, humans continue to provision their kin well beyond their reproductive years (Hrdy 2011; Hawkes and Coxworth 2013; Crespi 2014; Kurzban et al. 2015). It is likely that such provisioning evolved in hominins as a result of selection acting on indirect fitness benefits.

Along with cooperative behaviors being selected for due to indirect fitness benefits, the structure of the social groups that were forming as hominins aggregated together would have also allowed for numerous types of cooperation to be selected for
due to direct fitness benefits. One way that cooperative behaviors can be selected for due to their direct fitness benefit is through group augmentation. Group augmentation involves the evolution of cooperative behaviors, which lead to an increase in the size of a social group when living in large groups has some sort of fitness advantage (Kokko et al. 2001). When individuals are more likely to survive in larger groups, such as if larger group size protects group members against the harms of predators, or if larger group size allows for more successful hunting or the hunting of larger prey-species, cooperative behaviors, which augment the size of the group will be favored by natural selection due to the direct fitness benefits of these behaviors. As the prior discussion outlined, hominins aggregated into social groups for protection from predation. Hominins also aggregated into groups because of the benefits of cooperative foraging and the benefits of reproductive and non-reproductive divisions of labor. To the extent that larger group size enhanced survival in early hominin groups by increasing the group’s ability to defend itself from predation, by increasing its hunting success, or by allowing for an elaboration of divisions of labor, cooperative behaviors that allowed hominin groups to increase in size would have been selected for due to their direct fitness benefits.

Another way that cooperative behaviors would have been selected for in early hominin social groups is when such behavior provided a return benefit through schemes of direct or indirect reciprocity. Living in small groups, early hominins would have frequently interacted with the same set of other individuals and this situation would have allowed for cooperative behaviors to emerge as a result of direct reciprocity (Trivers 1971; Kurzban et al. 2015). Just as the structure of early hominin social groups would
have allowed for cooperation on the basis of reciprocity, the lack of privacy afforded to individuals in such groups would have also allowed individuals to cooperate with others whom they observed to be cooperative, while withholding cooperation from those others whom were observed to be selfish (Alexander 1987; Kurzban et al. 2015). As hominins evolved and language emerged, language would have allowed hominins to engage in gossip, which would further their ability to use reputation as a mechanism for making decisions about with whom to cooperate (Dunbar 2004). To the extent that the structure of early hominin groups allowed individuals to repeatedly interact with the same set of others and to observe the interactions of others, either through visual monitoring or gossip, the structure of early hominin groups would have allowed for cooperative behaviors to be selected for due to their direct fitness benefits.

As ecological factors and synergistic factors combined, selection pressures would motivate a loud, slow, individualistic primate to seek the refuge of group living. As hominins came together into groups, such group living would both require and allow for higher levels of cooperation. When such cooperation provided an indirect fitness benefit, through being directed towards relatives; or when cooperation provided a direct fitness benefit, through group augmentation, direct reciprocity or indirect reciprocity, cooperation would be favored by natural selection. With ecological and synergistic factors creating selection pressures for group formation, and with the structure of these groups allowing for the genetic evolution of numerous cooperative behaviors in early hominins, the stage was set for the second process involved in an evolutionary transition – social group maintenance.
Social group maintenance involves the evolution of mechanisms for limiting exploitation of the group from individuals both inside of and outside of the group (Bourke 2011). Limiting exploitation from outside of the group involves the evolution of mechanisms, which allow individuals to distinguish group member from non-group member, so that group benefits can be withheld from non-group members.

Contemporary foraging societies exhibit high degrees of territoriality, whereby rights to forage on specified patches of land are determined by group membership (Kelly 2013). When individuals violate the territories of other foraging groups it is met with social sanctions and in certain instances violations of a foraging territory can lead to death (Diamond 2012: Kelly 2013). To enforce their territorial boundaries, many contemporary foraging groups find ways of delineating their foraging grounds from the rest of the natural environment. For instance, among the Maidu of California, territorial boundaries are marked off with symbols and these territories are patrolled by guards, who protect the territory from hunting by outsiders. Maidu territorial boundaries are so strict that even if an animal is shot by a hunter outside of Maidu territory, if the animal dies within the territory its carcass belongs to the Maidu village and not to the hunter who shot the animal (Kelly 2013). Among the Vedda of India, territories are marked by the carving of symbols into tree trunks. When an individual from another foraging group needs to pass through Vedda territory they must be escorted by a community member (Kelly 2013).

The evolution of mechanisms for limiting exploitation by outsiders in early hominin social groups is also supported by empirical evidence from experiments on
Western, industrial populations. Experimental research has found that humans tend to cooperate with other individuals whom are a part of their in-group, but they are not inclined to cooperate with individuals whom are part of their out-group, especially if they are in competition with this out-group for some valued resource (Tajfel and Turner 1979; Puurtinen and Mappes 2009; Puurtinen et al. 2015; Burton-Chellew et al. 2010).

Moreover, social psychological research has found that individuals are more likely to associate positive characteristics with in-group members and negative characteristics with out-group members (Perdue et al. 1990). Humans tend to be unconsciously biased in favor of their in-group (Trivers 2011). Given the presence of moral outrage in response to territory violations among contemporary foraging populations, along with the tendency of individuals in Western, industrial societies to judge and act more favorably towards in-group members than they do towards out-group members, it is reasonable to suggest that a concern with limiting exploitation by outsiders evolved in hominin populations in response to selection pressures for social group maintenance.

Along with the evolution of mechanisms for limiting exploitation from outside of the group, social group maintenance requires the evolution of mechanisms for limiting exploitation from within the group. To limit exploitation from within the group, a group can rely on punishment mechanisms, which discourage exploitation by making individuals pay a cost for attempting to exploit the group (Bourke 2011). Although punishment can successfully minimize exploitation from within the group, for punishment strategies to be evolutionarily viable they must meet certain conditions. First and foremost, for a punishment strategy to evolve, the benefits received to the individual
who does the punishing must outweigh the cost of engaging in a punishment behavior; furthermore, for punishments to successfully limit exploitation, the cost of being punished must be greater than the cost of forego ing an opportunity to exploit the group (Gardner and West 2004).

Experimental research on Western populations has found that when individuals are contributing to a joint good, they will pay a cost to punish other individuals who free-ride on the joint good (Fehr and Gächter 2002; Fehr and Fischbacher 2003; Egas and Riedl 2008). These results have been interpreted to demonstrate the fact that humans have an evolved tendency to engage in costly punishments of those individuals who exploit their group (Gintis et al. 2003). Despite such experimental findings, the extent to which individuals will pay a cost to punish another individual in the real world is questionable. In many of the experiments that have been used to justify the evolution of costly punishment, individuals are able to punish their exchange partners without the risk of retaliation (Guala 2012). In experiments conducted on punishment that gave punished individuals the ability to retaliate, individuals were hesitant to punish due to fears of retaliation (Molm 2007). Furthermore, the role of costly punishment in enforcing cooperation in foraging societies appears to be minimal (Guala 2012). It appears that when individuals have the opportunity to retaliate and when the act of punishing is costly, the benefits received by punishing free-riders do not outweigh the costs of punishing, so it is unlikely that selection pressures for social group maintenance resulted in a predisposition to engage in costly punishments among members of Pleistocene hominin groups.
Rather than produce a tendency to engage in costly punishments, selection pressures for social group maintenance worked on hominin emotional systems to create a primate that could use the emotional responses of others as a low-cost sanctioning system. This low-cost sanctioning system could operate to limit exploitation from within the group (Turner 2000). Emotions are specialized psycho-neuro-physiological states that have been crafted by natural selection to mobilize organisms in ways that allow them to meet the challenges of survival and reproduction (Nesse 1990; Nesse and Ellsworth 2009). Comparative neurological research on mammals has found that all mammals share seven basic emotional circuits: seeking, rage, fear, lust, care, panic, and play (Panksepp 2011). In response to selection pressures for social group maintenance, this basic emotional repertoire was expanded in hominins (Turner 2000). Given the changes in social organization observed in Homo erectus, it is likely that the emotional systems of hominins were already experiencing selection pressures for their elaboration as early as 2 million years ago. As hominins experienced continued selection pressures for social group maintenance, by the emergence of modern Homo sapiens the Homo emotional repertoire was elaborated to include such emotions as embarrassment, guilt, shame and pride (Turner, Jonathan H. 2000). Importantly, these emotions play a key role in enforcing cooperation, thereby limiting exploitation from within the group (Fessler and Haley 2003).

Embarrassment, guilt and shame are all emotions that produce a strong, aversive subjective sensation in the individual experiencing the emotion. Consequently, feelings of embarrassment, guilt and shame are experienced as a subjective punishment. As
individuals are motivated to avoid punishing stimuli, the experience of embarrassment, guilt or shame motivates individuals to act in ways that will alleviate the source of the negative emotion. Embarrassment, guilt and shame are felt when an individual violates some social norm or moral standard (Turner 2007), thus these emotions are experienced as internal punishments, which occur when an individual violates a group norm or moral standard. As these negative, social emotions are experienced as punishments, which result from normative and moral violations, they can be used to limit exploitation within the group. Contemporary foraging societies use social mechanisms such as gossip and ostracism to limit behavior that could be potentially damaging to the social group, as will be more fully outlined in the following chapter (Boehm 1999). Gossip and ostracism limit such behavior by signaling to a guilty party that this individual has violated some social norm or moral code, inducing the experience of embarrassment, guilt or shame in the guilty party. The painful experience of one of these emotions then serves to induce future normative or moral compliance. Furthermore, using gossip and ostracism to induce negative emotions is a low-cost punishment system and since gossip and ostracism are often a collective endeavor, using gossip and ostracism to enforce social norms and moral codes has a low risk of inciting retaliation. Experimental evidence on individuals from Western industrial societies has found that the experience of negative emotions induces cooperation (Ketelaar and Au 2003; Nelissen et al. 2006; de Hooge et al. 2007) and ethnographic evidence supports the role of emotions in limiting exploitation from within the group (Lutz 1988). Given the role of emotions in motivating human cooperation and given the ability of emotions to act as a low-cost punishment system
with a low-risk of retaliation, it is likely that the emotional elaboration observed in *Homo sapiens* resulted from selection pressures for social group maintenance acting on populations of Pleistocene hominins that were living in small groups organized around cooperative hunting and cooperative breeding.

Along with an elaboration of the emotional repertoire of hominins, by the time of *Homo erectus* a series of changes in the bodies of hominins had opened up another strategy for limiting exploitation from within the group. Humans are unique among primates in our throwing ability. Although other primates can throw objects, no other primate even comes close to throwing with the speed and accuracy of *Homo sapiens* (Lieberman 2013; Roach et al. 2013; Turchin 2016). Human throwing requires a specific mosaic of traits including a highly mobile waist, low and wide shoulders, a shoulder joint oriented to the side, extensible wrists, and a low level of humeral torsion; these traits first appear in combination in *Homo erectus* (Lieberman 2013; Roach et al. 2013). As the prior discussion outlined, humans tend to be wary of punishing exploitive group members for fear of retaliation. One way to overcome the risk of retaliation is to form a coalition to enact violent punishment against the perpetually offending group member. Although a coalition can be used to enact violent retribution, in the absence of projectile weapons the effectiveness of such a coalition decreases once the coalition reaches a certain size. Too many attackers get in each other’s way, and this confusion can allow the offending individual to escape with minimal harm. When individuals can use projectile weapons to attack an offending individual, the effectiveness of the coalition continues to increase as group size increases (Turchin 2016).
Once *Homo* had evolved a body plan that allowed them to effectively throw objects, projectile weapons could be used by coalitions to control group members whose exploitive behaviors could not be controlled through gossip and ostracism alone. Ethnographic research on contemporary foraging populations has found that when gossip and ostracisms fail to quell anti-social behaviors, the anti-social individual may be murdered by a projectile-wielding coalition (Turchin 2016). Although the first projectile weapons used by *Homo erectus* were likely thrown rocks, archeological evidence from South Africa suggests that by 71,000 years ago *Homo sapiens* were using advanced projectile weapons such as bows (Brown et al. 2012; Turchin 2016). Just as the expanded emotional repertoire of *Homo* compared to other primates was likely an evolutionary response to selection pressures for social group maintenance, the advanced projectile technology that evolved by 71,000 years ago may also have been an evolutionary response to selection pressures for social group maintenance. Together, emotions such as embarrassment, guilt and shame and advances in projectile weapon technology could operate to limit within-group exploitation in the emerging societal organisms of the Pleistocene (Turner, Jonathan H. 2000; Turchin 2016).

With the divergence of humans and chimpanzees from their LCA around 6 to 7 million years ago, the evolution of the human societal organism was set in motion. Ecological factors created selection pressures for social group formation in early hominins and as these selection pressures were exacerbated by synergistic factors, hominins became increasingly reliant on group living. Hominins were likely living in small groups to facilitate cooperative hunting and cooperative breeding beginning as
early as *Homo erectus*, if not earlier. As hominins continued to become more and more reliant on group living, *Homo* populations began to experience selection pressures for social group maintenance, which would lead to the evolution of an in-group/out-group psychology in *Homo sapiens*. Such selection pressures would also lead to the elaboration of the emotional repertoire of *Homo sapiens* compared to other primates. Furthermore, by the Middle/Upper Paleolithic transition, the fossil record makes it clear that *Homo sapiens* were living in multi-generational groups, with a reproductive division of labor. Given this combination of factors, it is safe to conclude that by 50,000 years ago, social groups of *Homo sapiens* had evolved to be simple societal organisms. Once groups of *Homo sapiens* had taken on the character of simple societal organisms, the stage was set for the final step in the evolution of a higher-level organism — social group transformation.

Once selection pressures have endowed social groups with the character of simple organisms, a positive feedback relationship between organism size and organism complexity can transform these simple organisms into complex organisms — true higher-level organisms. Social group transformation involves a feedback relationship, whereby increases in group size lead to increases in complexity, which in turn, further enable increases in group size. Such a positive feedback relationship between size and complexity is a central part of the iteration model of world-system transformation outlined by Chase-Dunn and Hall (1997) and Chase-Dunn and Lerro (2013). According to the iteration model, which will be outlined more fully in the next chapter, when a society grows larger, the demands of subsistence intensification and environmental
degradation inevitably create population pressures. Population pressures in turn lead to migration, conflict, social hierarchy formation and technological innovation, which all function to enable further population growth. Just as multicellular organisms and eusocial societies developed their truly organismic character through the positive feedback relationship specified by the size-complexity hypothesis, human societies developed their truly organismic character through the relationship between size and complexity specified by the iteration model of world-system transformation (Chase-Dunn and Hall 1997; Chase-Dunn and Lerro 2013).

As human social groups had the character of simple organisms by at least around 50,000 years ago, it was at this time that a feedback relationship between size and complexity could be initiated, transforming human social groups into complex societal organisms. Although the stage was set for social group transformation in Homo sapiens as early as 50,000 years ago, the operation of the feedback relationship between size and complexity necessary for the evolution of the complex societal organism was restricted by the demands of the foraging mode of subsistence. Forced to move with changes in wild resources, the size of foraging societies was necessarily kept low. As the size of foraging societies was limited, the positive feedback relationship between size and complexity necessary for the evolution of the complex societal organism went uninitiated.

When the world began to get warmer and wetter after the Last Glacial Maximum around 22,000 years ago, areas of local resource abundance would emerge and these areas of resource abundance would allow populations of mobile foragers to settle down,
adopting a sedentary way of life. When populations of foragers settled into areas of local resource abundance, these populations would tend to grow. This population growth would then initiate the positive feedback relationship between size and complexity outlined by the iteration model and by Bourke’s size-complexity hypothesis. By 12,000 years ago, populations of humans in Southwest Asia would start to rely more and more on agriculture and by 5,000 years ago the first agricultural civilizations would emerge. As these complex civilizations grew, selection pressures favoring the emergence of elaborated technologies of distribution and elaborated technologies of power would be initiated. In responding to such selection pressures, the members of complex civilizations would come to be bound together into increasingly dense webs of cooperation and this cooperation would increasingly be regulated by sophisticated institutions. With the emergence of agricultural civilizations, the evolution of complex societal organisms had taken place (Gowdy and Krall 2014, 2015). Furthermore, as the following chapters will attempt to make clear, once human societies had developed the character of complex organisms, this organismic character would, in general, increase over the subsequent course of societal evolution as increases in organism size and increases in the organism’s ability to capture energy from its environment would continually create selection pressures favoring the elaboration of both technologies of distribution and technologies of power within the growing organism.

CONCLUSION

Starting 6 to 7 million years ago, evolution took a solitary primate with a propensity for individualism and weak social ties and altered its nature and social organization. By
50,000 years ago evolution had driven *Homo sapiens* to live in groups that had the basic character of organisms. Evolution continued to alter the nature and social organization of *Homo sapiens* and by 5,000 years ago processes of evolution, just as they had done in the emergence of multicellular organisms and in the emergence of eusocial societies hundreds of millions of years prior, produced a higher-level organism – the human societal organism. By showing how multicellular organisms, eusocial societies, and human civilizations all emerged as ecological and synergistic factors worked to create selection pressures for social group formation, maintenance, and transformation, the current discussion has attempted to illustrate the parallel principles of organization, which operate to structure life in this universe.
Chapter 4: The Foraging Organism

INTRODUCTION

The prior chapters used recent theorizing in evolutionary biology to provide a definition of organisms before outlining the three-part process by which higher-level organisms emerge from aggregates of lower-level entities. Organisms emerge through a process of social group formation, social group maintenance, and social group transformation (Bourke 2011). An organism is a collective entity that features a high level of cooperation and a low level of conflict among its component parts. This high level of cooperation and low level of conflict allows the organism to adaptively modify flows of energy in its environment, allowing for the continued persistence of the organism.

Furthermore, organisms exist as a matter of degree; some organisms exhibit the property of organismality more so than do other organisms. This is because the property of organismality emerges in a collective as the members of that collective become integrated through cooperative interactions, which bind members of the collective together into webs of mutual dependence; these cooperative interactions result from members of the collective following individual-level decision rules (Hölldobler and Wilson 2008). The more the decision rules of a collective lead to cooperative behavior and mutual dependence the more that collective will exhibit the property of organismality.

The fact that organismality emerges in a collective as individuals become integrated through the cooperative behaviors that result from the following of individual-level decision rules has important consequences for the organismic character of human societies. In their everyday lives, individuals in all societies are faced with decisions
about how to use their energy and how to spend their time. To decide how to use their limited time and energy, humans follow decision rules, which operate at a largely unconscious level (Smith and Winterhalder 1992). The contents of these decision rules are based both on what it takes to capture the energy required to survive in one’s physical environment (Smith and Winterhalder 1992), along with what it takes to maintain or increase one’s current level of emotional energy given one’s socio-cultural environment (Collins 2004). Both the physical environment and the socio-cultural environment in which an individual lives shape the decision rules that this individual will follow when acting in a given situation. When the characteristics of the physical and socio-cultural environment collude to produce decision rules that specify cooperative behavior and suppress behaviors that lead to conflict, the collection of individuals will take on an integrated character; the collective will exhibit organismality. When the characteristics of the physical and socio-cultural environment collude to produce decision rules that specify individually-oriented behavior and behaviors likely to lead to conflict, the collection of individuals will lack an integrated character; this collective will fail to exhibit organismality.

As societal evolution has unfolded, the dictates of the physical environment have come to have less and less of an effect in shaping the contents of the decision rules, which shape individual conduct, while the dictates of the socio-cultural environment have come to have an increasingly important effect. Prior to the emergence of agriculture, most of the adult members of a society would have to engage in subsistence-related labor in order to survive. However, in modern industrial societies most individuals are far
removed from subsistence-related labor. Instead individuals perform various jobs that provide them with money (a symbolic resource), which can then be exchanged for subsistence-goods such as food and fuel in a market economy. While the role of the physical environment in shaping decision rules has waned over the course of societal evolution, the role of the socio-cultural environment in shaping decision rules has grown. Due to the feedback relationship that exists between behavior and culture, where behavior shapes culture, which in turn shapes future behavior, as the importance of the socio-cultural environment in shaping decision rules has grown, it has taken on a runaway dynamic. Not only has the extent of the socio-cultural environment increased, it has increased exponentially over time.

As the effect of the physical environment has diminished and the effects of the socio-cultural environment have grown exponentially over the course of societal evolution, individuals have become increasingly dependent on the labor of the other members of their society. Because of this fact, over the course of societal evolution the decision rules, which shape human behavior, have increasingly come to encourage cooperative behavior, while discouraging behaviors that produce intra-societal conflict. This process has led to a general increase in the level of organismality exhibited by human societies over time. This argument does not mean to imply that every society has progressed from a state of less organismic to more organismic, nor does it mean to imply that the level of organismality exhibited by human societies has always increased without ever decreasing. Instead, what this argument intends to imply is that over the course of societal evolution, as the globe moved from being populated by multiple foraging
societies, to being populated by fewer, but still multiple agricultural civilizations the overall level of organismality exhibited by human societies increased. Further, as the globe moved from being populated by multiple agricultural civilizations to being populated by one global civilization dominated by industrial production, the level of organismality exhibited by human society increased yet again.

To make the case, the current chapter will argue that by 50,000 years ago, groups of humans organized into small foraging societies had already evolved the character of simple organisms. Using evidence from contemporary foraging societies, this chapter will outline why the small foraging societies of the late Pleistocene were likely to have featured high levels of intrasocietal cooperation and low levels of intrasocietal conflict, which would have allowed these populations to capture the energy necessary for their survival. After making the case that the foraging societies of the Upper Paleolithic had the character of simple organisms, the following chapters will then argue that as populations of foragers settled down and adopted agriculture, which eventually fueled the emergence of states, civilizations, capitalism and the industrial revolution, a size-complexity feedback relationship transformed the simple organisms of foraging societies into the complex organisms of agricultural and industrial civilizations. As societal evolution has progressed, the organismic character of human societies has increased.

THE FORAGING ORGANISM

Around 6 to 7 million years ago hominins and chimpanzees diverged from a common ancestor (Turner and Maryanski 2008). The last common ancestor between the evolutionary line that would become modern humans and the evolutionary line that
would become modern chimpanzees was most likely an individualistic primate with a preference for weak social ties and high levels of social mobility (Maryanski and Turner 1992; Turner and Maryanski 2008). Despite this propensity for solitary living, the hominin fossil record shows that group living dates back to at least *Homo erectus*. Brain and body size increase in *Homo erectus* compared to earlier *Australopithecines* suggests that *Homo erectus* populations were under selection for increasing sociality, which led to the appearance of both cooperative hunting and cooperative breeding in this species (Antón et al. 2014). The selection pressures favoring cooperative hunting and cooperative breeding in *Homo erectus* continued to favor increasing sociality in hominins as they evolved throughout the Pleistocene and as the prior chapter outlined, by 50,000 years ago populations of *Homo sapiens* were living in social groups that had the character of simple organisms. It is in the foraging societies of the Upper Paleolithic that human social groups first began to exhibit this simple organismic character. These groups would maintain this character until the Neolithic revolution set in motion a positive feedback relationship between society size and societal complexity, which would transform the simple organisms of foraging societies into the complex organisms of agrarian and industrial civilizations.

The following section will first outline the general characteristics of contemporary foraging societies before describing how these societies are able to motivate high levels of cooperation and regulate societal conflict, which allows the members of these societies to capture the energy necessary for their survival. Although studies of contemporary foraging societies provide a good outline of what socio-cultural arrangements are
possible in a society based on the foraging mode of subsistence, the inferences that can be made about the lifeways of prehistoric foragers from studies of contemporary foragers is limited as contemporary foragers are dynamically changing groups, not living fossils. Furthermore, there exists tremendous diversity in the lifeways of contemporary foraging groups. Because contemporary foraging societies are not living fossils and because there is a significant amount of diversity among the lifeways of contemporary foraging societies, the inferences that can be made regarding the lifeways of Upper Paleolithic foragers from studies of contemporary foraging populations are limited. In order to move around this limitation, the present chapter will try to use archaeological evidence to support conclusions regarding cooperation and conflict among Upper Paleolithic foragers whenever possible.

Although contemporary foraging populations cannot be used as stand-ins for prehistoric foragers, the foraging mode of subsistence does impose some limitations on what sociocultural arrangements are viable in foraging societies. Due to the operation of these limitations, there should be some similarities in the social structures of contemporary foraging societies and the foraging societies of the Upper Paleolithic. For instance, the depletion of wild resources forces contemporary foraging populations to live a mobile existence; when contemporary foraging populations are not mobile it is because they are tethered to some invaluable resource, such as fishable rivers and streams. Furthermore, just as the depletion of wild resources forces many foraging societies to be mobile, this combination of factors also forces many foraging societies to be small (Kelly 1983, 2013). Given these relationships, it is reasonable to conclude that the foraging
populations of the Upper Paleolithic were also mobile, unless the presence of some invaluable resource made the need for such mobility unnecessary; furthermore, during the Upper Paleolithic, the foraging societies that were mobile were likely to have been smaller than were any foraging societies that were sedentary. As this example shows, due to the limitations imposed by the foraging mode of subsistence, there should be some similarities in the lifeways of contemporary and prehistoric foraging populations and these similarities can be used as a guide to help assess the organismic character of the foraging societies of the Upper Paleolithic.

Using ethnographic evidence from contemporary foraging populations supplemented with archeological evidence from prehistoric foraging populations, the current chapter will provide a speculative illustration of the foraging societies, which dominated the planet from around 50,000 years ago until the Neolithic revolution. In so doing the current chapter will attempt to illustrate the simple organismic character of the foraging societies of the Upper Paleolithic before showing, in subsequent chapters, how the organismic character of human society has, in general, increased over the course of societal evolution. This increase is the result of increases in societal size and energy capture, which have produced selection pressures favoring elaborations in technologies of distribution and technologies of power. In turn, such technological developments have enabled further increases in societal size and energy capture.

CHARACTERISTICS OF FORAGING SOCIETIES

Foraging societies are societies whose primary method of energy capture depends on the hunting of wild animals, fishing, and the gathering of wild plants with no domesticated
plants or animals, other than dogs (Kelly 2013; Morris 2015). Foragers subsist on a variety of plants, animals and aquatic resources depending on their specific environment. Ethnographic research has found a systematic relationship between environmental characteristics and forager diets (Kelly 2013). In general, the importance of plant food in the diet of a forager declines as one goes from the Earth’s equator to the poles. Furthermore, the dietary composition of foraging societies tends to demonstrate an inverse relationship between the reliance on aquatic resources and the availability of plant food, with foragers relying less on plant food, the more they rely on aquatic resources (Kelly 2013). For their non-food energy, foragers also rely on materials that have either been hunted or gathered (Morris 2013, 2015). Much of the non-food energy that foragers consume on a daily basis comes in the form of dried wood and the fats and oils of animals, which can be burned to make fire. Foragers also rely on the inedible portions of plants and animals as raw materials, which can be used to make clothing, shelter, tools, weapons and toys.

Foragers are typically described as working no more than 15 to 20 hours per week and as having a well-balanced and diverse diet. Given this set of lifeways, foraging societies have developed a reputation for being the ‘original affluent societies’ (Sahlins 1972; Lenski and Lenski 1987; Sanderson 1999; Turner and Maryanski 2008; Chase-Dunn and Lerro 2013). Not all ethnographic research on foraging societies supports this depiction, however (Hawkes and O’Connell 1981; Terashima 1983; Altman 1984; Hill et al. 1985; Hurtado et al. 1985; Hurtado and Hill 1990; Rai 1990). When taking into account the time it takes to walk between one’s camp and where one forages, process
foods, and maintain tools, the members of foraging societies can work longer hours than depicted by the view of foragers as the original affluent society. Furthermore, depending on the time of year, foragers may have to spend more or less time engaged in foraging pursuits. Overall contemporary foraging societies exhibit significant variation in the hours their members spend engaged in subsistence labor, with some foraging societies fitting the affluent forager model, and some populations working much longer hours (Kelly 2013). Indeed, Winterhalder (1993) developed a model simulating forager subsistence strategies and found that due to the influence of numerous factors there should be a large amount of variation in the time and effort required by subsistence activities across different foraging societies. Given the variation in subsistence efforts seen between different foraging societies and given the variation seen within a foraging society depending on the season, it is safe to conclude that the time and effort that foragers of the Upper Paleolithic would have spent engaged in subsistence activities was likely to have exhibited a great deal of both regional and temporal variation (Kelly 2013).

Although many foragers have sufficient diets, members of some contemporary foraging societies are undernourished (Howell 1986, 2010). Furthermore, in some contemporary foraging populations both weight and nutritional status fluctuate widely throughout the year, depending on the season (Kelly 2013). Among the Dobe Ju’hoansi, individuals frequently complain of hunger (Howell 1986). Furthermore, the body mass index (BMI) of the average women in Ju’hoansi society is 18.5; a BMI of 18.5 is

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6 While most estimates of forager work-hours come from contemporary foraging populations, Altman (1984) provides estimates for the hours worked of pre-contact Gunwinggu populations.
associated with chronic energy deficiencies (Howell 2010). Archaeological research on the skeletal remains of prehistoric populations from the coast of Georgia and from Stillwater Marsh in Nevada suggests that in these populations nutritional stress was neither rampant, nor infrequent, but it was a regular fact of life (Hutchinson and Larsen 1988, 1995). Given the ethnographic and archaeological evidence of nutritional stress among contemporary and prehistoric foragers, it is reasonable to conclude that some of the foraging populations of the Upper Paleolithic would have experienced nutritional stress and the experience of such stress would have led to selection pressures for sociocultural mechanisms, which could reduce the risks posed by such nutritional stress.

As the prior discussion has attempted to illustrate, some contemporary foraging societies fail to align with the picture of foragers depicted by Sahlin’s (1972) affluent forager model. One reason for this disparity may be that contemporary foragers occupy marginal environments. It is often assumed that contemporary foragers occupy marginal environments as throughout history, agricultural societies have been able to use their larger size and more complex social organization to displace foragers from their lands. Given this dynamic, foragers should occupy habitats that are less productive than were the habitats that they occupied before the emergence of agriculture. Although this line of reasoning makes sense, it does not appear to be supported by the data. To test this hypothesis, Porter and Marlowe (2007) collected data on the net primary productivity levels for the habitats of the foraging and farming populations found in the Standard Cross Cultural Sample (SCCS). In comparing the net primary productivity levels of these habitats, Porter and Marlowe (2007) found that farming societies occupied slightly more
productive habitats. However, when Porter and Marlowe (2007) restricted their observations to societies at latitudes no higher than approximately 40 to 45 degrees north and south, which is a better representation for the evolutionary environment of early *Homo sapiens*, they found that the foraging societies in their sample actually occupied more productive habitats than did the farming societies. Given these findings Porter and Marlowe (2007) conclude that any differences between contemporary and prehistoric foraging populations are unlikely to be due to contemporary foraging societies occupying marginal habitats, as the evidence suggests they do not occupy such habitats.

Foraging societies have a sexual division of labor organized around hunting and gathering, but outside of this sexual division of labor occupational specialization does not appear to exist in foraging societies. Many foraging societies do have certain types of specialists, such as religious specialists; however, the specialists in foraging societies are not specialists in the true sense of the term as despite their unique talents these specialists must still engage in subsistence labor (Lenski and Lenski 1987). In foraging societies men hunt large game and women gather plant materials and hunt small game (Johnson and Earle 2000; Turner and Maryanski 2008). While instances of women hunting large game in the ethnographic record exist, and although women fully participate in communal hunting drives, in general large game is hunted by males exclusively (Kelly 2013). Interestingly, as the importance of meat in the diet increases, women devote less time to gathering plant resources and devote more time to non-food procurement tasks (Waguespack 2005). The reason for the sexual division of labor found in foraging societies is due to the incompatibility of hunting large game with breastfeeding and
childrearing (Lenski and Lenski 1987; Kelly 2013). Hunting large game requires hunters to spend long amounts of time away from the safety of camp, pursing prey in silence. In such a situation, an adult cannot take time away from pursuing prey to tend to the needs of noisy children. This demand for a silent, uninterrupted pursuit is not present in gathering as plant material does not get scared and run away. Moreover, gathering allows gatherers more ability to return to camp when need be, and for these reasons gathering is more compatible with breastfeeding and childrearing than is hunting.

A reliance on wild resources for both food and non-food energy creates limitations on what types of social structures are viable in foraging societies. One limitation of the foraging mode of subsistence is that foraging societies, in general, must be highly mobile. Although there is variation in the mobility of contemporary foraging societies and although some foraging societies, specifically those that rely predominantly on aquatic resources, are sedentary, most foraging societies move their residential camps around a larger territory many times per year. Furthermore, depending on the time of year and the availability of food, three or four smaller residential camps may aggregate into a temporary, larger residential camp (Kelly 1983, 2013). Kelly (1983, 2013) provides data on the residential mobility patterns of contemporary foraging societies. Whereas some foraging societies such as the Yurok of California are almost completely sedentary, moving just two times or less per year; other foraging societies, such as the Aché of Paraguay are highly mobile, moving camps up to 50 times per year. The Baffinland Inuit move residential camps around 60 times per year. While the foraging societies of the Upper Paleolithic may not have been as mobile as are the Aché or the
Baffinland Inuit, this data on the mobility patterns of contemporary foragers outlines the realm of what is possible when it comes to forager mobility patterns.

Just as there is a systematic relationship between environment and diet in foraging societies, there is also a systematic relationship between environment and mobility in foraging societies. In general, camp moves are determined by women’s gathering efforts (Kelly 1983; 2013). For instance, among the Agta of the Philippines, both men and women contribute to camp discussions about when to move, but the women in camp have the final say on the matter (Rai 1990). Women’s gathering efforts tend to determine camp movements because the territory that men use to hunt tends to be much larger than the territory that women use to gather. Due to this size difference, gathering efforts are much more susceptible to local resource depletion than are hunting efforts. When gathering efforts deplete the edible plant materials in the foraging area around a residential camp, when the return rate for gathering in the current location falls below the average rate of return for gathering in other locations, taking into account the energy that would be necessary to pack up camp and travel to the new location, foragers will be motivated to move their residential camp (Kelly 1983; 2013). Thus, in most climates, camp moves are determined by gathering rather than hunting concerns. Although movement is in general associated with the availability of food resources, foraging groups will also move due to a lack of water or firewood, if a camp has gotten too dirty, or if there are too many insects at the present location (Poltis 2007; Marlowe 2010; Kelly 2013). Although there is no way to be sure of the exact mobility patterns of Upper Paleolithic foraging societies, the mobility patterns of contemporary foraging societies
along with the reasons for their mobility, suggests that many of the foraging societies that populated the globe during the Upper Paleolithic would have had a significant degree of mobility.

Relying on wild plants and animals for energy forces most foragers to be highly mobile. Those foragers that aren’t mobile and that do lead a more sedentary existence do so because they are tethered to some invaluable resource, such as fishable streams and rivers (Yesner 1980). This process, whereby foraging societies that become tethered to some invaluable and stationary resource adopt a sedentary way of life has important implications for the transition from foraging to agriculture, but overall, most foraging societies are highly mobile. Relying on wild plants and animals and being highly mobile sets limitations on the size of viable foraging societies. Ethnographic research indicates that most foragers live in residential groups of between 14 to 60 individuals depending on the time of the seasonal round (Binford 2001; Zhou et al. 2005; Hamilton et al. 2007). Foragers need to balance the risk of going hungry against the rate of resource depletion. When hunting, having more individuals in a group increases the likelihood that somebody will have a successful hunt, thus if individuals share food resources, as foragers often do, increases in group size can decrease the likelihood that the group will go hungry. But at the same time, once a group gets too big the group will too quickly deplete the wild resources found in a given area. Also, as group size increases, the likelihood that two individuals will come into conflict with each other increases as well. Due to this trade-off, the optimal size for the residential groups of foragers, with deviation from this size dependent on the idiosyncrasies of local environments, appears to
be between 14 to 60 individuals (Binford 2001; Zhou et al. 2005; Hamilton et al. 2007; Kelly 2013). For instance, among the Ju/'hoansi, the mean group size is 25; among the Hadza of Tanzania, the mean group size is 30; among the Semang of the Malay Peninsula, the mean group size is 30; among the Copper Inuit, the mean group size is 15; among the Aché of Paraguay, the mean group size is 16; and among the Tiwi of Australia, the mean group size ranges between 40 to 50 individuals (Kelly 2013).

The social organization of foraging societies consists of a nested hierarchy of social groups. The average forager lives in a family, which itself is a part of a larger residential group consisting of anywhere from 14 to 60 individuals depending on the time of year. Such residential groups are themselves nested within larger regional aggregations and ethnic communities (Binford 2001; Zhou et al. 2005; Hamilton 2007; Hill et al. 2008). The smallest social unit in foraging societies is the family, which consists of around 4 to 5 individuals. As families aggregate into larger residential groups, which, in turn, aggregate into regional communities and ethnic populations, the size of each grouping tends to increase by a factor of between 3 and 4 (Zhou et al. 2005; Hamilton et al. 2007; Hill et al. 2008). Hamilton et al. (2007) used data on 339 foraging groups to assess the average size of different forager aggregations. They found the average foraging family consists of about 4 or 5 people; the average dispersed residential camp consists of between 14 to 17 people; the average aggregated residential camp consists of between 50 to 60 people; the average regional community consists of 150 to 180 people; and the average ethnic population consists of between 730 and 950 people (Hamilton et al. 2007).
The group size estimates presented by Hamilton et al. (2007) are similar to those provided by Binford (2001). According to Binford (2001), the average forager family consists of 5 individuals, the average residential group during the dispersed phase of the seasonal round consists of 14 individuals, the average residential group during the most aggregated phase of the seasonal round consists of 41 individuals, the average regional community consists of 171 individuals, and the average ethnic population consist of 1,075 individuals. Overall, foragers depend on wild plants and animals for their energy and because of this method of subsistence foraging societies tend to be relatively small. Given the energetic limits of the foraging mode of subsistence and given the fractal nature that characterizes increases in contemporary forager group size, it is likely that Upper Paleolithic foragers lived in a nested hierarchy of social groups, with the size of each group increasing by a factor between 3 and 4.

Along with being small and highly mobile, foraging societies appear to exhibit minimal-to-no social hierarchy (Turner and Maryanski 2008; Flannery and Marcus 2012; Chase-Dunn and Lerro 2013). Being highly mobile, foragers accumulate few material possessions, which puts a natural limit on the level of hierarchy that can emerge around material inequality. Foraging societies also exhibit minimal levels of political hierarchy. In general, decisions that will affect the entire foraging group are made by consensus with every adult having the right to participate in the decision making process; although, the opinions of older individuals may have more influence than the opinions of younger individuals within a group (Flannery and Marcus 2012; Chase-Dunn and Lerro 2013). Furthermore, foraging societies tend to eschew leadership positions. Leadership
positions are usually open and only occupied temporarily based on individual talents and the task at hand; the leadership systems that emerge in foraging societies tend to be situation specific (Chase-Dunn and Lerro 2013). Given the lack of material and political hierarchy observed in foraging societies, foraging societies tend to have an egalitarian ethic (Turner and Maryanski 2008; Chase-Dunn and Lerro 2013), but it’s important to note that such an egalitarian ethic is not a universal feature of foraging societies (Kelly 2013). Despite their lack of political and material hierarchies, foraging societies did exhibit minimal levels of gender hierarchy. In general, foraging societies lack gender hierarchies, but ethnographic studies have found that when hunting pursuits cause males to spend large amounts of time away from females, males develop attitudes of dominance towards women (Kelly 2013). Now that the general characteristics of foraging societies have been outlined, it will be possible to outline how foraging societies motivate cooperation and suppress intra-group conflict, thereby affording these societies their organismic character.

COOPERATION AND CONFLICT IN FORAGING SOCIETIES

Organisms are collective entities that feature high levels of cooperation and low levels of conflict amongst their component parts. High levels of cooperation and low levels of conflict allow organisms to adaptively modify flows of energy in their environment, which allows for the organism’s persistence. In order to demonstrate the organismic character of foraging societies, it is necessary to outline how these societies motivate cooperative behaviors and regulate conflict, which allows the society to capture the energy needed for its persistence. To survive humans must capture energy for food, for
fuel, and for raw materials (Morris 2013, 2015). The amount of energy that an individual in a foraging society requires to survive each day exhibits great variation both between individuals and between different foraging groups. Despite this variation, knowledge of the bioenergetics of primates along with knowledge of the lifeways of contemporary foragers allows Morris (2013, 2015) to conclude that the average adult member of a foraging society requires around 4,000 kilocalories of energy per day to survive, with about 2,000 kcal of energy coming from food and the rest of this energy coming from fuel sources and raw materials. In colder regions close to the poles, the average forager may use up to 8,000 kcal of energy per day. Fischer-Kowalski et al. (2014) provide a similar estimate for forager energy use. Fischer-Kowalski et al. (2014) estimate that foraging societies use an average of around 4 GJ of energy per capita per year in food, and about 7 GJ per capita per year in fuel, for a total of 11 GJ per capita per year. 11 GJ per capita per year is equivalent to 7,203 kcal per capita per day. From the emergence of behaviorally modern humans somewhere around 50,000 years ago until the dawn of the Neolithic revolution around 12,000 years ago, the majority of humans lived in foraging societies where the average adult required somewhere between 4,000 kcal to 8,000 kcal of energy per day to survive.

Although 4,000 to 8,000 kcal of energy may not seem like much, it can be more energy than a solitary adult in a foraging society can provide on a daily basis, especially if that adult must also provide for one or more children. Because of this fact, the members of foraging societies are dependent on the assistance of others for their survival (Kaplan et al. 2000, 2009; Kelly 2013). In a study of the Hiwi of Venezuela and the
Aché of Paraguay, Hill and Hurtado (2009) found that due to random variation in hunting success combined with the potential for injury and illness, the average pair of adults within these societies can expect to have at least two weeks per year where they depend upon provisioning from others to survive. Moreover, Hill and Hurtado (2009) found that the average pair of adults with dependent aged children in both societies, received regular food donations from approximately 1.3 non-reproductive adult members of their society. Similarly, in a study of the Ju/'hoansi of the Kalahari desert, Howell (2010) found that adult pairs that have more than two children cannot feed both themselves and their children, thus they must rely on the food donations of other members of their society to survive.

In many foraging societies the sharing of food is integral to the survival of the group (Kaplan et al. 2000, 2009; Kelly 2013). The average adult in a foraging society needs between 4,000 to 8,000 kilocalories of energy per day to survive (Morris 2013, 2015; Fischer-Kowalski et al. 2014) and although this does not seem like much it can be more than a solitary adult can capture on his or her own. In most foraging societies, methods of food storage are limited and so food must be collected on a more or less daily basis. This can pose a problem because people get injured, fall ill or otherwise have bad luck and thus individuals cannot always bring in the calories necessary for their own survival, especially if they must also provision dependent offspring. Even in plentiful environments, individuals cannot control when accidents will happen; accidents, which could render an individual temporarily unable to hunt or gather. To deal with the possibility of food shortages, caused for whatever reason, contemporary foraging
societies have evolved elaborate food sharing arrangements. These food sharing arrangements are technologies of distribution in the foraging organism.

Foraging societies feature a sexual division of labor whereby males hunt large game and females gather plant materials and hunt small game. Hunting is a high risk activity, on many occasions a hunter will return with no kill; however, the meat provided by hunting is a vital food resource given the high protein and fat content of the meat. Gathering is a low risk activity, gatherers always come home with gathered plant materials or small game; however, the plant material gathered provides fewer nutrients compared to the meat of large game. By engaging in a sexual division of labor whereby males hunt and women gather, breeding pairs are able to increase the efficiency of their food collecting behaviors. Within families, the female usually shares the plant foods that she has gathered with her partner and children and these plant foods are rarely shared outside of her immediate family (Kelly 2013). The sharing of meat is a different story. Men usually share the meat from a successful hunt with their partner and children, but in many cases the meat from a successful kill is also shared with the rest of the camp, and in a number of cases meat is shared according to culturally specific sharing rules (Testart 1989; Kishigami 2004; Kelly 2013). By sharing plant material (a low-risk, low energy food) within families and by sharing meat (a high risk, high energy food) within the larger camp foragers ensure that both their families and the larger societal organism will not go hungry.

The cooperative food sharing arrangements that characterize many contemporary foraging groups allow these groups to cope with the problems of acquiring food and
resources in an uncertain, unpredictable world (Kaplan and Hill 1985; Johnson and Earle 2000; Kameda et al. 2002). Acquiring food in resource rich habitats will be a task riddled with less uncertainty than will be acquiring food in marginal habitats, but uncertainty is a feature of all environments as there is no environment where active individuals are immune to accidents and injury and where the weather is 100% predictable. Given this line of reasoning, the foraging societies that populated the globe during the Upper Paleolithic were likely to have experienced selection pressures favoring the evolution of cooperative food sharing arrangements, which allowed these societies to deal with the uncertainties that characterized their local environments. When the foraging societies of the Upper Paleolithic occupied environments characterized by low levels of uncertainty, selection pressures for food sharing would be low and groups would be able to get by with less sharing; when they occupied environments characterized by higher levels of uncertainty, selection pressures for food sharing would be higher, requiring foragers to distribute more resources throughout the group. Ethnographic research on contemporary foraging populations can be used as a guide for illustrating the structure of food sharing practices in prehistoric foraging societies.

Many known foraging societies have cultural meat sharing arrangements, but the specific cultural rules that govern the sharing arrangement vary from case to case. Among the Nayaka, who live in the jungles of southern India, meat is distributed equally throughout the entire camp (Bird-David 1990). When a Nayaka hunter returns from a successful hunt, the hunter passes his kill on to another man. This man then divides the animal into small pieces and places the pieces in piles, which are then distributed to the
households in the camp with the proportion that each household receives dependent on the relative size of the household (Bird David 1990). Among the Aka, who live in the forest area of the northeastern Congo, when a man makes a successful kill he will butcher the kill and share the meat with the other hunters in his group according to the roles that they performed during the hunt. After the meat has been distributed to those who participated in the hunt, the meat is then shared throughout the camp at the meat-owner’s discretion (Kitanishi 1998).

Among the Martu of the northwestern portion of Australia’s Western Desert, when a hunter kills a kangaroo, the hunter is expected to make no claim to the carcass and to play no part in its butchery, cooking or distribution (Bird and Bliege Bird 2009). After killing a kangaroo, a Martu hunter will drop the carcass at the edge of camp. The carcass will then be butchered in a ritual fashion and distributed according to the following rule: the hunter receives the head and the tail, the hunter’s father-in-law or mother-in-law receives the backend, the hunter’s eldest brother or wife receives the forequarter, and his brother-in-law or married elder sister receives a rear leg (Bird and Blieve Bird 2009). The Gunwinggu of Northern Australia have a similar ritual for redistributing meat (Altman 1987). Gunwinggu men hunt kangaroos and wallabies. When a Gunwinggu man has a successful hunt, the head and one of the forequarters of the animal go to the hunter, the other forequarter goes to the hunter’s companion or brother. The backend and tail goes to the hunter’s mother’s brother’s son or his mother’s mother’s brother’s daughter’s son. Each hindquarter goes to a senior man in the camp, while the internal organs go either to the hunter himself or to other men present at the kill
Along with complex systems of food exchange, contemporary foraging societies also feature complex webs of cooperation for the exchange of non-food goods. Just as foragers develop cooperative networks for the exchange of meat, they also develop cooperative networks for the exchange of other goods vital for their survival. Perhaps the best known exchange network described in the ethnographic record of foraging societies is the *hxaro* exchange of the Dobe Ju/'hoansi (Lee 1979, 2003; Wiessner 1982). For the Ju/'hoansi, *hxaro* is a system of gift exchange that circulates goods, lubricates social relationships, and helps to alleviate risk (Wiessner 1982; Lee 2003). Simply described, *hxaro* is a delayed form of nonequivalent gift exchange. In the *hxaro* exchange, one individual will provide their exchange partner with a gift and at some time down the line their exchange partner will provide them with a return gift, which may or may not be of equivalent value. An adult may have over a dozen or more exchange partners, while children will usually have fewer than a dozen exchange partners. Any two people, regardless of age or sex may become exchange partners; however, one’s *hxaro* partners are usually one’s relatives. According to Lee (2003) a typical string of *hxaro* exchange partnerships would go from mother to daughter, from daughter to husband, from husband to his father and beyond. Almost any item of material culture can become an object of *hxaro* exchange. Objects that are typically exchanged include ostrich-bead jewelry, pots, dogs, and digging sticks. The only two things that may not be exchanged through the *hxaro* system are humans and food (Lee 1979, 2003).
The Ju/'hoansi associate themselves with inherited tracks of land called *n!ore*. *N!ore* are centered around a watering hole and can vary in size from 300 to 600 km$^2$. The Ju/'hoansi often live at separate *n!ore* from their extended families and friends and because of this separation, visiting a friend of family member’s *n!ore* is a frequent pastime of the Ju/'hoansi (Lee 1979, 2003). When members of one *n!ore* travel to another *n!ore* to visit friends or family they often use the *hxaro* exchange as a pretext for their visit. In this way the *hxaro* exchange binds individuals living at one *n!ore* to individuals living at another *n!ore*. Having social connections outside of one’s *n!ore* is vital for survival in the Kalahari desert, where famine or draught can strike one *n!ore* while leaving others unaffected (Weissner 1982; Lee 1979, 2003).

The *hxaro* exchange strengthens social relationships, while binding members of the Ju/'hoansi together into webs of cooperative exchange (Lee 1979, 2003). The *hxaro* exchange has this effect because of the delayed nature of gift giving process. Within a *hxaro* relationship, when one individual exchanges with a second individual, the second individual does not immediately reciprocate. The second individual provides a return gift at a later date. The delayed nature of reciprocal gift giving found in the *hxaro* exchange builds cooperative social relationships among exchange partners. As one Ju/'hoansi man recounted to Lee (2003); “if you give something and I give you something back, we are even, we are finished. In *hxaro* you are never finished. One or the other is always waiting to see what comes back” (121). Through creating the anticipation of future reciprocation, the *hxaro* exchange binds together members of Ju/'hoansi society in webs of cooperation and commitment. Furthermore, cultural views regarding wealth among
the Ju/'hoansi increase the extent to which the *hxaro* exchange strengthens cooperative social relationships among members of their society. Among the Ju/'hoansi, wealth is not considered a function of how many material possessions one owns, wealth is considered to be a function of how many *hxaro* exchanges in which an individual takes part. The more exchanges in which a member of Ju/'hoansi society is able to partake, the more wealthy this individual is considered to be (Lee 1979, 2003). Due to this cultural value, members of Ju/'hoansi society are motivated to engage in as many *hxaro* exchanges as they are able, in order to demonstrate their wealth. In trying to exhibit their own individual wealth, members of Ju/'hoansi society participate in a system of exchange that strengthens one’s commitments to other members of their larger society.

As the examples of meat sharing among the Nayaka, the Aka, the Martu and the Gunwinggu and the example of *hxaro* exchange among the Ju/'hoansi demonstrate, contemporary foraging societies feature elaborate systems of cooperation, which allow all members of the society to acquire the energy they need to survive in an uncertain environment. The aforementioned systems of cooperation likely evolved as selection pressures caused by uncertainty favored the evolution of sociocultural mechanisms, which could reduce the risks associated with such uncertainty (Kaplan and Hill 1985; Johnson and Earle 2000; Kameda et al. 2002; Lee 1979, 2003). As varying degrees of uncertainty would be a characteristic of the environments of the Upper Paleolithic, it is reasonable to conclude that the foraging societies of this time period would feature various systems of cooperation for off-setting the risks associated with such uncertainty. Along with this line of reasoning, the existence of exchange networks among Upper
Paleolithic foraging societies is supported by archaeological evidence (Ambrose 1998; Marwick 2003; Balme and Morse 2006; Pearce and Moutsiou 2014).

Although it is hard to assess social behaviors, such as the existence of cooperative exchange networks, from the archeological record, the archaeological record does provide some insight into the exchange systems of Upper Paleolithic foraging societies. Evidence for personal ornamentation first appears in the fossil record in Africa during the Middle Paleolithic. In deposits dated to around 70,000 years ago at the Blombos Cave site in South Africa, archaeologists have uncovered perforated marine shells that show clear evidence of wear, some marine shells even have been colored with ochre; also, in deposits dated to around 70,000 years ago at the Grotte des Pigeons site in Morocco, archaeologists have uncovered perforated marine shells that show traces of intentional modification (d’Errico and Stringer 2011). By 40,000 years ago in Africa and by 36,000 years ago in Europe archaeological evidence of personal ornamentation is widespread (Balme and Morse 2006). While there are many reasons that individuals might take the time to manufacture personal ornaments, one reason why individuals might manufacture personal ornaments is for exchange. The use of personal ornaments as items for exchange is supported by the fact that many of the materials used to manufacture the ornaments found in Upper Paleolithic deposits come from regions that are over 250 km away from where the ornaments were uncovered (White 1992; Balme and Morse 2006). Given the far distance that the materials used in the crafting of these personal ornaments could travel, Ambrose (1998) concludes that the proliferation of personal ornaments
found in the archeological record after about 40,000 years ago may indicate the beginning of systems of gift giving and exchange in human prehistory.

Balme and Morse (2006) use archaeological data from Australia to support the conclusion that that the foraging societies of the Upper Paleolithic were characterized by systems of exchange. Shell beads dated to around 30,000 years ago have been uncovered in Western Australia at the coastal Mandu Mandu Creek rockshelter and the inland Riwi rockshelter. Aspects of the shell beads found at both sites suggest that shells were collected specifically for ornament making. The shells come from a non-edible species and the process of constructing shell bead ornaments appears to have undergone some standardization; the ornaments that have been uncovered are of a similar size and they all appear to have been modified to conform to a specific ornamental style (Balme and Morse 2006). Importantly, the marine shells used in the construction of shell bead ornaments must be collected in the coastal regions of Kimberly, Australia. Riwi rockshelter is currently 300 km away from the coast; 30,000 years ago Riwi rockshelter was around 500 km from the coast. The presence of shell bead ornaments at an archaeological site this distance from the coast suggests that shell beads traveled a long way to reach their final destinations during the Upper Paleolithic. Given the evidence, which suggests both that shell bead ornaments travelled long distances and that the production process of shell beads had already undergone some elements of standardization, Balme and Morse (2006) conclude that by 30,000 years ago the foraging populations of Australia were already engaging in widespread networks of exchange.
Pearce and Moutsiou (2014) use data on obsidian transfer distances during the Middle and Upper Paleolithic to come to a similar conclusion. According to Pearce and Moutisou (2014), the radii of the maximum distance over which social relationships are maintained among contemporary foragers at low latitudes is about 200 km. Data on Middle and Upper Paleolithic obsidian transfer in East Africa shows that obsidian could travel up to about 200 km. At higher latitudes the radii of the maximum distance over which social relationships are maintained among contemporary foragers is about 365 km. Data on Upper Paleolithic obsidian transfers in Europe shows that obsidian could travel up to 400 km. Given the overlap in the size range of contemporary foraging populations and the distances that obsidian artifacts travelled during the Middle and Upper Paleolithic, Pearce and Moutsiou (2014) conclude that Middle and Upper Paleolithic foraging populations could have been engaging in exchange across their home ranges.

Lacking a time machine there is no way to be certain that the foraging populations of the Upper Paleolithic had systems of cooperative exchange. But as systems of exchange in contemporary foraging populations appear to be sociocultural mechanisms, which evolved to offset the risks of living in an uncertain world and as archaeological evidence suggests that prehistoric populations engaged in the exchange of valued goods over long distances, it is reasonable to conclude that the foraging societies of the Upper Paleolithic would have, in many cases, been characterized by networks of exchange. Such networks would have played a vital role in allowing for the continued persistence of the foraging organism. Along with adaptations that ensure high levels of cooperation among the foraging organism, foraging societies also feature mechanisms that limit the
level of conflict present in these societies. By minimizing the level of conflict found in foraging societies these mechanisms may be considered adaptations, which allow for the continued persistence of the societal organism.

Although foraging societies lack the centralized institutions that agricultural and industrial societies have at their disposal for minimizing social conflicts, foraging societies have sophisticated cultural mechanisms, which keep conflict from erupting to levels that would threaten the integrity of the societal organism. These mechanisms represent the initial technologies of power in the societal organism. Before outlining the mechanisms that foraging societies use to keep levels of conflict within bounds, it is necessary to first outline the levels of violence observed in foraging societies past and present. Due to their egalitarian ethos, foraging societies are often considered to be peaceful places; however, ethnographic and archeological research indicates that foraging societies can be violent places, with some foraging societies exhibiting high levels of homicide and frequent warfare (Ember 1978; Keeley 1996; Otterbein 2004; Gat 2006; Kelly 2013).

Like all phenomena, the level of violence in a foraging society varies between societies. Some known foraging societies such as the Batek and the Semai of Malaysia have no significant violence, but these pacifist societies appear to be a relatively rare occurrence and the lack of violence in these societies is overstated. For instance, the Semai of Malaysia are often reported to have no significant violence; in fact, Denton (1979) entitled his monograph on the Semai, A Nonviolent People of Malaya. Denton’s own ethnographic evidence does not support his non-violent characterization, however.
According to Denton (1979), from 1955 to 1977 there were two murders among the Semai. Two murders may not seem like much, especially when they were spread over 22 years, but given the small size of Semai society, two murders in 22 years is actually quite a high level of violence. As Knauft (1987) points out, two murders in 22 years in a population of 300 individuals translates into a homicide rate of 30.3 homicides per 100,000 people per year. For comparative purposes, in the United States during the 1990’s the homicide rate was around 5.5 homicides per 100,000 people per year (Morris 2014). Given this homicide rate of 5.5 homicides per 100,000 people per year, if the United States was as small as Semai society was when it was being observed by Denton (around 300 individuals), there would likely be a single murder every 181 years!

Comparing homicide rates between societies of vastly different sizes can be tricky. When viewed as a function of frequency, homicide appears to be a much bigger problem in modern industrial societies than in foraging societies. In a modern industrial society, such as the United States of America, people are murdered every day; whereas in a foraging society many years can pass without lethal violence. This comparison makes modern industrial societies seem much more violent than are foraging societies; however, this difference in frequency is a product of the enormous size difference between industrial and foraging societies. To remove the influence of population size on comparisons of homicidal violence researchers use a scale of mortality rate per 100,000 people per year. Normalizing the data in this way removes the distorting influence of size differences and allows for the meaningful comparison of levels of lethal aggression between societies.
It may seem counter-intuitive to talk about homicide rates per 100,000 people in societies that consist of only a few hundred people; however, data on rates of lethal violence must be normalized so that meaningful comparisons across societies of different sizes can be made and using a scale of homicides per 100,000 people is the most straightforward way to do so. Data could be normalized using a scale that more closely matches the size of foraging societies; however, using such a scale would produce equally counterintuitive rates of lethal aggression. For instance, Morris (2014) reports that during the 1990's, the United States had a homicide rate of 5.5 homicides per 100,000 people per year. This rate could be alternatively stated as 0.0055 homicides per 100 people per year, but discussing 0.0055 homicides per year seems equally if not more counterintuitive than talking about rates of homicide in small-scale societies using a scale of homicides per 100,000 people per year.

Wrangham et al. (2006) compiled data from a variety of ethnographic sources regarding the rates of lethal aggression in foraging societies. They found a wide variety of homicide rates between different foraging societies, but in nearly all cases foraging societies had homicide rates higher than those of modern industrial societies. Wrangham et al. (2006) report that the Semai of Malaysia had a mortality rate of 0 deaths per 100,000 people per year due to lethal aggression. Although as Knauf (1987) points out, between 1955 and 1977 the Semai actually had a homicide rate of 30 deaths per 100,000 people per year. According to Wrangham et al. (2006) the Dobe Ju/'hoansi had a mortality rate of 42 deaths per 100,000 people per year due to lethal aggression; the Yaghan of Tierra del Fuego had a mortality rate of 169 deaths per 100,000 people per
year due to lethal aggression; the Yurok of California had a mortality rate of 240 deaths per 100,000 people per year due to lethal aggression; and the Casiguran Agta of the Philippines had a mortality rate of 326 deaths per 100,000 people per year due to lethal aggression. Wrangham et al. (2006) calculated the median homicide rate for the 12 foraging societies in their sample to be 164 homicides per 100,000 people per year.

Much of the data on the homicide rates of foraging societies, such as the data presented by Wrangham et al. (2006), comes from surveys of foraging societies that have been described after Western contact. Given the experience of indigenous people all over the globe during the era of Western European colonialism it is tempting to come to the conclusion that homicide rates in foraging societies must have been lower in these societies prior to contact with Western colonial powers. While this conclusion is true in many cases, it is not true in all cases. Moreover, research on violence in contemporary foraging societies indicates that homicides in these societies are primarily motivated by the emotions of sexual jealousy, a desire for revenge, or even fear of sorcery and magic (Knauft 1987, 1991). Given the fact that emotions such as jealousy, anger and fear are evolved adaptations (Nesse 1990), these feelings were likely to have existed in Upper Paleolithic humans similarly to how they exist in humans today. Because homicide in contemporary foraging societies appears to be motivated by jealousy, a desire for revenge, and a fear of sorcery, and because these sentiments were likely to be present in the individuals who made up the foraging societies of the Upper Paleolithic, it is reasonable to conclude that individuals in prehistoric foraging societies would have murdered each other on occasion.
Controversially, some authors (Hill et al. 2007; Diamond 2012; Morris 2014) even go so far as to argue that homicide rates in prehistoric foraging societies would have been higher than the homicide rates exhibited by contemporary foragers because the centralized institutions brought by Western European colonial powers had a pacifying influence on forager violence. While this case may be overstated, such a reduction in intra-group homicidal violence after colonial contact appears to have happened in certain circumstances, such as with the Gebusi of New Guinea (Knauft 1987) and the Dobe Ju/'hoansi (Lee 1979, 2003). According to Knauft (1987), a majority of the homicides in Gebusi society occur as a result of fears over sorcery and magic. After contact with Western society, the influence of Christianity began to trickle into Gebusi society and as Christianity gained more influence, fears over sorcery and magic waned. As such fears waned, homicidal violence declined. Knauft (1987) reports that from 1940 to 1962, the Gebusi had a homicide rate of 683 homicides per 100,000 people per year. In the period after contact, from 1963 to 1982, this rate declined to 419 homicides per 100,000 people per year (Knauft 1987). Lee (1979, 2003) reports a similar dynamic among the Dobe Ju/'hoansi. From 1920 to 1955, the Ju/'hoansi had a homicide rate of 42 homicides per 100,000 people per year. After colonial contact, this homicide rate declined to 29 homicides per 100,000 people per year (Lee 1979, 2003).

Just as data on contemporary foragers suggests that the foraging societies of the Upper Paleolithic would have had to deal with some intragroup lethal aggression, archeological finds from Central and Western Europe dating from 34,000 to 24,000 years ago confirm the notion that some individuals in the Upper Paleolithic met a violent end.
At Grimaldi in Italy, a child’s skeleton was uncovered with a projectile point embedded in the spine and in southern France a skull with cut marks indicative of scalping was unearthed (Keeley 1996). Furthermore, archaeological finds from the Egyptian Nile Valley dating to 20,000 years ago of a male skeleton with projectile points embedded in both the arm and abdominal region further support the existence of lethal aggression in the Upper Paleolithic (Keeley 1996). Not only does archaeological evidence support the existence of lethal aggression in the Upper Paleolithic, it also supports the conclusion that lethal aggression between hominins long pre-dates the Upper Paleolithic. Recently, archeologists working at the Sima de Los Huesos site in Spain uncovered the remains of a Homo individual dating to 430,000 years ago that appears to have been killed by blunt force trauma to the head, blunt force trauma that was most likely the result of interpersonal conflict (Sala et al. 2015).

Regardless of whether or not the foraging societies of the Upper Paleolithic had homicide rates comparable to the rates found in contemporary foraging societies, the fact that contemporary foraging societies do exhibit lethal aggression and the fact that such lethal aggression is often motivated by universal emotional impulses, which were likely to have been present in Upper Paleolithic humans, combined with archaeological evidence for violent aggression in hominins that dates back to 430,000 years ago, suggests that at least some homicidal violence would have occurred in the foraging societies of the Upper Paleolithic. If lethal aggression did occur, it would produce selection pressures favoring the emergence of technologies of power, which could be
used to minimize such lethal aggression. The emergence of such technologies would be a key step in the evolution of the human societal organism.

Along with homicide, warfare also takes place in contemporary foraging societies, but whereas almost all foraging groups experience interpersonal violence not all foraging groups experience warfare. In contemporary foraging societies warfare consists largely of raids and revenge raids where an enemy may be taken by surprise and killed. These raids happen when one group of foragers is able to use advantages provided by larger group size and surprise to ambush an enemy, killing an enemy target with little or no risk of injury to the attackers. Interestingly, this same type of raiding behavior is observed among chimpanzees (Wrangham and Glowacki 2012; Pandit et al. 2015). Among contemporary foraging societies warfare appears to be most prominent among sedentary societies (Kelly 2013) and societies that rely more on hunting than they do on gathering (Otterbein 2004). Using estimates drawn from contemporary foraging societies, Keeley (1996) estimates that up to 50% of contemporary foraging societies experience frequent warfare, 20% of foraging societies experience nearly continuous warfare and 30% of foraging societies never or rarely experience warfare. Ember (1978) also uses data on contemporary foraging societies to conclude that 64% of foraging societies had warfare occurring at least once every two years, 26% had warfare occurring somewhat less often, and only 10% of foraging societies rarely or never experienced warfare.

Archaeological evidence suggests that by the end of the Upper Paleolithic warfare was taking place among foraging societies. Cave art from Western Europe dated to the Upper Paleolithic portrays human individuals both carrying weapons and human
individuals felled by arrows or spears (Otterbein 2004). At Jebel Sahaba, a 14,000-year-old cemetery in the Sudan, over 40% of the 59 men, women and children uncovered in the cemetery had projectile points intimately associated with or embedded in their skeletons. Moreover, several of the adults had multiple wounds, some adults even had healed fractures indicating that violence at Jebel Sahaba was not a once in a lifetime event. Also, all of the remains of children found at the site had head and neck wounds consistent with execution blows (Keeley 1996). Recently uncovered finds from the Nataruk site in West Turkana, Kenya support the notion that warfare took place during the late Upper Paleolithic. At Nataruk, archeologists discovered the remains of at least 27 individuals dating to around 10,000 years ago. 12 of these skeletons were relatively complete and of these relatively complete skeletons 10 died a violent death; half from blunt-force trauma to the head and half from sharp-force trauma (Lahr et al. 2016). Furthermore, of the two skeletons that did not exhibit peri-mortem trauma, both were uncovered with their hands positioned in a way that is consistent with their hands having been bound at the time of death (Lahr et al. 2016).

It is most likely that the violent scenes uncovered at Jebel Sahaba and at Nataruk are not the first such instances of violence to have taken place in human history, which suggests that warfare was probably taking place earlier than 14,000 years ago. Taken together the presence of warfare in the ethnographic record of contemporary foraging groups, along with the archaeological evidence of warfare from Jebel Sahaba and Nataruk suggests that by the end of the Upper Paleolithic, if not earlier, warfare was becoming an increasingly important force in the lives of foragers. As the prevalence of
warfare increased, foraging societies would experience selection pressures to come up with solutions for the survival problems caused by warfare. Whereas selection pressures to regulate interpersonal violence would lead to the emergence of elaborate systems of sanctions in foraging societies, selection pressures to regulate inter-societal violence would lead to the eventual emergence of war leaders and bigger societies, which would set the stage for the emergence of chiefdoms by at least 7,000 years ago.

Evidence from contemporary foraging societies, along with archeological evidence from prehistoric foraging populations, suggests that the foraging societies of the Upper Paleolithic would have experienced some interpersonal violence. Furthermore, as was previously described, the average adult forager requires around 4,000 to 8,000 kcal of energy per day to survive (Morris 2013, 2015; Fischer-Kowalski et al. 2014). This is more energy than an adult can reliably capture on a daily basis, especially if they must also provide energy for dependent children, and so the members of foraging societies rely on complex webs of cooperation for survival (Kaplan et al. 2000, 2009; Hill and Hurtado 2009). Humans evolved from a LCA with chimpanzees that likely had a predisposition for individualism and weak social ties (Turner and Maryanski 2008); also all organisms have been shaped by natural selection to cooperate in some scenarios, but not others (Lehmann and Keller 2006). Due to these facts any cooperative relationship has the potential to break down as the multiple individuals in the relationship seek their own individual interests over the interests of those with whom they are cooperating. This situation would initiate selection pressures favoring the evolution of socio-cultural mechanisms that could regulate conflict within the foraging organism. In the absence of
centralized legal institutions, contemporary foragers use a variety of informal sanctions to minimize the extent to which individuals put their own interests over those of the group. Contemporary foraging societies use norms and informal sanctions to regulate both actual and potential sources of conflict; conflict, which could disrupt the integrity of the organism. While it is impossible to know the exact regulatory mechanism, if any, that characterized Upper Paleolithic foragers, it is entirely possible that the informal sanctioning mechanisms that are so affective at limiting conflict in contemporary foraging societies first emerged in the foraging societies of the Upper Paleolithic.

When members of foraging societies act in ways that violate the society’s norms regarding cooperation other members of the society use ridicule, ostracism and gossip to bring the behavior of the norm violator in line with the society’s normative expectations. If these techniques do not work to bring about more cooperative behavior, norm violators may be shunned from the group, or even killed (Boehm 1999; Flannery and Marcus 2012; Kelly 2013). For instance, among the Caribou Inuit of the arctic regions of Canada, ridicule is used to suppress stingy behavior and greed. When an individual develops a reputation as a selfish person, other Caribou will write songs and dances mocking this individual. If such artistic ridicule does not squelch the problem behavior, the deviant individual will be given the silent treatment and might even be left behind when camp moves. If these solutions still do not fix the deviant behavior, the perpetrator of the deviant behavior may be killed by another member of his or her own family (Flannery and Marcus 2012). The Caribou Inuit use a response system that grades from ridicule, to silent treatment, to execution to minimize the occurrence of any social
conflict, which would disrupt the networks of cooperation necessary for the society’s survival. A similar gradation of informal sanctions in response to norm violations is seen in all foraging societies (Boehm 1999; Flannery and Marcus 2012; Kelly 2013).

The Dobe Ju/'hoansi have a particularly interesting and well-studied way of using ridicule to keep behavior in-line with normative standards. The Dobe Ju/'hoansi participate in a practice that Lee (2003) calls “insulting the meat”. Among the Dobe Ju/'hoansi meat is a shared commodity. Even though meat is shared, meat is a highly valued resource and because of this value, hunters that are more successful than average have the potential to develop a big ego. In a society where the survival of everybody depends on the absence of big egos, the Ju/'hoansi have developed a technique for minimizing the likelihood that successful hunters will develop an inflated sense of pride. Whenever a Ju/'hoansi man makes a kill, no matter how big and meaty the kill, the other members of the society will intensely ridicule the animal, acting as if the meat is worthless. By talking about the kill as if it was worthless, while still feasting on the meat provided by the kill, the members of Ju/'hoansi society are able to minimize the extent to which successful hunters develop a grandiose sense of pride as a result of their hunting success; a sense of pride, which has the potential to disrupt the egalitarian ethos of the society.

Along with their tradition of insulting the meat, the Dobe Ju/'hoansi have other informal methods for dealing with social conflicts. When conflicts develop in Ju/hoansi society, the first method of recourse is for the two affronted parties to come together to talk about the specific issues at the heart of the conflict; usually these conversations
involve a heavy dose of both ridicule and laughter (Lee 2003). If the problem was not rectified through ridicule and laughter, the involved parties may choose to fight about their problem (Lee 2003). If the conflicting parties were not able to resolve their difference through non-lethal fisticuffs, one of the aggrieved parties may choose to leave, migrating to another n!ore (Lee 2003). Finally, if an individual is consistently involved in societal conflicts a coalition may form to execute the problem-causing individual (Lee 2003). To deal with societal conflicts in the absence of any centralized legal authority, the Ju/'hoansi rely on a series of informal sanctions ranging from ridicule and laughter, to fighting, to migration, to execution. By utilizing this system of informal sanctions for norm violations, the Ju/'hoansi, just like the Caribou Inuit and other contemporary foraging societies, are able to minimize the occurrence of behaviors, which could produce larger social conflicts; conflicts that would disrupt the society’s ability to capture the energy necessary for its survival.

Along with using informal sanctions to minimize normative violations, thereby minimizing social conflict, contemporary foraging societies also feature systems of religious belief, which help keep conflicts within a manageable level. All contemporary foraging societies have their own unique cosmologies and systems of belief, but there are similarities in the religious systems exhibited by different societies sharing the same methods of subsistence. Contemporary foraging societies are known to practice a form of religion known as animism (Lenski and Lenski 1987; Turner and Maryanski 2008; Chase-Dunn and Lerro 2013). In animistic religions sacred forces are present in the everyday world and these sacred forces are believed to be interdependent with the
individual, the society, and the natural environment (Chase-Dunn and Lerro 2013). According to animistic religions, sacred forces may inhere in individuals, but they also may inhere in mountains, rivers, lakes, stones, trees and other animals. The fact that sacred spirits may inhere in both individuals and other non-human objects provides a motivation for individuals to act in accordance with the norms of their society (Lenski and Lenski 1987). If individuals act in selfish ways, or if individuals act in ways that violate social norms they may lose the favor of their society’s sacred spirits. When one loses the favor of the sacred spirits bad luck is sure to follow. Thus, in order to maintain the favor of sacred spirits, so as to avoid the bad luck that occurs when one falls out of step with the spirit world, individuals in foraging societies are motivated to act in accordance with their society’s social norms (Lenski and Lenski 1987).

Under systems of animism the spirit world also may act as a safe target for individual attributions of social slights, which can reduce the likelihood of intrasocietal aggression and conflict. Research in social psychology (Stets and Burke 2005; Burke and Stets 2009; Turner 2007) has found that when individuals have their normative expectations violated in an encounter, if they attribute the violation to their own actions they are likely to experience sadness or fear depending on the power and status dynamics of the interaction. On the other hand, when individuals have their normative expectations violated, if they attribute the violation to the actions of others they are likely to experience anger. When individuals experience such anger, one way that they may express this anger is to take aggressive action against those deemed responsible for the normative transgression. If this happens, the individual on the receiving end of the
aggressive action may respond with counter-aggression, which can lock the duo into a spiral of aggressive action and reaction. One way that this spiral of aggression may be avoided is if the individuals in the encounter have an external target, a target outside of the encounter to which they can attribute the source of the normative violation (Turner 2007). When such a scapegoat exists, individuals can project anger towards the external target without setting off the spiral of aggression that may erupt if they were to direct their anger toward someone actually present in the encounter. The effect of such scapegoats is to limit the level of overt conflict that becomes manifest in encounters as a result of normative violations. In societies organized around animistic religions, where both humans and non-human objects can be inhabited by different sacred spirits, these spirits can act as scapegoats for normative violations, decreasing the in-group aggression that results (Spiro 1952).

Spiro (1952) provides an example of how spirits play this scapegoat role in his ethnographic studies of the Ifaluk people of Ifaluk atoll in Micronesia. Ifaluk cosmology makes room for belief in both high gods and ghosts. High gods do not take interest in the affairs of humans, whereas ghosts play a significant role in influencing the daily lives of people. According to Ifaluk mythology, ghosts come in two forms: benevolent ghosts and malevolent ghosts. Malevolent ghosts delight in causing evil and because of this are the most feared and hated objects known to the Ifaluk. The Ifaluk even use the presence of malevolent ghosts to explain the existence of evil in the world. According to Ifaluk psychology, humans are born good; inherently good, humans only commit evil acts when they have been taken over by a malevolent ghost. Given this folk psychology,
malevolent ghosts act as a scapegoat for the normative violations that transpire in encounters between Ifaluk individuals. Living on a small coral atoll in the middle of the Pacific Ocean, the persistence of Ifaluk society depends on high levels of cooperation, which has led to a general intolerance towards expressions of aggression. To minimize the expression of anger towards other group members, any anger that emerges in encounters is directed towards malevolent ghosts, whom are believed to be responsible for the normative transgression (Spiro 1952). The malevolent ghost, rather than the individuals present in the encounter, then serves as the target for any aggression that results from the encounter. Through their belief in the influence of malevolent ghosts, the Ifaluk, “turn their aggressions from their fellows and direct them against a common enemy. The common hatred that results not only enables the people to displace most of their aggressions from the in-group to the out-group, but also serves to strengthen the bonds of solidarity.” (Spiro 1952: 502). By directing any anger that emerges in encounters toward the spirit world, the Ifaluk are able to minimize intrasocietal conflict, enabling the cooperation required for survival on a small coral atoll in the middle of the Pacific Ocean.

Along with motivating individuals to act in ways that align with the norms of their larger societies, so as to maintain the favor of the spirit world; and along with providing a scapegoat towards whom individuals can direct any aggression that emerges within encounters; the animistic beliefs of contemporary foraging societies limit intrasocietal conflict in a third way. Apes have a tendency to create dominance hierarchies where an alpha individual dominates all other members of the society. Under the alpha is a beta
individual who dominates all other members of the society except for the alpha. Under the beta is the gamma individual who dominates all other members of the society except for the alpha and the beta. This sort of hierarchical ordering will continue on all the way down to the lowliest omega individual. Such dominance hierarchies are not set in stone, they emerge as individuals within a society compete for status (Flanner and Marcus 2012). The competition that results as individuals compete to gain status, in order to become the alpha of their society can result in high levels of intrasocietal conflict.

Humans, as do chimpanzees and many other mammalian species, tend to naturally arrange themselves into dominance hierarchies with all the subsequent aggression and conflict that results. Thus, to limit levels of intrasocietal conflict, different societies have different methods for limiting aggressive status-seeking. The animistic cosmologies of contemporary foraging societies function to serve this role by limiting intrasocietal status seeking.

According to the cosmologies of many contemporary foraging societies, the universe was created by celestial spirits. These celestial spirits gave birth to the ancestors of the society and from these ancestors the inhabitants of society were born (Flannery and Marcus 2012). In these animistic cosmologies the celestial spirits responsible for creating the earth take on the role of the society’s alphas. The ancestors who were created by the celestial spirits take on the role of the society’s betas. The living members of the society then fill in the rest of the societal dominance hierarchy. By creating cosmologies that assigned the roles of alpha and beta to supernatural beings and ancestors, contemporary foraging societies are able to limit status competition by limiting
the level of dominance that any one individual can attain (Flannery and Marcus 2012). No matter how much an individual strives to achieve societal dominance, due to the cosmological order of things this individual can never be more than a gamma in the social dominance hierarchy. By creating hierarchies that bridge the supernatural and natural worlds, the animistic cosmologies of contemporary foraging societies provide ideologies, which limit intrasocietal conflict by discouraging aggressive status competition (Flannery and Marcus 2012).

Although it is impossible to know whether or not the foraging societies that populated the globe during the Upper Paleolithic had animistic systems of religious belief, which could function to limit intra-societal conflict in the ways outlined above, archaeological evidence does suggest that Upper Paleolithic *Homo sapiens* had the symbolic capacity for religious belief. As d’Errico and Stringer (2011) report, the earliest undisputed human burials come from Skhul and Qafzeh caves in Israel; the burials are dated to 150,000 years old and 100,000 years old, respectively. In Australia, evidence for the intentional burial of human remains comes from Lake Mungo, dating to around 40,000 years ago; in Europe, the earliest known burials date to around 30,000 years ago. The use of pigments appears in the archeological record even earlier. By 120,000 years ago there is systematic evidence for the use of pigments in South Africa, and some evidence suggests that the use of pigments in Africa was common as early as 280,000 years ago (Marean et al. 2007; McBrearty and Brooks 2000). Moving from pigment to artwork, the earliest evidence for abstract designs intentionally engraved on bone and ochre come from Blombos Cave in South Africa, dating to around 100,000 years ago.
(Henshilwood et al. 2009). Representations of engravings and carvings of animals appear later in the archaeological record. The first artistic depiction of animals in Africa dates to around 31,000 years ago at Apollo 11 Cave in Namibia, and the first carved figurines in Europe date to around 35,000 years ago at Hohle Fels Cave in southwestern Germany (Wendt 1976; Conard 2009). The first evidence for musical instruments in the archeological record also comes from Europe around this time period. Bone flutes from Hohle Fels Cave in southwestern Germany date to around 35,000 years ago, and a bone flute uncovered in Austria dates to around 19,000 years ago (Conard et al. 2009). Taken together, this evidence suggests that during the Upper Paleolithic, *Homo sapiens* had the symbolic capacity required for religious thought.

The capacity for symbolism does not guarantee that Upper Paleolithic *Homo sapiens* would have had systems of religious belief, but it does show that they had the cognitive capacity for such thought. The existence of religion during the Upper Paleolithic is further supported by archeological finds from Göbekli Tepe in Turkey. At Göbekli Tepe there exists a series of T-shaped, monolithic pillars; each pillar weighs between 20 and 50 tons. The pillars are installed within circular stone enclosures and the pillars are even adorned with images of animals. The presence of such structures suggests that Göbekli Tepe was a ceremonial site; making it the oldest known ceremonial center on earth (Turchin 2016). Dating to 10,000 years ago, Göbekli Tepe was a ritual site that was constructed and used by foragers (Schmidt 2000; Flannery and Marcus 2012; Turchin 2016). Turchin (2016) calculates how long it would have taken populations of foragers to construct Göbekli Tepe, concluding that construction of the
site was likely to have taken between 100 to 500 years of labor. The architectural structures at Göbekli Tepe suggest that by the end of the Upper Paleolithic, foraging populations had sophisticated enough systems of religious beliefs to motivate the construction of megalithic architecture, architecture that may have taken up to 500 years of labor to create.

Overall the archeological evidence suggests that the foraging societies that populated the globe during the Upper Paleolithic were likely to have had some type of religious belief. Evidence of symbolic behavior starts over 100,000 years ago, and by 30,000 years ago Homo sapiens were creating works of art and making music (Wendt 1976; McBrearty and Brooks 2000; Marean et al. 2007; d’Errico and Stringer 2011; Conard 2009; Conard et al 2009; Henshilwood et al. 2009). While evidence of symbolic behavior is not direct evidence of religion, the construction of megalithic architecture by 10,000 years ago suggests that religious beliefs were, at least by the end of the Upper Paleolithic, a major force motivating the behaviors of some populations of foragers (Schmidt 2000; Flannery and Marcus 2012; Turchin 2016). While there is no way to directly know how such prehistoric religions functioned, research on the religious beliefs of contemporary foragers suggests that the animisms of contemporary foraging societies play an important role in limiting conflict within these societies. Given the likely existence of religion in the Upper Paleolithic if the foraging populations of this time period were experiencing selection pressures favoring the evolution of socio-cultural mechanisms that could function to regulate intrasocietal violence, it is entirely possible that systems of religious belief, along with systems of informal sanctions more generally
could have emerged and been shaped by processes of selection to perform this vital regulatory function.

Organisms are collective entities that are able to motivate high levels of cooperation among their component parts, while suppressing any conflict that may emerge between these component parts. In motivating cooperation and suppressing conflict organisms are able to adaptively control the flow of energy in their environment, which enables their persistence. As the above discussion has demonstrated, contemporary foraging societies clearly possess these organismic qualities. As demonstrated by the discussion of meat sharing and the discussion of the *hxaro* exchange, contemporary foraging societies feature elaborate networks of cooperation. These networks of cooperation provide the members of foraging societies with the energy they need to persist. As demonstrated by the discussion of the use of informal sanctions in response to normative violations, and the role of animism in motivating conformity, providing a scapegoat for aggressive impulses, and limiting aggressive status competition, contemporary foraging societies feature elaborate regulatory mechanisms, which can suppress intrasocietal conflict before such conflict reaches levels that are too disruptive for the society to function. Given both the archeological evidence and the presence of these structures in contemporary foraging societies, it is reasonable to conclude that the prehistoric foraging societies that dominated the planet during the late Pleistocene also featured similar networks of cooperation and similar mechanisms for regulating societal conflict. Such technologies of distribution and technologies of power would have allowed these foraging populations to capture the energy required for their
persistence. In possession of these features, the foraging societies that dominated the
globe from around 50,000 years ago until the dawn of the Neolithic revolution had the
cell of simple societal organisms.

Overtime, as societal evolution has unfolded, world-systems have gone from
being dominated by foraging societies, where the average individual requires between
4,000 to 8,000 kcal of energy per day to survive; to being dominated by agricultural
civilizations, where the average individual requires between 5,000 to 50,000 kcal of
energy per day to survive; to being dominated by industrial civilizations, where the
average individual requires between 40,000 to 230,000 kcal of energy per day to survive
(Morris 2013, 2015; Fischer-Kowalski 2014). As this process of societal evolution has
transpired, selection pressures favoring the elaboration of technologies of distribution and
technologies of power have caused the networks of cooperation that people rely on for
their survival to become more complex, while the tools at a society’s disposal for
suppressing conflict have become more formalized and efficient. With these changes, the
organismality of human societies has increased over the long haul of societal evolution.

The following chapter will focus on demonstrating how the organismality of
human societies has increased with the emergence of agricultural and industrial
civilizations, but before moving on to talk about this increasing organismic character, it
will first be necessary to describe the general evolutionary process that has transformed
the simple societal organisms of foraging societies into the complex societal organisms of
agricultural and industrial civilizations. As was outlined in the prior chapter, organisms
emerge through a three step process involving social group formation, social group
maintenance, and social group transformation (Bourke 2011). The final step in the emergence of an organism, social group transformation, takes place when a size-complexity feedback relationship emerges, whereby increases in organism size lead to increases in organism complexity, which enables further increases in organism size (Burke 2011). In order to successfully make the case that the organismic character of human societies has increased over the course of societal evolution, it will first be necessary to illustrate how a size-complexity feedback relationship is at the heart of processes of societal evolution. In so doing, the following discussion will pay specific attention to the role that increases in organism size and energy capture play in initiating selection pressures, which favor the elaboration of technologies of distribution and technologies of power; technologies that in turn, enable further increases in organism size and further increases in energy capture.

SOCIETAL EVOLUTION AND THE SIZE-COMPLEXITY HYPOTHESIS

The current section will outline the size-complexity feedback relationship, which has driven the increasing complexity exhibited by societal organisms over the course of societal evolution. In outlining the operation of the size-complexity feedback relationship that has shaped human societies over the course of societal evolution, the following section will rely on the iteration model of world-system transformation presented in Chase-Dunn and Hall (1997) and Chase-Dunn and Lerro (2013), integrating this model with insights regarding societal selection processes from Turner (2010). The iteration model is depicted in Chapter 2, Figure 2.
As societies grow, the needs of the expanding population create survival problems due to the constraints of the local ecology. The experience of survival problems initiates selection pressures, which favor the persistence of societies that are able to come upon solutions to these survival problems. The iteration model (Chase-Dunn and Hall 1997; Chase-Dunn and Lerro 2013) outlines how the emergence of survival problems and the emergence of their institutional solutions are intertwined into a recursive loop of spiraling complexity; whereby population growth creates survival problems, which are resolved through a variety of different pathways, each pathway allowing for the persistence of the society and for further population growth. Of course, some pathways will be more favorable to a society’s persistence than will others and some pathways may even fail to solve the survival problems faced by a society, in which case the society is likely to collapse or be overcome by a larger, more organized society. When a society stumbles down a pathway that alleviates a survival problem faced by the society, the society will persist and the population may even grow. While each of the pathways outlined in the iteration model may solve the survival problems faced by a given society, each offers only temporary solutions to a society’s woes. Overtime the solutions that a society stumbles upon will lose their effectiveness, and the society will be forced to embark upon the search for new solutions to its survival problems.

Survival problems emerge as populations grow; pushing against the limits of what is sustainable in a given environment. Because of this fact, the iteration model begins with the variable of population pressure. As populations get bigger, more mouths must be fed and feeding more mouths means that more calories must be harvested from the
environment, converted into a digestible form, and distributed to those hungry mouths. Hungry mouths require bodies to work harder; to deal with this problem, societies intensify their subsistence activity. Although the specific ways that a society intensifies its subsistence activity will depend on its particular historical circumstance, in general, intensification requires a society to use land and resources for subsistence that had previously not been used for such a purpose.

As intensification increases it leads to environmental degradation. When foragers intensify their subsistence efforts they are forced to rely on plants and animals that they had previously ignored. As farmers intensify their subsistence efforts they are forced to farm land that had previously been unattractive for farming, or they are forced to intensify production on farmland that is already in use. As industrial societies intensify their subsistence efforts they are forced to seek out sources of fossil fuels and raw materials that had previously been ignored due to their hard-to-reach character. In all of these cases the end result of intensification is the degradation of the natural environment. Because it inevitably leads to degradation of the environment, intensification can only solve the problems posed by population pressure for so long before a society’s subsistence efforts begin to produce declining marginal returns (Tainter 1988). When investments in subsistence reach a point of declining marginal returns, the society will start to experience the strain of population pressure (Chase-Dunn and Hall 1997; Chase-Dunn and Lerro 2013).

Population pressure occurs because the combination of subsistence intensification, which is required to meet the energetic demands of a growing population,
and environmental degradation, which is an unavoidable outcome of subsistence intensification, forces the members of a population to either work harder to maintain the same standard of living or to accept a lower standard of living for the same level of effort (Sanderson 1999). Humans, in general, ascribe to the principle of least effort (Chase-Dunn and Hall 1997; Turner and Maryanski 2008), meaning that when humans do work they attempt to maximize the return they receive from their work relative to the energy they expend in doing that work. The fact that humans follow a principle of least effort has received support from analyses of the foraging strategies of contemporary foraging societies. Such analyses have shown that in the foraging societies studied, the choice of where to hunt and the choices of which foods to eat and which to ignore often conform to the predictions of optimal foraging theory (Bird and O’Connell 2006; Borgerhoff Mulder and Schacht 2012; Kelly 2013). As population pressure increases and the ratio of energy returned to energy invested falls, the strain placed on individuals and groups will motivate the search for lifeways, which can alleviate the strains of population pressure. The groups that are able to come upon solutions to the problems posed by population pressure will persist, those that are unable will eventually see the declining marginal returns of their subsistence activities lead to a total system collapse.

According to the iteration model (Chase-Dunn and Hall 1997; Chase-Dunn and Lerro 2013), there are multiple pathways by which societies deal with the selection pressures initiated by population pressure. The first strategy that populations may use to alleviate the strains of population pressure is migration. When a population has depleted an area’s resources to a level that is below the average level of resources available in
other areas, factoring in the resources that would be expended travelling to these new locations, the population will be motivated to migrate to more resource dense areas (Kelly 1983; 2013). By migrating to areas of higher resource density, the population will alleviate the strain of population pressure. When population densities are low and land is plentiful, migration is the default strategy for dealing with population pressure. Using migration to alleviate such strain is a common tactic among contemporary foraging societies (Kelly 1983, 2013). Although migration can effectively alleviate the strains of population pressure, using migration as a strategy for dealing with population pressure limits the complexity that can emerge in a society. Due to this factor, when populations have the ability to migrate in response to population pressure, the size-complexity feedback relationship outlined in the iteration model will fail to be activated, unless of course migration leads to conflict. It is only when population pressure or conflict creates selection pressures, which favor hierarchy formation and technological development that the size-complexity feedback relationship necessary for the emergence of a complex societal organism is activated.

When population densities are low and land is plentiful, migration can be used to alleviate the strains of population pressure. In many circumstances, a variety of factors may work to cage-in a population, limiting the population’s ability to migrate. When this happens a population is said to be circumscribed; and such circumscription drastically limits the population’s ability to use migration as a solution to the problem of population pressure. Carneiro (1970, 2012) describes three types of circumscription. The first type of circumscription is environmental circumscription. In this case there are geographical
obstacles, which cage-in a population, impeding the population’s ability to successfully migrate. This may happen when a population lives on an island and lacks the seafaring ability required to leave the island, or when a population is surrounded on all sides by impassable desert or mountains. The second type of circumscription outlined by Carneiro (1970, 2012) is resource circumscription. In this case a population may be dependent on and therefore tied to some resource base, such as fishable rivers and streams, fertile agricultural grounds, or urban settlements, which limits their ability to successfully migrate. The final type of circumscription is social circumscription. Social circumscription occurs when all of the land in a given region is occupied. In such a circumstance, a population can only migrate if they are able to successfully displace the land’s previous occupants. According to the iteration model (Chase-Dunn and Hall 1997; Chase-Dunn and Lerro 2013) when populations experience the pangs of population pressure, and when populations attempt to migrate in circumscribed environments, populations will come into violent conflict.

When two groups go to war and when they have similar population sizes, levels of social organization and levels of technological sophistication, they may get locked into a seemingly endless cycle of attack and counter-attack with no side emerging as the clear victor. This is seen in the warfare of the Dani people of Western New Guinea and the Yanomami of the Amazon rainforest. However, if there are disparities in the size and organization of the two societies, the society that is larger and better organized will be able to run over the smaller, less well organized society (Spencer 1897; Gat 2006; Morris 2014). The end result of this process is the formation of new levels of socio-political
hierarchy (Spencer 1998, 2010). Hierarchy formation occurs when socio-political structures emerge, which concentrate power, prestige and control over resources in a society among a select group of individuals or organizations within that society (Chase-Dunn and Hall 1997). When one society emerges as the clear victor in conflict with another society, the members of the population on the losing-side may find it more worthwhile to accept subordination, living under the rule of the victorious society, rather than lose their lives fighting an opponent against whom they are clearly outmatched. As the members of the society on the losing end of the war are incorporated into the population of the victorious society, the society will experience selection pressures favoring a more sophisticated leadership hierarchy, which can administer the expanded, and in many cases ethnically diverse, population (Spencer 1998, 2010). Through this pathway, the warfare that results from the experience of population pressure in circumscribed environments can lead to the formation of new socio-political hierarchies. It is through this dynamic, where warfare creates selection pressures for socio-political hierarchy, that the first chiefdoms, states and empires emerged (Flannery and Marcus 2012).

Not only does warfare create selection pressures favoring the emergence of socio-political hierarchies, the emergence of socio-political hierarchies itself creates selection pressures favoring the emergence of new technologies of distribution and new technologies of power. As the following chapters will attempt to illustrate, as warfare led to the emergence of chiefs, kings and emperors, selection pressures were initiated that favored elaborated technologies of distribution and elaborated technologies of power,
which could facilitate cooperation and regulate conflict in the growing societal organism.
For instance, as the first states emerged in Mesopotamia and Egypt 5,000 years ago, these states would come to be characterized by a temple complex (Flannery and Marcus 2012). The temple complex of these ancient Mesopotamian and Egyptian states would act as both a novel technology of distribution and a novel technology of power. Temple complexes in Mesopotamia and ancient Egypt would oversee the extraction of the surplus and the redistribution of this surplus, they would oversee market transactions and they would administer interest-bearing loans. In engaging in these activities, temple complexes facilitated the distribution of resources across the growing societal organism. The temple complex would also facilitate regulation in the societal organisms of ancient Egypt and Mesopotamia. Temple complexes would house religious and legal specialists, who could interpret state religion and laws. The temple complex would also oversee the calendar of ritual ceremonies. In providing these functions, temple complexes were able to provide legitimacy to the rulers of these ancient states. The temple complex represented an elaboration of technologies of distribution and power, allowing for the persistence of these ancient states.

Although the aforementioned pathways can alleviate the strains of population pressure, migration and warfare are not the only two ways that a society may respond to the selection pressures initiated by survival problems associated with a growing population. An alternative pathway through which population pressures can be reduced, is through the direct formation of socio-political hierarchies (Chase-Dunn and Hall 1997; Chase-Dunn and Lerro 2013). Through the formation of socio-political hierarchies,
societies are able to mobilize resources to alleviate the strains of population pressure in ways that would be impossible without such hierarchical organization. When societies develop increased levels of socio-political hierarchy in response to selection pressures initiated by population pressure, these societies will experience selection pressures for the elaboration of technologies of distribution and technologies of power. An example of how selection pressures can favor the formation of socio-political hierarchies, socio-political hierarchies, which in turn, initiate selection pressures favoring the elaboration of technologies of power and technologies of distribution, is provided by the Iñupiat of the North Slope of Alaska. The Iñupiat of Alaska’s North Slope can be broadly demarcated into two groups: the Tareumiut and the Nunamiut. Johnson and Earle (2000) outline the social organization of both groups.

The Tareumiut live in villages of 200 to 300 members scattered along the Arctic coast. Tareumiut society is organized around a subsistence system centered on cooperative whale hunting. Living in the North Slope of Alaska affords the Tareumiut with few food resources. The Tareumiut do some foraging and hunting of caribou, seals and walruses, but whales provide them with both the bulk of their meat and invaluable oils. Ethnographic research on the Iñupiat suggests that an adult eats about seven to eight pounds of meat per day. Due to the population densities of Tareumiut villages and the scare resources of the Arctic coast, when a season’s whale hunts are unsuccessful, famine is a real danger. To increase their success in whale hunting, Tareumiut men join together into voluntary whale hunting associations. These voluntary whale hunting associations then organize whale hunts throughout the village. The formation of voluntary whale
hunting associations represents the formation of a simple socio-political hierarchy in response to selection pressures produced by population pressure.

As voluntary whale hunting associations emerge, the formation of these associations initiates selection pressures favoring the emergence of new technologies of power and distribution. Voluntary whale hunting associations are organized under the leadership of an *umealiq* or ‘boat owner’. The emergence of such leadership represents an elaboration of the technologies of power and distribution found in Tareumiut society. The *umealiq* not only owns the boat and other fishing equipment required to bring in a whale, the *umealiq* also coordinates the hunting association, organizing and controlling the division of labor necessary for a successful hunt. This gives the *umealiq* substantial power within the association; however, with this power comes greater responsibility. Not only is the *umealiq* expected to distribute the catch from a successful hunt among members of the association, he is also expected to support his association’s members in times of hardship. To do this the *umealiq* must cultivate ties with other *umealit* in his village, so that he can call on their support during times of shortage. In performing these roles, the *umealit* play important distributive and regulatory functions in their society, which enables the persistence of the Tareumiut in the harsh climate of Alaska’s North Slope.

Finally, just as migration and the formation of socio-political hierarchies can emerge in response to selection pressures initiated by population pressure, such selection pressures can also favor the emergence of new technologies of production, which increase the ability of the societal organism to capture energy from its environment; new
technologies of distribution, which increase the ability of the societal organism to
distribute matter, energy and information among its component parts; and technologies of
power, which increase the ability of the societal organism to regulate the interactions of
its component parts. When societies discover new technologies of production,
technologies of distribution, and technologies of power, the population pressure that
emerges from the combination of increasing population size, subsistence intensification,
and environmental degradation can be overcome. The timber shortage that struck Britain
during the 17th century prior to the takeoff of the industrial revolution illustrates the role
of technological innovation in overcoming population pressure.

In the 17th century Britain was dependent on its land for nearly all of its material
goods; food came from agricultural land, clothing came from the wool of sheep raised in
the British pasture; and fuel as well as building materials came from the timber of
Britain’s extensive forests. As the British population grew and trade increased
throughout the 16th and 17th centuries an increasing amount of forest had to be cleared to
free up land for agricultural cultivation and to provide timber for both fuel and
construction. The continuing clearance of Britain’s forests led to a timber shortage in the
17th century (Wilkinson 1973; Ponting 1991; Hughes 2001; Williams 2006). To deal
with the timber shortage Britain turned to both imported timber, importing timber from
Scandinavia, Russia and North America, and to timber cultivated on newly emerging
plantations. However, the timber imported into the country could not meet British
demand; imported timber was also seen as inferior to British timber. Timber plantations
were also too few and far between to successfully alleviate the shortage. As timber grew
increasingly scarce it also became increasingly costly. From 1583 to 1633 the population of London grew from around 50,000 to about 340,000; during this time the price of timber rose at a rate that was twice as high as the rate of increase in the general price of goods (Williams 2006). To deal with this challenge the people of Britain began to rely more and more on coal as a fuel source (Wilkinson 1973; Ponting 1991; Hughes 2001; Williams 2006). From 1551 to 1681 British coal production increased from a rate of about 210,000 tons per year to a rate of about 2.9 million tons per year (Williams 2006). As Britain made the shift from timber to coal, the population pressure caused by Britain’s timber shortage was alleviated. Britain’s move from timber to coal would also play a crucial role in the future evolution of the entire world-system; Britain’s increasing reliance on coal played a key role in ushering in the industrial revolution (Sanderson 1999). By turning from timber to coal, Britain was able to alleviate the population pressure caused by its 17th century timber famine. As this example shows, to alleviate the strains of population pressure a society can move down the path of technological innovation (Chase-Dunn and Hall 1997; Chase-Dunn and Lerro 2013).

The iteration model is a recursive model where increases in society size, create selection pressures favoring increases in complexity, such complexity, in turn, enables further population increase. As the prior discussion has attempted to show, the formation

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7 Although the shift from timber to coal alleviated the population pressure felt by Britain’s growing population, it did little to alleviate Britain’s deforestation problem. While the use of coal decreased the number of trees felled for the purpose of fuel; during the industrial revolution the overall demand for timber continued to increase. Timber was necessary for the construction of coal mines and railroads; it also became increasingly necessary for the growing furniture industry (Hughes 2001).
of socio-political hierarchies and the elaboration of technologies of production, distribution, and power can alleviate the strains of population pressure. However, as the iterated nature of the model makes clear, as the formation of socio-political hierarchies and the elaboration of technologies both enable future population growth, these solutions are only temporary fixes to the problems of population pressure. By manipulating the bio-social-physical environment in a way that allows individuals access to more energy, the aforementioned socio-cultural mechanisms alleviate the strains of population pressure felt by the societal organism, but they also sow the seeds of their own destruction. When humans have surplus energy they often will use this surplus energy to make more humans (Morris 2013). When more humans are made the dynamics of the iteration model will be set in motion once again. As the following chapter will attempt to make clear, it is through this iterative dynamic, whereby population growth inevitably leads to population pressure, which initiates selection pressures for migration, the formation of socio-political hierarchies and the elaboration of technologies of production, distribution, and power, which in turn, enables further population growth, that the simple foraging organisms of the Upper Paleolithic were transformed in the complex organisms of agrarian and industrial civilizations. It is through this iterative dynamic that the organismic character of human societies has increased overtime.

**CONCLUSION**

From around 50,000 years ago until the dawn of the Neolithic revolution around 12,000 years ago, humans lived in small bands organized around a foraging mode of subsistence. From the archeological and ethnographic evidence, it seems safe to conclude that the
foragers of this time period were likely living in bands organized around the sharing of both food and non-food items. It also seems safe to conclude that these foraging societies were likely to have had graded systems of informal sanctions, as well as animist systems of religious belief, which could function to regulate conflict within the society. These socio-cultural mechanisms allowed the foraging societies of the Upper Paleolithic to capture the energy from their environments necessary for the survival of the society. Given this line of argument, the prehistoric foraging societies that dominated the globe from around 50,000 years ago until the dawn of Neolithic revolution can be considered simple organisms. As changes in the global climate allowed for the emergence of agriculture, the emergence of this new system of energy capture would set in motion a size-complexity feedback relationship, which would allow for the transformation of the human societal organism over the course of societal evolution. Now that the organismic character of prehistoric foraging societies and the iteration model of world-system transformation have been outlined, the next chapter will focus on using this iteration model to demonstrate how the organismic character of human societies was transformed with the Neolithic and industrial revolutions.
Chapter 5: The Societal Organism Transformed

INTRODUCTION

From at least 50,000 years ago until the dawn of the Neolithic revolution, the bands of foragers that populated the globe had the character of simple societal organisms. As a series of selection pressures initiated a positive feedback relationship between society size and societal complexity, the organismic character of human societies would transform. With the emergence of agricultural civilizations, human societies would take on the character of complex societal organisms. With the eventual emergence of industrial power, and the emergence of a global societal organism, the organismic character of human society would continue to increase overtime. To illustrate how the societal organism has transformed over the course of societal evolution, the present chapter will outline the evolutionary processes that led to the emergence of agricultural civilizations, and eventually to the emergence of industrial civilizations. In outlining this process, the present chapter will focus on the role of selection pressures that are induced by growth of the societal organism, which have favored the continued elaboration of technologies of distribution and technologies of power. As these technologies were elaborated, their ability to motivate cooperation and regulate conflict throughout the societal organism would allow for further increases in the size and scope of the societal organism, transforming the organism overtime.

FROM FORAGING SOCIETIES TO AGRICULTURAL CIVILIZATIONS

For the vast majority of Homo sapiens’ time on this planet, humans have met their energy needs through a foraging mode of subsistence. Around 11,500 years ago in Southwest
Asia this all began to change as humans in this region began to cultivate plants, eventually domesticating and becoming reliant on these plants along with a range of domesticated animals. Shortly thereafter between 9,000 and 4,000 years ago, a reliance on domesticated plants and animals for energy would independently emerge in central China, the New Guinea Highlands, Mesoamerica, the central Andes, the Mississippi basin, and possibly southern India and western Africa (Bellwood 2005). From these regional centers, agricultural civilizations emerged and as they grew, they spread by a series of pulsations throughout the globe. By 2,000 years ago the majority of earth’s inhabitants were living under agricultural subsistence systems (Sanderson 1999).

Agriculture emerged independently in at least six, but possibly eight regions and the agricultural developments in each of these regions were unique; for instance, the agricultural systems that emerged in the Fertile Crescent of Southwest Asia were centered around the domestication of wheat, barley and rye, whereas the agricultural systems that emerged in East Asia along the Yangzi and Yellow rivers were centered around the domestication of millet and rice. Despite the unique features of each agricultural emergence, the sociological dynamics that caused populations of mobile foragers to first become sedentary and then to develop cultivation and domestication techniques were the same across the cases. Before describing the general process by which mobile populations of foragers became settled populations of agriculturalists, I will first briefly describe what is meant by the agricultural mode of subsistence.

CHARACTERISTICS OF THE AGRICULTURAL MODE OF SUBSISTENCE

The agricultural mode of subsistence comprises a variety of subsistence forms that all
share one similarity. In subsistence systems based on agriculture, the most important source of energy comes from domesticated plants and/or domesticated animals (Morris 2015). Societal types that fall under the agricultural mode of subsistence include: gardening, farming and herding societies. Gardening societies are societies whose mode of subsistence is centered on gardening. Gardening refers to the cultivation of plants without the assistance of metal-based technologies, such as the plow. Gardeners also may hunt wild game or raise domesticated animals such as pigs to supplement their gardening efforts. Without technologies such as the plow, the intensity with which gardeners can cultivate the land is limited (Lenski 2005). Gardening societies originated at the dawn of the Neolithic revolution around 12,000 years ago (Chase-Dunn and Lerro 2013); today, those that remain, such as the Yanomami of the Amazon rainforest and the Dani of the highlands of Western New Guinea, exist in tropical climates with plenty of rainfall. Farming societies are societies whose mode of subsistence revolves around the farming of domesticated plants and animals. The members of farming societies farm with the assistance of metal-based technologies, such as the plow, and this allows farmers to cultivate the land much more intensively (Lenski 2005). Farming societies emerged after gardening societies, emerging during the era of Bronze Age states around 5,000 years ago (Chase-Dunn and Lerro 2013). The last type of society that falls under the agricultural mode of subsistence is herding societies. Herding societies are societies whose mode of subsistence is centered on herding livestock (Lenski 2005). It is likely that herding societies emerged as an offshoot of farming societies in areas that were inhospitable to the cultivation of plants (Lenski 2005).
Compared to societies organized around foraging, societies organized around an agricultural mode of subsistence are much larger. Gardening societies range from villages made up of a few dozen members to empires of several million inhabitants (Lenski 2005) and farming societies have populations that range from the thousands to several hundred million (Turner and Maryanski 2008). Whereas a reliance on wild food makes foragers highly mobile, a reliance on cultivated food makes the members of both gardening and farming societies sedentary, caged to their life-sustaining fields. Herding societies represent an exception to these trends. Herding societies are often highly mobile, as members of these societies must follow their herd. And although they can be larger than simple gardening societies, herding societies tend to be much smaller than complex gardening and farming societies (Lenski 2005). Although herders have played a significant role in shaping human history, the evolution of the societal organism has centered around the transition from foraging to gardening and farming. Given this, the present theory, which is meant to illustrate how the organismality of society has increased overtime, will focus on the transformations from foraging to gardening and farming, at the expense of herding societies.

From the emergence of modern humans until the dawn of the Neolithic revolution, humans living in foraging populations consumed between 4,000 to 8,000 kcal of energy per day (Morris 2013, 2015; Fischer-Kowalski et al. 2014). This all changed in a tremendous way as humans made the transition to gardening and eventually to farming. Morris (2013) provides estimates of the energy available to and used by individuals living in the Western core from the dawn of the Neolithic revolution to the dawn of the
industrial revolution. During this time period the Western core was an area centered on
the eastern portion of the Mediterranean from about 13,000 to 600 years ago. Then, from
about 600 until 200 years ago the location of the Western core shifted northwest through
Europe to be centered on Italy, Spain, France, Britain, the Netherlands and Germany
(Morris 2013). The Western core as defined by Morris (2013) represents the core area of
what Wilkinson (1897, 1992, 1993) calls the Central civilization. In the early stages of
the Neolithic revolution, when foragers were becoming sedentary and slowly adopting a
gardening way of life, gardeners barely used more energy per day than did their foraging
ancestors. Morris (2013) estimates that around 12,000 years ago the emerging gardening
societies of the Western core used around 5,000 kcal of energy per capita per day.

The amount of energy available to humans increased as cultivation intensified.
By the era of Bronze Age states around 5,000 years ago, the societies of the Western core
had developed more sophisticated farming techniques and were using around 12,000 kcal
of energy per capita per day (Morris 2013). The amount of energy used by individuals in
the agricultural societies of the Western core continued to climb until around 2,000 years
ago, when it peaked at about 31,000 kcal of energy per capita per day (Morris 2013).

With the collapse of the Roman Empire the amount of energy available to the members
of farming societies in the Western core decreased. Around 1,000 years ago, societies in
the Western core used only around 26,000 kcal of energy per capita per day, but by the
eve of the industrial revolution around 300 years ago, the energy available to the
agricultural societies of the Western core had gone back up to about 32,000 kcal of
energy per capita per day (Morris 2013). Although the members of agricultural societies
could use up to 32,000 kcal of energy per day, only a small portion of this energy would be consumed as food. The rest of the energy that the members of agricultural societies consumed on a daily basis would come in the form of feed for farm animals; fuels, such as charcoal and timber; and raw materials, which were necessary for the building and upkeep of permanent villages (Morris 2015).

As Morris’s estimates demonstrate, when societies became organized around gardening and farming, the amount of energy available to humans in these societies increased dramatically. When the amount of energy increased, agricultural populations grew, which would in turn create selection pressures for elaborated technologies of distribution and power. As technologies of distribution and power were elaborated, and the populations of gardening and farming societies developed more extensive networks of cooperation and more sophisticated mechanisms of societal regulation, the organismic character of these societies increased. The rest of this section will outline the evolutionary processes that led societies in certain regions of the world to abandon foraging in favor of gardening and farming, which set in motion a process that would lead to the eventual emergence of civilizations. After outlining this evolutionary process, I will then outline how technologies of distribution and technologies of power were elaborated as the transition to agricultural allowed civilizations to consume more energy. With the emergence of civilizations supported by agriculture, the simple organismic character of foraging societies was transformed into the complex organismic character of agricultural civilizations.
THE EMERGENCE OF AGRICULTURAL CIVILIZATIONS

According to Bellwood (2005) there were two factors that were necessary, but not sufficient, for the emergence of agriculture. The first necessary factor was that foragers had to start deliberately planting the seeds of wild plants and then cultivating these seeds on an annual cycle (Bellwood 2005). By planting and cultivating wild seeds, foragers were creating the opportunity for selection to produce the domesticated crops that would come to characterize agricultural societies. While this condition may seem self-explanatory, of course the emergence of agriculture required individuals to begin planting and cultivating seeds, planting and cultivation would set in motion a series of demographic and socio-cultural changes that would bring about the transition from a foraging to an agricultural mode of subsistence. The second necessary factor for the emergence of agriculture according to Bellwood (2005), was the Holocene stabilization of warm and rainy climates in the regions where agriculture would eventually emerge. Around 20,000 years ago the climate was cold, dry and highly variable. By 12,000 years ago, the global climate had become warmer, wetter and less variable. As the climate got warmer, wetter and more reliable and as foragers began to plant and cultivate wild seeds, a series of dynamics were set in motion that would lead to the emergence of agriculture in multiple locations throughout the globe.

Foraging societies, in general, are highly mobile. Reliant on wild plants and animals, foraging societies must move when the availability of food in the environment changes. As was stated in the section on foraging societies, women’s gathering efforts often determine when foragers will move residential camps. When the rate of return on
foraging efforts at the current location falls below the average rate of return for other locations, factoring in travel time, foragers will be motivated to move camps (Kelly 1983, 2013). If the rate of return at a given location never falls below the average rate of return for foraging efforts at other locations, a foraging society will not be motivated to move. Given this logic, Kelly (2013) concludes that, “sedentism is a product of local abundance in a context of regional scarcity” (107). When foraging populations occupy a location that offers more resources than does any alternative location, foragers will stay at this location, developing permanent or semi-permanent villages. As the climate got warmer and wetter in the interval between 20,000 and 10,000 years ago, increased rainfall allowed rainy areas to swell with plant and animal life. As the climate warmed at the end of the last ice age, areas with resources abundant enough to support a more sedentary way of life emerged. Some foraging populations soon moved into these regions, abandoning their temporary camps for sedentary villages and the longer these foragers remained sedentary the more tied to these villages they became. The foraging societies that adopted more sedentary lifeways also tended to get bigger.

The size of foraging societies is limited by the demands of the foraging mode of subsistence; more specifically the size of foraging societies is limited by the energy available to women. In all known foraging societies, women are the primary caretakers of children, although mothers receive childcare assistance from friends, female relatives and their children’s fathers (Hrdy 2011). Women in foraging societies are also responsible for gathering a significant amount of the calories consumed by members of the group and so women must multi-task, providing childcare for their dependent
offspring while they forage. Not only can the presence of children decrease a woman’s foraging efficiency; Bliege Bird (2007) reports that Meriam women in the Torres Straight Islands would sometimes switch to foraging for resources with a lower energy-return rate when children were present. Foraging while caring for children also places a high energetic burden on women’s bodies. While foraging, women must carry both the fruits of their labor and their dependent offspring; Hurtado et al. (1985) report that when Aché women forage they frequently take rest breaks to recover from the strain of carrying both their baskets and their children. Moreover, mothers in foraging societies practice on-demand breastfeeding, where children will engage in short, but frequent breastfeeding bouts; and lacking any substitute for breast milk, children in many foraging societies will breastfeed until they are at least three or four years of age (Quinlan and Quinlan 2008). Such a rigorous schedule of childcare and foraging places high energy demands on women’s bodies, which when combined with the low caloric intake of many foraging diets can limit the ability of women in foraging societies to get pregnant. As Kelly (2013) points out, a woman who is eating a diet low in calories, who is expending energy to forage on a daily basis and who is lactating will not ovulate frequently. Because of these conditions, women in foraging societies often do not have more than one child under the age of three at a time. Ethnographic research on contemporary foragers has found that across societies, foraging women have average birth intervals of 3.3 years between offspring (Marlowe 2005).

As areas of local resource abundance led foraging populations to abandon mobility in favor of a sedentary way of life, the energetic burdens, which limited the
ability of women in foraging societies to conceive were slowly lifted (Bellwood 2005; Kelly 2013). The warm, wet areas that were emerging at the end of the last ice age would decrease the variability in foraging return rates for those individuals settling in resource dense areas. This would increase both the quantity and the consistency of calories taken in by the members of these populations. When populations of foragers began to plant and cultivate the plants in these regions, the quantity and consistency of calories available for consumption would continue to increase. The increased availability and consistency of calories would lift some of the energetic constraints that kept the size of foraging populations so low (Bellwood 2005; Kelly 2013).

As the populations of foragers that settled down in areas of rainfed abundance began to rely more on cultivated plants they would inevitably come to rely on resources that required more processing work and this work would be performed by women. Although it is probably less enjoyable, processing plant foods for consumption is less aerobically demanding than is gathering wild plants with children in tow and so as women spent more time processing foods and less time gathering foods, they expended fewer calories in their everyday labors (Kelly 2013). Furthermore, as the cultivation of plants progressed, the invention of pottery would have allowed cereal grains to be converted into soft porridges, which could have been used as a substitute for breast milk, allowing children to be weaned earlier (Bellwood 2005). The early weaning of children would have further reduced the energetic demands experienced by women in the emerging gardening and farming societies. The combination of more calories taken in, along with fewer calories expended in everyday labor and in breastfeeding would lift the
energetic constraints that kept birthrates in mobile, foraging societies low. Members of these societies had no truly reliable method of birth control (Kelly 2013); so as the energy available to women increased, rates of conception would inevitably increase and the emerging gardening and farming societies would see their populations grow. Bentley et al. (1993) compared the fertility rates of foraging societies and agricultural societies. These authors found that for foraging societies the average total fertility score was 5.5 offspring per adult, whereas for agricultural societies the average total fertility score was 6.3 offspring per adult.

As more humans were produced, a point would be reached whereby individuals would have to work harder just to maintain the same standard of living, and the experience of this population pressure would encourage individuals to find ways to intensify their cultivation techniques. This feedback dynamic between population growth, population pressure and the intensification of cultivation efforts would eventually lead to the domestication of crops such as wheat, barley and rice. When humans settled into permanent villages it also created the opportunity to corral and pen wild animals. This opportunity allowed humans to raise the young of captured animals, which would allow these humans to actively select for animals that showed low levels of both fear and aggression. Shortly after humans domesticated plants they had also successfully domesticated multiple animal species (Flannery and Marcus 2012). With the domestication of both plants and animals, humans became fully reliant on the energy produced by their crops, flocks and herds, and because of this reliance they became tethered to their lands.
The emergence of the agricultural mode of subsistence took place at different times in different regions, but from its origins in Southwest Asia, central China, the New Guinea highlands, Mesoamerica, the central Andes, the Mississippi basin, western Africa and southern India, agriculture spread throughout the globe (Bellwood 2005). Making its first appearance 11,500 years ago, by 2,000 years ago the majority of humans on planet earth were surviving off the fruits of agricultural labor (Sanderson 1999). When the agricultural mode of subsistence spread, it did not lead to the disappearance of the foraging way of life, but it did lead to a substantial reduction in the number of foragers throughout the world as the members of foraging societies either adopted agriculture or were conquered and controlled by populations that had. Those foraging societies that did not adopt agriculture were increasingly pushed to isolated and remote habitats as the larger and more powerful agricultural societies spread around the globe (Lenski and Lenski 1987).

The transition from a foraging mode of subsistence to an agricultural mode of subsistence had drastic consequences for the societal organism. One consequence of this transition was the emergence of political and material hierarchy. As is outlined by the iteration model, when a population experiences population pressures, socio-political hierarchy may emerge either directly, or through a process of migration in circumscribed environments, which leads to conflict. Moreover, the emergence of socio-political hierarchy enacts selection pressures favoring the elaboration of technologies of distribution and technologies of power; all of which enable further population growth. Through this process, the complexity of the human societal organism would be
transformed. Foraging societies work hard to maintain an egalitarian ethos and with their small size and few material possessions, foragers are able to use a system of informal sanctions to maintain a sense of egalitarianism within their society (Boehm 1999). All over the globe, when foragers settled down and began to garden and farm, the egalitarian nature of their societies began to disappear as socio-political hierarchies emerged along with new technologies of distribution and power. Individuals in Southwest Asia began to cultivate plants around 11,500 years ago; by 7,300 years ago, chiefdoms with hereditary inequality had emerged in this region; by 5,000 years ago, the first states with stratified classes had emerged; and by 4,350 years ago, this region gave birth to the world’s first empire (Flannery and Marcus 2012).

Although it happened first in Southwest Asia, the transition from egalitarian societies to chiefdoms, states and empires occurred all around the globe, paralleling the emergence of agriculture. The co-evolution of modes of subsistence and modes of socio-political regulation would have important implications for the organismic character of human society. As populations of egalitarian foragers slowly evolved into populations of agrarian states, human societies would become organized into civilizations (Wilkinson 1987, 1992, 1993) and it is these civilizations that would take on the character of the societal organism. How did populations of egalitarian foragers create agricultural civilizations? The process involved wily, or just lucky, individuals capitalizing on the bottlenecks in power that appeared as mobile populations became sedentary and as agriculture produced a surplus (Early 1997); it also involved a conversion in social logic, whereby power that was once acquired through achievement became power acquired
through hereditary transmission (Flannery and Marcus 2012); finally, it involved the
effects of increasingly intense warfare on the spatial and political organization of

The first step in moving from egalitarian foraging societies to agrarian
civilizations involves the emergence of a sociopolitical hierarchy. Earle (1997) outlines
how enterprising individuals could take power in the newly emerging agricultural
societies. The first way that aspiring leaders could gain power is through economic
control. When individuals control fertile lands, or when they control food storage
facilities, or when they control necessary subsistence technologies, these individuals can
use their control to extract payments, labor and oaths of duty from the other individuals in
their society who need access to these items. This is what Earle (1997) calls staple
finance. For instance, once irrigation technologies had developed, the individuals who
lived on land that allowed them to control the flow of water through irrigation channels
could use this control to extract payments or labor from those individuals whose fields
were dependent on the water provided by the irrigation system. The second way that
individuals can take hold of economic power is through what Earle (1997) calls wealth
finance. When an individual controls access to prestige goods, either through controlling
the land that is the source of these goods or through controlling the movement of goods
through long-distance trade networks, these individuals can use this control to extract
payments, labor and oaths from the other individuals in their society who would like
access to their prestige-goods (Earle 1997). For instance, if many individuals depend on
the stone axes that are produced by a neighboring society, individuals who have network
connections with the axe-producing society can use their connections to acquire stone axes and then monopolize the distribution of these axes within their own society. Through either staple or wealth finance, enterprising individuals were able to take hold of economic power in the emerging agricultural societies.

The second way that enterprising individuals could take power is through the control of military power (Earle 1997). As humans settled down into agricultural villages, rates of violence initially increased (Otterbein 2004; Wrangham et al. 2006; Turchin 2015). Whereas, Wrangham et al. (2006) found their sample of 12 foraging societies to have a median mortality rate of 164 deaths per 100,000 people per year due to lethal aggression, they found their sample of 20 simple agricultural societies to have a median mortality rate of 595 deaths per 100,000 people per year due to lethal aggression. This drastic increase in aggression-based mortality comes from the increasing prevalence of warfare in early agricultural societies. While warfare was known to certain prehistoric foraging societies, such warfare largely consisted of raids that would take place when one side could use a numerical advantage and the element of surprise to ambush and kill an enemy with little risk of return attack (Wrangham and Glowacki 2012; Pandit et al. 2015). As foraging societies made the transition to agriculture and became caged to their fields and pastures, land became a good worth fighting for and defending. Also, as agriculture-induced population growth created a circumscribed landscape, conflict would result when individuals attempted to migrate in order to alleviate the strains of population pressure. Due to these facts, the rate of violence initially increased as foraging societies became sedentary and adopted agriculture (Otterbein 2004; Turchin 2016). With war
taking on an increasing importance in the lives of early agriculturalists, warriors and those with special fighting prowess gained growing levels of social-esteem. Warriors and fighting specialists could offer the other members of their society an element of protection, but in return warriors and fighting specialists would require payments, labor and oaths of loyalty from those whom they were protecting (Earle 1997).

Whether the emerging leaders of agricultural societies used economic or military power to gain control, once they had a position of authority they would be in a position to use ideological power as a complement to their economic or military might (Earle 1997). Once emerging leaders had resources at their disposal, these leaders could use their resources to build religious monuments and to hold ceremonial gatherings. By using their resources to construct monuments and to host ceremonial gatherings leaders were able to gain symbolic legitimacy in the eyes of the other members of their society (Earle 1997). Not only could the emerging leaders use their resources to build spectacular monuments and host ceremonial gatherings, these leaders could also use the resources at their disposal to rewrite their society’s religious cosmologies (Flannery and Marcus 2012). The cosmologies of foraging societies created a supernatural/natural hierarchy where no human individual could occupy a position higher than that of a gamma individual. By altering the interpretation of their society’s cosmologies, leaders were able to refashion the supernatural/natural hierarchies they contained. In so doing, leaders were able to place themselves directly under the creators of the universe, thereby moving themselves from the position of gamma to the position of beta in their society’s supernatural/natural hierarchy (Flannery and Marcus 2012). By building monuments,
hosting ceremonies and by rewriting their society’s cosmologies, the emerging leaders of early agricultural societies were able to cultivate symbolic legitimacy, which would further reinforce their social power (Early 1997; Flannery and Marcus 2012).

When gardening and farming were just emerging, the political inequalities that appeared as enterprising individuals took control of the sources of social power were minimal. This is because although fortuitous advantages would allow some individuals to accumulate more social power than others, to truly have power these leaders would have to command the deference of their subjects. In foraging societies, goods were exchanged under an ethic of generalized reciprocity; moreover, the act of exchange was viewed as more important than the specific items exchanged (Johnson and Earle 2000). Recall, among the Ju/'hoansi wealth in the hxaro exchange was a product not of how many possessions one had, but was a product of the number of transactions in which an individual took part (Lee 2003). This ethic pervaded the emerging power structures of early agricultural societies and because of this, for those with material advantages to convert these advantages into deference, they would be forced to redistribute the products of their material advantage. Through redistributing wealth, the emerging power holders of early gardening and farming societies could gain the deference of their fellows. Such deference was vital, as the emerging leaders of these societies could only hold on to their power if they were able to successfully redistribute the resources that they had come to control (Johnson and Earle 2000; Flannery and Marcus 2012).

As early gardening and farming societies developed socio-political hierarchies, the emergence of such hierarchies would enact selection pressures favoring elaborated
technologies of power and distribution. In early agricultural societies, one’s ability to control the sources of social power was based on achievement (Flannery and Marcus 2012). The individuals that could perform important tasks better than others received a disproportionate share of social power, but this share of social power was contingent upon the ability of these individuals to perform tasks better than the other members of their society and to redistribute the fruits of their social power. As the populations of early gardening and farming societies continued to grow, demanding the intensification of subsistence efforts, the importance of achievement-based power would decrease, while the importance of power acquired through hereditary inheritance would take on an ever-expanding role. As hereditary power became more important, the nature of redistribution would change, and the overall level of inequality observed in agricultural societies would increase (Flannery and Marcus 2012).

Under a foraging mode of subsistence, one’s success as a hunter or gatherer depends more on skill than on inherited property (Kaplan et al. 2009). In foraging societies, all members of the society have access to hunting and gathering grounds and the technologies necessary for successful hunting and gathering. As individuals all have access to both the land and tools that are needed for subsistence, successful hunting and gathering depends primarily on one’s skills as a hunter or gatherer (and luck). As members of a society begin to rely less on foraging and more on gardening and farming, the role of skill in determining an individual’s subsistence success decreased and the role of inherited property increased. In foraging societies material property is limited, which limits the amount of property that can be passed down to one’s offspring. In a society
organized around agriculture, not only does the general level of material property increase compared to a foraging society, but the extent to which one’s success depends on the material property that they inherit, such as fertile lands or tools, increases as well (Kaplan et al. 2009). Furthermore, as agricultural cultivation intensified, the importance of inherited material property in determining one’s success as a farmer intensified in concordance. This means that over time, as the scale and scope of agriculture progressed, inheritance became increasingly important for determining one’s success. As the source of success came to be more dependent on what your parents could bestow and less on your individual talents, social power went from being something that was acquired by achievement to being something that was acquired by heredity (Flannery and Marcus 2012). When this shift happened, individuals became much less willing to re-distribute their wealth and much happier to accumulate wealth for the benefit of their family. The shift from systems of power based on achievement to systems of power based on heredity marked the true emergence of inequality in human society (Flannery and Marcus 2012).

The emergence of inequality corresponds with the emergence of chiefs and the chiefdom mode of socio-political organization in agricultural societies. From the archeological record, it appears that chiefdoms and systems of hereditary inequality emerged around 7,000 years ago in Southwest Asia and 3,000 years ago in Peru and Mesoamerica (Flannery and Marcus 2012).

With the emergence of chiefs, whose power was based on hereditary inheritance, the nature of re-distribution in agricultural societies was forever changed. In prehistoric foraging societies, redistribution was organized around an ethic of generalized reciprocity
Under the achievement-based systems of social power that characterized the early gardening and farming societies of the agricultural era, redistribution was organized around an ethic of egalitarian redistribution. Under the ethic of egalitarian redistribution, aspiring leaders would accumulate large surpluses of food and prestige goods before re-distributing these surpluses to their followers through a series of feasts and rituals (Sanderson 1999). As power became increasingly based on hereditary status rather than achievement, the nature of redistribution changed even further. No longer was redistribution based on an ethic of egalitarian redistribution, as gardening and farming progressed and chiefs emerged, redistribution came to be based on an ethic of stratified redistribution (Sanderson 1999). Under an ethic of stratified redistribution, chiefs would amass a surplus from their followers only to redistribute a small fraction of this surplus, keeping the rest of the bounty for themselves and their family. The shift from systems of prestige based on achievement to those based on hereditary status, and the shift from an ethic of egalitarian redistribution to an ethic of stratified redistribution would set the stage for the emergence of states and civilizations. The emergence of states and civilizations would mark a significant increase in the level of socio-political hierarchy exhibited by the societal organism. This increase in socio-political hierarchy would, in turn, create selection pressures favoring the elaboration of technologies of distribution and power.

The first states, also known as pristine states, appear 5,000 years ago in Mesopotamia and Egypt; 4,000 years ago in Pakistan and China; and 2,000 years ago in Mexico and Peru (Flannery and Marcus 2012). It is likely that these first states emerged
when chiefdoms, whose populations were growing larger and whose chiefs were demanding a larger surplus, came into conflict over territory (Carneiro 1970, 2012; Flannery and Marcus 2012). As gardening and farming populations grew, the strains of population pressure would be ever present, and as chiefly egos grew, chiefly demands for surplus would continually drive subsistence intensification. Unfortunately for the chiefs seeking new territory, as chiefdoms emerged and as agricultural production continued to develop, the bounties of agriculture caused the landscape to fill up with humans; open, farmable land was quickly becoming a scarce commodity. This meant that when a chief attempted to expand his territory, he would be doing so at somebody else’s expense. Populations of gardeners and farmers don’t give up their lands easily, so when chiefs would attempt to expand their territory they would inevitably come into conflict with their neighbors.

When two chiefdoms went to war, the winning chiefdom would usurp the losing chiefdom’s farmlands and either enslave or incorporate the losing chiefdom’s population. Through this process of chiefdom conquering chiefdom the first states emerged around the globe (Carneiro 1970, 2012; Flannery and Marcus 2012). Once one state had emerged in a region, the size and the sociopolitical structure of that state would allow it to run over the smaller chiefdoms in its path. Because of this, once a state had emerged in a region, its neighbors were forced to get bigger and adopt a state-based mode of sociopolitical organization, or run this risk of being conquered. The formation of the first states was not a pretty process, as Flannery and Marcus (2012) point out, it involved thousands of deaths and the enslavement of thousands more.
In chiefdoms, the territories ruled by chiefs were small enough to be administered by the chief himself, with the assistance of a coterie of sub-chiefs. As chiefdoms went to war and the losing chiefdom was incorporated into the sociopolitical structure of the winning chiefdom, territories became too big and populations too complex to be administered by the chief and his small coterie of sub-chiefs (Spencer 1998, 2010). When territories grew beyond what any chief could administer, chiefs had to form a permanent administrative staff and it was the formation of a permanent and specialized administrative staff that marked the formation of the first states (Spencer 1998, 2010). The administrative apparatus of the newly formed states consisted of the king, religious specialists, military specialists, tax-collectors and servants to name just a few of the positions that would be required to run this new form of sociopolitical organization. To support his administrative staff, the king would rely on the surplus produced by his people, extracting this surplus and then redistributing it to himself and his administrative staff. The underlying ethic of this new form of re-distribution is what Sanderson (1999) refers to as surplus extraction. It is under the ethic of surplus extraction that the world would see the emergence of its first stratified classes (Flannery and Marcus 2012). In the first agrarian states labor was predominantly provided by laborers, who were subject to hefty rents and taxes. Slavery existed in these first states, but it was not the predominant mode of surplus extraction. Overtime, agrarian states and later empires began to rely increasingly on slave-labor and by the time of the Greek city-states and the Roman Republic, slavery had reached massive proportions (Anderson 1974).
Extracting the surpluses of their people, the kings in these early states could amass great wealth, but great wealth was never enough. As kings consolidated their power over larger and larger populations, they legitimized this power by having cosmologies re-fashioned, thereby making themselves the ancestors of the gods, or in the case of Ancient Egypt, making themselves into gods outright (Flannery and Marcus 2012). From the perspective of an individual living in a predominantly monotheist society like the United States of America, the idea that kings could just have cosmologies re-fashioned in order to change their relationship with the gods may seem ludicrous, but the emerging polytheisms of the first states had no written religious scriptures (Whitmarsh 2015). Lacking any written religious scripture, re-fashioning the cosmology of the society over which one ruled meant changing the way the cosmology was recounted and remembered, rather than having it literally re-written; a seemingly much easier task. Believing themselves to be gods, or at least god-like, the kings of early states saw no earthly limit to the amount of wealth they could amass and so they were constantly driven to increase the surplus produced by their society.

In an era of limited technological innovation, the primary means by which the kings of early states could achieve a larger surplus was to control more land and more laborers. And so to increase their wealth, kings would attempt to conquer other kings in order to take their land and incorporate or enslave their population. Empire-building is a difficult task and in the era of the first states no king was successful until around 2350 BCE, when Sargon of Akkad plundered Syria and the Levant for wealth and then used this wealth, along with advancements in military formation to unify Mesopotamia under
his control (Mann 1986; Morris 2010; Chase-Dunn and Lerro 2013). Empires were formed when kings and their states went to war with each other. Turchin et al. (2013) developed a model to assess the role of warfare in the formation of empires. Using data on the emergence of Old World empires from the years 1500 BCE to 1500 CE, Turchin et al. were able to explain 65% of the variance in Old World empire formation, using just two variables: the intensity of warfare in a given area, and the diffusion of military technologies to that area. The evidence indicate that empires were formed through the crucible of warfare in the agricultural era.

Although warfare played a crucial role in the formation of states and empires, once empires had formed they could use their strength to pacify the region over which they controlled and when an empire emerged and expanded, the quality of life for those living within the empire would rise (Mann 1986; Morris 2014). When an empire’s power began to decline, be it for whatever reason, states would come into conflict as they challenged the current empire’s claim to dominance until eventually a new empire would emerge (Chase-Dunn and Hall 1997; Chase-Dunn and Lerro 2013). This cycling of agrarian states and empires would continue throughout the agricultural era until the 19th century, when the emergence of industrial power in Britain would allow the British Empire to expand over the entire globe. The emergence of agriculture set in motion a series of societal dynamics that led to the formation of chiefdoms, agricultural states and empires. As these new forms of political hierarchy were invented, the societal organism experienced selection pressures favoring elaborated technologies of distribution and
elaborated technologies of power, which could enable cooperation and regulate conflict in the growing societal organism.

A second major consequence of the agricultural revolution was the growing trend towards urbanization. The members of mobile foraging societies spent most of their time in residential camps of around 25 individuals (Kelly 2013). Periodically, foraging groups would aggregate together for trade and ceremony, or for winter villages; these temporary aggregations could contain up to several hundred people (Binford 2001; Kelly 2013). As humans began to settle in the rainfed areas that were opened as the climate warmed after the last ice age, the size of human settlements began to grow. By 9,000 years ago, Çatalhöyük, which was likely the largest settlement in the Western core at this time, had an estimated population of about 1,000 residents. By 5,000 years ago, Uruk, which was by then the largest settlement in the Western core, had a population of about 45,000 residents and by 2,000 years ago, Rome had a population of about 1,000,000 residents (Morris 2013). Not only did the size of settlements increase with the appearance of agrarian states and empires, the number of settlements increased as well. Sanderson (1999) provides data on the number of settlements with over 30,000 inhabitants worldwide from the years 2250 BCE to 1500 CE. In the year 2250 BCE, it is estimated that there were 8 settlements with 30,000 or more inhabitants. About 1,000 years later, in 1200 BCE, it is estimated that there were 16 settlements with 30,000 or more inhabitants and by the year 100 CE, it is estimated that there were 75 settlements with populations of 30,000 or more. As the above numbers demonstrate, agriculture allowed for the emergence of states and empires and with this came a growing trend in urbanization;
however, it’s important to note, despite the drastic increase in urbanization, the majority of the world’s population still lived outside of cities. From the data presented by Sanderson (1999), in 2250 BCE about 240,000 people lived in cities throughout the world. The world population at this time is estimated to have been around 23 million people. This means that in 2250 BCE about 1% of the world’s population was living in cities. Over 2,000 years later, in 100 CE, about 5,181,000 people lived in cities throughout the world. At around this same time the total world population is estimated to be around 252 million people. This means in the year 100 CE, only about 2% of the world population was living in cities. Although 2% may seem like a small fraction of the population, this 2% represents a major increase in the number of people that were living in cities prior to the advent of the agricultural mode of subsistence.

What was it about the emergence of agriculture, states and empires that produced this trend in urbanization? The major factor appears to be safety. As states and empires emerged, warfare became both more frequent and more intense; recall the results of Turchin et al. (2013) where the intensity of warfare and the diffusion of military technologies in an area were the strongest predictors of when and where an empire would emerge in the Old World. As the prevalence and the viciousness of warfare increased, the perils of war would cause some individuals to move to the city, where they could trade the openness of their rural fields for the safety of city walls (Flannery and Marcus 2012). Once they had relocated to the city, these individuals would have to find new lines of work, which would lead to an increasingly complex division of labor in agricultural societies. Individuals with unique talents could be employed in the
production of various crafts, whereas individuals without such talents could be employed as sharecroppers working for the city temple or for wealthy families (Flannery and Marcus 2012). It’s likely that the kings who ruled over the emerging cities accepted immigrants with open arms; more residents meant more laborers and military specialists and the grander the city’s architecture and the more imposing its military force, the less likely would it be to come under attack (Flannery and Marcus 2012). As cities grew in size, the safety from war provided by living within the city, along with the economic opportunities created by an ever expanding division of labor would cause cities to grow from around 1,000 inhabitants in the first agricultural settlements to 1,000,000 inhabitants in 1st century Rome.

With the surpluses of agriculture leading to the emergence of states and empires, human societies became organized into civilizations. Civilizations are characterized by the presence of states and the socio-political formations associated with states, which includes irrigation agriculture, stratification, urbanism, ceremonial centers, codified law, taxation and bureaucracy (Flannery 1972; Mann 1986). Civilizations are characterized by the presence of the aforementioned socio-political formations, but civilizations are not these socio-political formations. Instead, civilizations are the socio-political interaction networks of cities and their populations; socio-political interaction networks exist whenever the members of different cities interact intensely, significantly and continuously overtime (Wilkinson 1987, 1992, 1993). As individuals tried to survive in the environments created by agricultural states and empires, these individuals came to be dependent on goods produced outside of their city causing cities and their populations to
become linked in dense networks of trade. At the same time, the expansionary tendencies of states and empires brought the populations of different cities into networks of conflict and alliance. Through the interaction of individuals and groups within these networks, civilizations emerged. When civilizations supported by agriculture emerged in human history the organismic character of human society jumped from the scale of individual societies to that of civilizations.

According to the definition of civilization provided by Wilkinson (1987, 1992, 1993), two societies are linked together into a civilization whenever their populations experience significant and continuous interactions with each other, even if these interactions are defined by conflict. Organisms are whole entities that feature a high level of cooperation and a low level of conflict among their component parts (Queller and Strassmann 2009; Strassmann and Queller 2010). The fact that organisms require low levels of conflict, whereas civilizations can exist as networks of conflict may seem to preclude civilizations from being considered organisms, but Wilkinson’s (1987) justification for considering separate societies engaged in sustained conflict as civilizations clarifies why civilizations can be considered organisms, conflict and all. Wilkinson notes that sociologists have long recognized the ability of conflict to unify opposing parties (Simmel [1908] 1955; Coser 1956). When two parties engage in conflict, the conflict will often lead to the emergence of an entity that supersedes either of the conflicting parties. As both the iteration model (Chase-Dunn and Hall 1997; Chase-Dunn and Lerro 2013) and the models of Turchin et al. (2013) demonstrate, societal conflict leads to sociopolitical hierarchy formation. When two states come into conflict,
if one state has a socio-political or military advantage, the advantaged state can take over the administration of the weaker state. When two warring states are more evenly matched, the presence of prolonged conflict may lead to the formation of an alliance or treaty. In both cases, the socio-political entity that emerges from the conflict is an entity that supersedes either of the parties engaged in the conflict and because of this character the emergent entity is able to regulate future conflict; as Wilkinson argues, “*a fortiori* then we must recognize that a unifying social entity or system exists where we have evidence that a pair of groups alternates war with negotiation, or war with trade, or war with coalition, or war with subordination, or war with watchful waiting or war with threats and preparations for war” (1987: 34).

Although conflict must be kept at a minimum for an organism to maintain its integrity, it is not required that organisms have absolutely no conflict. What is necessary is that organisms have mechanisms, which are able to regulate conflict, thereby keeping levels of conflict low enough so that they do not disrupt adaptive function at the level of the organism (Queller and Strassmann 2009; Strassmann and Queller 2010). Societies, just like organisms, are temporary aggregations of high order; because of this, the key adaptive challenge faced by an organism is capturing the energy from its environment that it needs to persist\(^8\). Therefore, as long as the conflict between societies within a civilization does not disrupt the ability of the civilization to capture the energy needed for

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\(^8\) For most organisms, such as humans or dogs, persistence requires survival and reproduction. For some organisms, such as some species of modular plants and human civilizations, persistence requires survival but not reproduction. Instead these types of organisms persist by replacing their component parts overtime.
the persistence of that civilization, the conflict has not disrupted the civilization’s adaptive functioning. Therefore, the conflict should not disqualify the civilization from being considered an organism. Moreover, the evolution of conflict mediation mechanisms is a key step in the emergence of a higher-level organism (Michod 1999) and the emergence of organismality is a matter of degree (Herron et al. 2013). Some organisms have more effective methods for regulating conflict than do other organisms; the organisms with more effective conflict mediation mechanisms have a higher degree of organismality than do their less effective counterparts (Clarke 2013). As organismality is a matter of degree, civilizations can be considered more or less organismic depending on the how much trade and how much conflict is present within the civilization’s socio-political interaction networks and by what mechanisms exist for regulating conflict within these networks. When a civilization is characterized by a high level of trade and a low level of conflict, and when the civilization has effective mechanisms for regulating conflict, that civilization exhibits a high degree of organismality. When a civilization is characterized by low levels of trade and high levels of conflict, and when the civilization lacks effective mechanisms for regulating conflict, that civilization exhibits a low degree of organismality. Following from this logic, when a civilization is composed of warring states, this civilization will exhibit higher levels of conflict, and thus will have a low degree of organismality. On the other hand, when a civilization is composed of an empire that is able to dominate other states and pacify a region, this civilization will exhibit lower levels of conflict and thus will have a high degree of organismality.
According to Wilkinson (1987, 1992, 1993), throughout human history, no more than 14 civilizations have existed. The history of these civilizations is the history of 14 societal organisms. Moreover, once a civilization has come into existence, the civilization itself has almost never completely collapsed; instead it has either been coupled with or engulfed by another civilization. The first civilizations to emerge in human history emerged around 5,000 years ago with the appearance of the first states in both Mesopotamia and Egypt. About 4,700 years ago, Aegean civilization emerged, and 400 years after that Indic civilization emerged. Around 3,500 years ago, East Asian civilization emerged and during this same time period, the Mesopotamian and Egyptian systems became coupled to form what Wilkinson calls the Central civilization. About 3,100 years ago, Mexican civilization emerged and then around 2,500 years ago, Aegean civilization was engulfed by the Central civilization. Around 2,200 years ago, Peruvian civilization emerged, followed by the emergence of West African civilization around 1,700 years ago. Irish civilization emerged about 100 years after that. Around 1,400 years ago, Japanese civilization emerged, followed by Indonesian and Mississippian civilizations around 1,300 years ago. Around 1,000 years ago, Indic and Irish civilizations were engulfed by the Central civilization. In the next 600 years the Central civilization would violently engulf Mexican, Peruvian, Chibchan (whose date of emergence is unknown), Indonesian and West African civilizations. About 400 years ago, the Mississippian civilization would be destroyed, perhaps by pestilence, the solitary case of civilization collapse according to Wilkinson (1987, 1992, 1993). Finally, about 150 years ago, the Central civilization would engulf East Asian and Japanese civilizations.
to create a global civilization. The full globalization of the Central civilization would have important consequences for the social organism, but as this globalization was made possible by the emergence of industrial power, these implications will be saved for the section on the industrial organism.

As gardening and farming societies came to capture more energy from their environments, they grew larger and as societies grew larger, new levels of socio-political hierarchy would emerge, culminating with the emergence of states and empires. When states and empires were locked into webs of trade, conflict and alliance, civilizations emerged around the globe. As the societal organism transformed with the emergence of civilizations, selection pressures caused by the growing societal organism would favor elaborated technologies of distribution and elaborated technologies of power, which could facilitate cooperation and regulate conflict within the growing societal organism. The foraging societies of the Upper Paleolithic were likely to have featured simple networks of exchange. As the growing societal organism experienced selection pressures favoring elaborated technologies of distribution, the networks of exchange that first appeared in foraging societies would deepen and become more extensive; furthermore, highly differentiated divisions of labor would emerge locking the populations of agricultural civilizations together into webs of mutual interdependence. As the societal organism experienced selection pressures favoring elaborated technologies of power, the informal systems of conflict regulation that characterized the foraging societies of the Upper Paleolithic would evolve into the formalized systems of law that characterized agricultural civilizations. And as polytheistic and monotheistic religions emerged, the
combination of law and religion would function to regulate conflict within the growing societal organism. The next section will outline the elaboration of technologies of distribution and technologies of power, which enabled cooperation and regulated conflict within the agricultural organism.

COOPERATION AND CONFLICT IN AGRICULTURAL CIVILIZATIONS

As processes of societal evolution caused foraging societies to slowly transform into agricultural civilizations, the degree of organismality that characterized the newly emerging agrarian civilizations jumped upward. The increase in organismality exhibited by agrarian civilizations emerged as societies adapted to changing climates in innovative ways, which allowed these societies to capture more energy from their environments and grow larger. As societal organisms grew larger and new levels of socio-political hierarchy emerged, these organisms experienced selection pressures to develop elaborated technologies of distribution and elaborated technologies of power, which could facilitate cooperation and regulate conflict within the growing organism. As selection pressures favored the elaboration of technologies of distribution within the growing societal organism, extensive networks of within and between community trade would emerge, along with increasingly differentiated divisions of labor. As selection pressures favored the elaboration of technologies of power within the growing societal organism, formalized systems of law, and polytheistic and monotheistic religions would emerge. Through these developments in technologies of distribution and technologies of power, the overall level of cooperation within the societal organism increased and societal organisms became increasingly efficient at regulating conflict, which allowed
these organisms to continue to capture the energy from their environments necessary for their persistence

The emergence of horticulture and agriculture led to a significant increase in the amount of energy available to the members of agricultural civilizations. As Morris (2013) demonstrates, at the dawn of the agricultural revolution individuals in the gardening societies that were emerging were barely using more energy per day than foraging populations. The individuals in the early gardening societies of the Western core were consuming about 5,000 kcal of energy per capita per day. When better gardening and farming techniques developed, humans captured more energy from their environments. By the time that civilizations were emerging in Mesopotamia and Egypt about 5,000 years ago, these civilizations were using around 12,000 kcal of energy per capita per day, and by 2,000 years ago, the Roman Empire was using about 31,000 kcal of energy per capita per day. To sustain this increase in energy capture, agricultural societies experienced selection pressures to develop sophisticated divisions of labor as was noted by the 14th century sociologist, Ibn Khaldun; “the power of the individual human being is not sufficient for him to obtain (the food) he needs, and does not provide him with as much as he requires to live…Thus, he cannot do without a combination of many powers from among his fellow beings, if he is to obtain food for himself and for them. Through cooperation, the needs of a number of persons, many times greater than their own number, can be satisfied” (Ibn Khaldun quoted in Abdullahi and Salawu 2012: 28-29).
In foraging societies cooperation was organized around an ethic of reciprocity where resources would be shared both within and between families. In the civilizations that would emerge in the agrarian era sharing within and between families according to an ethic of reciprocity would continue to be an important practice (Johnson and Earle 2000; Chase-Dunn and Lerro 2013), but cooperation would also come to be organized around a complex division of labor. Outside of the sexual division of labor, foraging societies had no occupational specialization (Kelly 2013). Individuals with inordinate spiritual prowess would be able to use their spiritual gifts to take on positions of ritual specialist; however, the ritual specialists of foraging societies were still required to engage in subsistence labor, and thus they were not specialists in the true sense of the word (Lenski and Lenski 1987). As populations of foragers became sedentary and began to rely on gardening and farming, the division of labor exploded rapidly. When a surplus was produced, this surplus would free some individuals from subsistence tasks. Freed from subsistence labor, these individuals would be able to dedicate their time and energy to performing some other social role. Those who had manufacturing skill could specialize in producing weaponry or pottery, those who had construction skill could specialize in building dwellings or boats, those who had bartering skills could specialize in merchant activities. As the surplus produced by plant cultivation increased and as technologies developed, the number of specialists engaged in the production of various goods or the performance of various services increased (Turner and Maryanksi 2008).

Also, as the surplus produced by cultivation increased, the surplus would come to support full-time military and ritual specialists, along with the chiefs and kings that
would emerge in the agrarian era. With the emergence of agriculture, selection pressures favoring the elaboration of technologies of distribution led societies to develop highly differentiated divisions of labor. From the archaeological record, it appears that the development of the division labor first took place as craft specialists emerged. For instance, finds dated to 9,000 years ago from the site of Çatalhöyük in Anatolia indicate that the people living at this settlement had craft specialists, but no priestly cast or political leaders (Mithen 2003). 2,000 years later, around 7,000 years ago, archeological evidence indicates that the societies in Mesopotamia had developed hereditary leadership (chiefs) and 1,000 years after that around 6,000 years ago, archeological sites in Mesopotamia have clear evidence of temple complexes, which suggests the presence of ritual specialists (Flannery and Marcus 2012).

With the emergence of specialized producers, the individuals in the first gardening societies developed a level of mutual interdependence that had never before been observed in human societies. The majority of individuals in gardening societies, just as in the farming societies that would follow, were engaged in subsistence tasks and for these individuals most goods were produced and consumed at a household level (Lenski and Lenski 1987; Johnson and Earle 2000). However, for the emerging class of specialists, survival would depend upon the surplus produced by subsistence labor. Furthermore, although much of the energy consumed by households in the emerging gardening societies of the agricultural era was produced at the household level, these households benefited from the labor of specialists in other important ways. Cultivation was labor intensive and required those individuals engaged in subsistence work to spend
long hours cultivating their fields or tending to their animals. Due to this time burden, those individuals who were engaged in subsistence labor would have little time or know-how to manufacture the technological products they had come to rely on, such as ceramic pottery, and because of this situation, subsistence farmers would depend on the labor of specialist producers. Through the division of labor, those individuals engaged in subsistence tasks and those individuals engaged in the production of goods would become fundamentally dependent on the labor of each other. As selection pressures favored the elaboration of technologies of distribution, the emerging division of labor that would result would bind populations together into webs of cooperation.

Just as the needs of craft specialists and the needs of subsistence producers led to a mutual dependence between the two categories of people, the needs of the general population and the needs of emerging leaders in the gardening and farming societies of the agrarian era created a mutual interdependence between leader and follower. Chiefs and kings supported themselves on the surplus produced by the general population; no matter how powerful the chief or king, his ability to eat was dependent upon the subsistence labor of other people. Furthermore, leadership positions depended on that position being granted legitimacy by those over whom the leader had power and to receive such legitimacy a chief or king needed to provide for his chiefdom or kingdom. And so in these ways, the leaders that took power in the agrarian era were dependent on the subsistence labor and support of their subjects. The general population was also dependent on the leadership skills of their newly appointed leaders. As humans settled down and began to cultivate the land, rates of warfare increased (Wrangham et al. 2006).
Due to the threat of warfare, the survival of the many individuals living in the societies of the agrarian era was dependent on the ability of their leaders to mobilize warriors in defense of the population and to mobilize labor to construct city walls and palisades. Furthermore, as the agrarian era progressed and trade between communities took on increasing importance, the members of these societies became increasingly dependent on the ability of chiefs and kings to foster trade connections with neighboring communities. In these ways, leaders and their followers were also bound together into webs of mutual interdependence. Through the evolution of the division of labor in the early agrarian era in response to selection pressures for the elaboration of technologies of distribution, populations of subsistence producers, craft specialists and political and religious leaders became linked in complex webs of mutual interdependence.

As the gardening societies of the early agrarian era evolved into agricultural civilizations, the within-community division of labor would continue to differentiate, creating thicker webs of interdependence among the members of the emerging states and empires (Turner and Maryanski 2008). With technological innovations such as irrigation systems and the plow, agricultural surpluses increased dramatically (Lenski and Lenski 1987; Turner and Maryanski 2008). When agricultural surplus increased, the individuals freed from subsistence tasks increasingly moved into urban areas where they could take up a variety of non-subsistence related occupations ranging from craft production to military specialist, to government administrator. Archaeological evidence from the sites of early agricultural civilizations illustrates the extent of specialization in these societies. Inscriptions from the Late Uruk period, around 5,000 years ago, list the following
occupational specializations: accountant, servant, scribe, steward, messenger, overseer, merchant, smith, potter, mason, carpenter, weaver, leatherworker, launderer, cook, fisherman, shepherd, plowmen and gardener (Flannery and Marcus 2012). Inscriptions from Mycenaean Greece, dating to around 3,500 years ago, list a variety of leadership positions including: king, military leader and priest (Shelmerdine and Bennet 2008). Archeological evidence also indicates that Mycenaean Greece was home to a variety of highly specialized craftsman including: blue glass workers, perfume oil manufacturers and ivory workers (Shelmerdine and Bennet 2008). In addition to all of these specializations, the urban areas of agrarian civilizations would also be home to individuals specializing in a variety of illegal occupations (Lenski and Lenski 1978). This increasingly differentiated division of labor was made possible by the surplus generated by agricultural producers. And in many ways the agricultural producers were dependent on those individuals residing in the new urban areas. When agrarian states came into conflict with one another, the ability of famers to farm was dependent on the ability of military specialists to keep the peace and when intra-societal conflict sprung up, the ability of farmers to farm increasingly came to depend on the how effectively government and religious officials could use force and ideology to legitimate the social order. As within-community divisions of labor developed, the overall level of mutual interdependence exhibited by the members of agrarian civilizations increased dramatically compared to the level of mutual interdependence seen in the foraging societies of the prior era.
Along with the within-community division of labor that would emerge in response to selection pressures for the elaboration of technologies of distribution during the agricultural era, a between-community division of labor would also emerge during this time period furthering the extent of cooperation in the societal organisms of agricultural civilizations. Agriculture emerged in areas of great ecological contrast and this ecological contrast allowed for a division of labor to develop among different regions (Mann 1986). Full-scale agriculture emerged in the alluvial plains of major rivers, when the farmers in these areas developed methods to irrigate valley land with flood water. In these areas farmers were able to cultivate and harvest a variety of crops. In the rainfed regions outside of the alluvial plains, the environment would often be more suitable for herding and still further away from the alluvial plains that were at the center of this agricultural complex would be land that was most suitable for the hunting of wild game and the gathering of wild plants. As the different ecological zones in the areas of agriculture’s emergence specialized in the production of different goods, the residents of communities in these areas would become dependent on trade between ecological zones. Those individuals who were living in the alluvial valleys could exchange their crops for the meat, skins and dairy products of those living in the areas suitable for herding and for the wild plants and animals collected by those individuals living on the edges of agricultural regions. As the individuals residing in one ecological zone traded with individuals living in other ecological zones, the individuals that resided in separate ecological zones would come to depend on the products of their exchanges. In turn, the communities located in these different zones would come to be bound together in webs of
mutual interdependence as selection pressures favoring the elaboration of technologies of distribution led the members of different communities to become increasingly reliant on the products produced in other communities (Mann 1986).

Furthermore, as the agricultural era progressed and urban areas continued to grow, different urban centers would come to specialize in the production of different goods, which would allow urban centers to become linked into webs of cooperation (Lenski and Lenski 1987; Morris 2010). The between community trade networks of the Roman Empire illustrate the between-community division of labor that existed during the agrarian era. According to Lenski and Lenski (1987), in the Roman Empire, North Africa and Spain were suppliers of dried figs and olive oil; Gaul, Dalmatia, Anatolia and Syria were suppliers of wine; Spain and Egypt were suppliers of salted meats; Egypt, North Africa, Sicily and the Black Sea region were suppliers of grain; and the Black Sea region was also a noted supplier of salted fish. Throughout the agrarian era different regions would specialize in the production of different goods. When these goods were exchanged between regions, the individuals in different regions would become dependent on the goods produced in other regions and intricate webs of mutual interdependence would develop. Through the webs of mutual interdependence that developed during the agrarian era due to selection pressures favoring the elaboration of technologies of distribution, the level of cooperation in agrarian civilizations would increase compared to earlier foraging societies. Along with developments in the division of labor, the level of cooperation in agrarian civilizations would also increase as selection pressures favoring
the elaboration of technologies of distribution would cause the level of commercialization to increase throughout the agrarian era.

Throughout the agrarian era the level of commercialization would increase, until eventually an economic system organized around capitalism would emerge in the Central civilization during the long 16th century (Frank 1990; Sanderson 1999; Chase-Dunn and Lerro 2013). As commercialization increased throughout the agrarian era, the overall level of cooperation found in agrarian civilizations would increase, signaling the increasing organismality of human societal organisms. Commercialization refers to a wide range of inter-related economic processes including: the extent to which price-setting markets allocate commodities, land and labor, the extent of entrepreneurial activity, and the extent of money, marketplaces, credit and banking within a society (Smith 2004). Underlying the various aspects of commercialization at an interactional level is the process of market exchange. It is through market exchange that increasing rates of commercialization would lead to increasing levels of cooperation within agrarian civilizations. The relationship between increasing rates of market exchange and increasing levels of cooperation is supported by the relationship between exchange and cooperation that has been uncovered by social psychological research. Experimental research in social psychology (Lawler and Yoon 1993, 1996, 1998) has shown that when individuals engage in the exchange of valued goods, whether these exchanges be of a reciprocal nature (such as in the hxaro exchange of the Ju/'hoansi) or a negotiated nature (such as a market exchange), the act of exchange generates positive emotions and feelings of commitment towards one’s exchange partner. Moreover, feelings of
commitment are likely to encourage future exchanges with the same exchange partner, as well as other types of cooperative behavior directed towards this partner. Market exchange, through producing feelings of positive emotion and commitment between exchange partners, encourages both more market exchange and other types of cooperative behavior in the future (Lawler and Yoon 1993, 1996, 1998; Lawler et al. 2009).

Furthermore, cross-cultural research has uncovered a relationship between a society’s level of market integration and the propensity of individuals in that society to engage in cooperative behavior. Henrich et al. (2010) had individuals from 15 diverse societies, ranging from foraging societies such as the Hadza of Tanzania to industrial societies such as the United States, play a series of economic games, most notably the dictator game. In the dictator game, two players receive a lump sum of money. The first player gets to decide how to divide this money between the two players and the second player is forced to accept the first player’s division. The cooperative tendencies of the first player can be assessed by measuring how this player divides the money. Does the player doing the division keep the majority of the money for themselves, giving their partner only a small amount, which is considered uncooperative behavior; or do they divide the money into relatively equal portions, which is considered cooperative behavior.

Across societies, Henrich et al. (2010) found a significant association between market integration (measured as the percentage of household calories purchased in the market) and cooperative behavior (measured as how equitable monetary divisions were in the dictator game). The higher a society’s level of market integration, the more fair was
the average division of money in the dictator game. For instance, among the Tsimane of Bolivia, who had an average market integration score of 7%, the mean donation in the dictator game was about 25% of the money; whereas among the Sanquianga of Colombia, who had an average market integration score of 82%, the mean donation in the dictator game was between 45% and 50% of the money. As the results of social psychological research indicate, participation in market exchanges appears to encourage cooperation (Lawler and Yoon 1993, 1996, 1998; Lawler et al. 2009; Henrich et al. 2010). Given these findings it is reasonable to assume that as the level of market exchange increases in a society, the overall level of cooperative behavior increases as well. Thus, as selection pressures for the elaboration of technologies of distribution led to increasing levels of market exchange throughout the agrarian era, the overall level of societal cooperation, and the organismic character of agrarian civilizations, was likely to have increased.

Throughout the agricultural era as selection pressures favored the elaboration of technologies of distribution, the level of commercialization increased reaching its pinnacle with the emergence of capitalism in the Central civilization during the long 16th century (Frank 1990; Sanderson 1999; Chase-Dunn and Lerro 2013). Of course, increases in commercialization would happen faster in some regions than in others and there would be times where different regions saw decreases in commercial activity, but overall, throughout the agrarian era the level of commercialization would increase in response to selection pressures acting on the societal organism, favoring the elaboration of technologies of distribution.
Smith (2004) developed a scale of commercialization for assessing commercialization in the archeological record of early states. Smith (2004) distinguishes between four levels of precapitalist commercialization. The lowest level of commercialization is uncommercialized. Uncommercialized states lack marketplaces, independent merchants and general-purpose money; the state or the temple also controls the labor of full-time craft specialists in uncommercialized states. The ancient Egyptian state is an example of an uncommercialized state (Smith 2004). The next level of commercialization is low commercialization (Smith 2004). States with low commercialization have a limited marketplace in goods and services, but not land or labor; states control many sectors of the economy, but a small commercial sector of independent merchants and markets does exist. The next level of commercialization is intermediate commercialization (Smith 2004). States with intermediate commercialization have markets for goods and services; they have professional and independent entrepreneur merchants; they have general purpose money; however, land and labor is under control of the state or elites. The Sumerian city-states and the Assyrian empire are examples of ancient states with intermediate levels of commercialization (Smith 2004). The most advanced level of commercialization found in ancient states is what Smith (2004) calls advanced precapitalist commercialization. States with advanced precapitalist commercialization had extensive markets in goods, services and land. They also had limited labor markets, general purpose money, banking and credit systems. The city states of ancient Greece and the Roman Empire are examples of ancient states with an advanced precapitalist level of commercialization.
(Smith 2004). From Smith’s (2004) classification scheme, the ancient Egyptian state was uncommercialized, the Sumerian city-states and the Assyrian empire had intermediate levels of commercialization, and the Greek city-states and the Roman Empire had advanced precapitalist levels of commercialization. Given Smith’s (2004) classification, it appears that as the agrarian era unfolded and selection pressures for the elaboration of technologies of distribution shaped the social structures of growing societal organisms, states and empires became more commercialized; states and empires became more characterized by cooperative exchanges.

While ancient Egypt was uncommercialized and the Sumerian city-states had intermediate levels of commercialization, both societies were organized around a temple economy (Flannery and Marcus 2012; Chase-Dunn and Lerro 2013). The role of the temple in organizing economic affairs would decrease and the role of the market economy would increase in the ancient Greek city-states (Morris 2004) and the Roman Empire (Temin 2001, 2013). Temples were large religious-political complexes located at the center of urban areas in ancient states and these temples directed economic behavior. Religious specialists and some bureaucratic officials would reside at the temple complex, along with craft specialists, laborers and the servants owned by the temple. The temple would act as a redistributive center in these ancient societies. It would oversee the collection of the surplus and the collection of other taxes and it would redistribute the surplus and taxes to governmental, religious and military officials. Some of the revenue collected in surplus and taxes would be re-distributed back to the population in the form of payments for labor or loans—loans, which carried interest and could be foreclosed on
by the temple. The temple would also have its own agricultural lands where servants
would grow crops and farm animals to support the temple staff. In the words of Flannery
and Marcus, “early Dynastic temples were profit-making, surplus-accumulating, money-
lending, interest-charging corporations, and foreclosure on loans may have driven
thousands of needy farmers into servitude” (2012: 477). The strong economic role of
temples tended to limit the amount of market activity observed in early agrarian states as
the temple controlled both land and labor within the society. But as the agrarian era wore
on, the temple would take on a diminished economic role, which would allow for
increases in market activity.

Both the Greek city-states and ancient Rome had pre-capitalist market economies
(Smith 2004). The market-orientation of economies in ancient Greek and Roman
societies would allow for periods of profound commercial expansion in these societies.
Morris (2004) uses archeological data to illustrate increasing levels of commercialization
from 800 BCE to 300 BCE in Greece. Morris (2004) uses the archeological record of
ancient Greece to investigate changes in the consumption of food and fuel, changes in the
consumption of clothing, and changes in the size of houses over the period from 800 BCE
to 300 BCE. According to Morris’s (2004) estimates, during this 500-year period the
consumption of food and fuel increased by between 12.5 and 25%; housing sizes
increased between five to ten times; and clothing consumption either doubled or tripled.
When these estimates are compiled into one scale and are averaged out over the 500-year
period, they provide an annual increase in per capita consumption of between 0.07 to
0.14%. While this figure may seem small, from 1580 to 1820, Holland only had an
annual per capita rate of increase of 0.2% (Morris 2004). In addition to per capita growth rates, Morris (2004) also calculates aggregate growth rates for Greece between the years of 800 BCE and 300 BCE. Over this 500-year period, Morris (2004) estimates that the annual aggregate rate of consumption increased between 0.6 and 0.9%. In comparison, from 1580 to 1820, Holland had an annual aggregate rate of increase of only 0.5% (Morris 2004). As the archeological record indicates, between 800 BCE and 300 BCE, ancient Greece saw substantial increases in consumption patterns, and these increases in consumption were made possible by growing populations and increasing levels of commercialization (Morris 2004).

Just as ancient Greece had an advanced precapitalist level of commercialization, the Roman Empire did as well (Smith 2004). Temin (2001, 2013) even goes so far as to argue that the Roman Empire was primarily a market economy. Of course, this does not mean that market exchange was all there was in the Roman Empire; household production and reciprocal exchange within communities would remain an important economic activity, as would the extraction and redistribution of surplus by state elites, but within the Empire, “market exchange was ubiquitous” (Temin 2001: 181). A variety of evidence indicates the presence and extent of market activity in the Roman Empire. For instance, many goods and services had prices. Rent was paid for slaves and for housing, wages were paid to free laborers, money was paid for food and beverages and the prices for these goods would fluctuate overtime depending on supply and demand (Temin 2001, 2013). Another indicator of market activity in the Roman Empire is evidence of loans that had flexible interest rates (Temin 2001, 2013). Finally, individuals in the Roman
Empire appeared to manage their money in an instrumentally-rational way, which indicates the widespread presence of markets. For instance, some elite individuals in the Roman Empire would make loans to ship-owners, funding trading voyages. If successful these voyages could bring home vast amounts of wealth, but there was always the risk of the ship becoming wrecked at sea, whereupon the money lent to the ship-owner would be forever lost. To minimize the risk entailed in making loans to ship-owners, wealthy Romans would try to diversify their investments. Rather than invest all in one ship, wealthy Romans would spread out their investments among a number of ships. This strategy, where investors diversify their investments in order to minimize risk is the same strategy used by modern investors purchasing mutual funds. The presence of such instrumentally-rational economic behavior points to a market-orientation in the Roman Empire (Temin 2001, 2013).

Not only would the level of market exchange within states and empires increase as selection pressures favored elaborations of technologies of distribution in the growing societal organisms of the agrarian era, as this era progressed the overall level of world commercialization would increase culminating in the emergence of capitalism in the Central civilization during the long 16th century (Frank 1990; Sanderson 1999; Chase-Dunn and Lerro 2013). Sanderson (1999) argues that commercialization during the agrarian era can be divided into three periods, with the overall level of world commercialization expanding in each period. The first period outlined by Sanderson (1999) lasts from 2,000 BCE to 200 BCE. During this period commercial trade existed, but it was largely regional in scope. From 200 BCE to 1000 CE there was a large
increase in the scope of world trade (Sanderson 1999). During this 800-year time period trade became regularized between the Persian Gulf, the Mediterranean and India, between India and Southeast Asia, between Southeast Asia and China and Japan. For the first time ever, during the period from 200 BCE to 1000 CE a system of trade linking China to the Mediterranean would emerge.

While capitalism would eventually emerge as an economic system centered in the Central civilization, during the period of commercialization expansion that took place from 200 BCE to 1000 CE, much of the increase in commercialization was driven by China, rather than Western Europe. Maddison (2001, 2003) provides comparative data on the GDP per capita of both China and Western Europe from 400 to 1998 CE. According to Maddison’s data at around 400 CE, Western Europe and China had a comparable GDP per capita. From about 400 to 700 CE, Western Europe’s GDP per capita dropped while China’s GDP per capita stayed about the same. Shortly after 950 CE, China’s GDP per capita began to climb, with Western Europe’s GDP beginning to climb shortly after 1000 CE. China’s GDP per capita remained higher than Western Europe’s until around 1300 CE, when Western Europe’s GDP per capita began to climb even faster than it already was, while China’s GDP per capita growth leveled off. The final period of commercialization in the agrarian era is the period after 1000 CE (Sanderson 1999). During this time period there would be another big expansion in the extent and depth of worldwide trade networks, especially during the years from 1250 to 1350 CE, leading to a network of world-trade that was more complex and sophisticated than any prior trade network in human history (Sanderson 1999). As trade networks
expanded and deepened during the agrarian era, the increasing level of world commercialization would combine with the sociopolitical situation created by feudalism, to fuel the emergence of capitalism in Western Europe during the long 16th century (1450 CE to 1640 CE). Along with expanding commercialization, the feudal mode of socio-political organization would be vital to the emergence of capitalism.

Feudalism emerged in Europe out of the smoldering ashes of the collapsed slave-mode of production that characterized ancient Greece and Rome (Anderson 1974). As was already mentioned, ancient Greece and Rome featured a significant amount of market activity (Morris 2004; Temin 2001, 2013), but this market activity was limited to more elite segments of the population. To a large extent, the economies of ancient Greece and Rome ran off of slave labor (Anderson 1974); in ancient Greek towns, for instance, there could be as many slaves as there were free inhabitants (Murray 1986). As the economy of ancient Greece and Rome depended on slave labor, the economy was dependent upon the abilities of the state to acquire new territories, whose populations could then be enslaved. This economic situation would eventually set in motion the wheels that would turn bringing about the collapse of the Western Roman Empire in 476 CE (Anderson 1974; Tainter 1988). When Rome closed it imperial frontiers during the 2nd century CE, the supply of new slaves for the Roman economy dried up (Anderson 1974). As new sources of slave labor disappeared, the price of slaves would steadily rise and the profitability of slave labor would plummet. When this happened slave owners would soon find it more profitable to abandon the direct upkeep of their slaves, instead

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9 Capitalism would independently emerge in Japan in the 19th century.
establishing them on small plots of land where they could look after themselves, while still having their labor extracted by the elite landowners (Anderson 1974).

As fiscal pressures led the Roman Empire to intensify efforts of surplus extraction and as the Roman Empire increasingly came under external attack during the 3rd and 4th centuries CE, both former slaves and free farmers increasingly turned to agrarian elites for protection on their large, well-defended estates (Anderson 1974). The result of this situation was the formation of a tenant-landlord economic relationship in the late Roman Empire where *colunus* (dependent peasant farmers) would receive land and protection from a landlord and the landlord would receive about half the yields produced by a *colunus* (Anderson 1974). Although the Western Roman Empire would collapse in 476 CE, the tenant-landlord economic system that emerged in Rome in the 3rd and 4th centuries CE would provide the social logic for the systems of feudalism that would emerge in Western Europe by the 8th century CE (Anderson 1974).

By the 8th century CE, Western Europe was characterized by a socio-political system organized around feudalism (Sanderson 1999). In feudalism, economic production is organized around a manorial economy. In principle, each manor was the legal jurisdiction of its lord and labor on the manor was provided by dependent serfs, who pledged their labor to the lord of the manor in return for safety (Chase-Dunn and Lerro 2013). Although lords had legal jurisdiction over their manors, they did not own their own lands. Instead, lands would be given to a landlord by a regional king to whom the landlord pledged fealty. Compared to ancient states and empires, socio-political systems organized around feudalism where highly decentralized and this decentralized nature
would allow for the growth of autonomous towns in the interstitial spaces between feudal manors (Sanderson 1999; Chase-Dunn and Lerro 2013). Whereas the urban centers of ancient states and empires could have high levels of market activity such market activity was always subject to the stultifying hand of the agrarian state. The economic activities of the towns that would emerge in Europe during the feudal era would not be restricted by the caprices of state elites and because of this freedom, trade within and between towns would flourish. As trade flourished in urban environments a positive feedback cycle of increasing market activity would be initiated. By the 12th and 13th centuries CE, Europe would see tremendous growth in both the feudal system and in levels of trade. Such economic growth would continue until the 14th century when a confluence of factors would interact to produce a crisis in the feudal mode of socio-political regulation (Sanderson 1999; Chase-Dunn and Lerro 2013).

From about 950 CE to about 1250 CE, Europe experienced a period of warm weather. Following this period of relative warmth, Europe experienced what is known as the Little Ice Age, an abnormally cool period lasting from about 1350 to 1850 CE. The cooling of the European climate in the 14th century would disrupt agricultural yields as Europeans farmers struggled to adjust to the new growing seasons. Around the same time, traders traveling across the Eurasian Steppe would bring the bubonic plague to Europe in 1348 CE. The bubonic plague would have a devastating effect; shortly after its arrival it would kill between one third and one half of the European population. The combination of falling agricultural yields, along with the devastation wrought by the
bubonic plague would lead to famines, falling incomes for landlords and peasant revolts (Chase-Dunn and Lerro 2013).

As agricultural yields and the incomes of landlords fell, landlords would try to offset their losses by extracting more and more from their tenants. But as the bubonic plague led to a drastic reduction in population numbers, the decreased labor force increased the bargaining power of serfs. To escape the increasingly extractive tendencies of landlords, peasants could move to the developing urban areas where they would be able to work as wage-laborers for the emerging merchant class. When peasants flocked to towns for their new lives as wage-laborers in the merchant economy, landlords on feudal manors were forced to offer their once dependent tenants positions as wage-laborers, or else risk these tenants moving to towns as well. As merchants in urban areas used the growing urban labor force to ramp up the production of commodities for sale in the market and as rural landlords were impelled to make the switch to agricultural commodity production, this wave of commodification would lead to the formation of two great classes, the bourgeoisie and the proletariat. With the emergence of the bourgeoisie and proletariat in Europe during the long 16th century, the underlying economic logic of the dominant powers in the Central civilization would change. No longer would the Western European economy be based on extraction from dependent producers; instead by 1640 CE, the Western European economy would be guided by the efforts of owners to make profits through the production, buying and selling of goods in price-setting markets (Sanderson 1999; Chase-Dunn and Lerro 2013). In Europe, capitalism would first
emerge in the city-states of Italy; it would then emerge in Spain, Portugal, the Netherlands, Britain and France.

Starting with the temple economies of Ancient Egyptian and Mesopotamian states and culminating with the capitalist economy that would emerge in the Central civilization during the long 16th century, the overall level of market exchange would increase dramatically throughout the agricultural era in response to selection pressures acting on the growing societal organisms of the agricultural era; selection pressures, which favored the elaboration of technologies of distribution. Given the connection between market exchange and cooperation (Lawler and Yoon 1993, 1996, 1998; Henrich et al. 2010), as commercialization increased throughout the agrarian era, the overall level of cooperation found within agrarian civilizations would have increased. Bolt and van Zanden (2014) provide estimates for the GDP per capita of Northern Italy, Spain, Holland, and Britain from 1 CE to 1700 CE. These estimates can be seen in Table 1. Although each of the states that Bolt and van Zanden (2014) provide data for saw both increases and decreases in their GDP per capita from 1 CE to 1700 CE, over this time the GDP per capita would increase in all four states. This pattern is demonstrated by Bolt and van Zanden’s (2014) assessment of the GDP per capita for Western Europe overall. Using a scale of 1990 international dollars, Bolt and van Zanden estimate the GDP per capita of Western Europe in the year 1 CE to be to $699. By 1700 CE the estimated GDP per capita of Western Europe had nearly doubled to $1,312.
As the GDP per capita estimates for Western European states during the agricultural era show, agricultural civilizations saw increasing levels of commercialization during this time. This increasing level of commercialization, along with the increasingly differentiated division of labor seen in agricultural civilizations occurred as selection pressure acting on the growing societal organisms of the agricultural era favored the elaboration of technologies of distribution, technologies, which could operate to facilitate cooperation within the growing societal organism. As technologies of distribution were elaborated in the societal organisms of the agricultural era, the cooperation facilitated by these technological developments would allow the members of these civilizations to consume more energy per day, compare the 31,000 kcal of energy that the average citizen of the Roman Empire would consume to the 4,000 kcal of energy that the average forager would consume per day (Morris 2013, 2015). Because increases in energy made possible dense webs of cooperation, which in turn would allow

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Table 1: GDP per capita estimates in 1990 international dollars for select Western European countries from 1 CE to 1700 CE (from Bolt and van Zanden 2014)
for further increases in energy capture, the organismic character of human society was transformed throughout the agricultural era. Of course, cooperation is only half of the story. For the organismic character of human societies to truly increase, agricultural civilizations had to develop increasingly sophisticated methods of conflict regulation in response to selection pressures acting on the societal organism, which favored the elaboration of technologies of power.

The small, highly mobile foraging societies that characterized the foraging era lacked formalized institutions of social control. This situation would change in agrarian civilizations in response to selection pressures favoring the elaboration of technologies of power. Lacking formal institutions of social control, the members of foraging societies would use a system of informal sanctions to minimize the occurrence of social conflict (Boehm 1999; Kelly 2013). To minimize the occurrence of social conflict, foraging societies would work hard to maintain an egalitarian ethos. When egalitarianism failed to eliminate social conflict before it could start, aggrieved parties could try to verbally reconcile the matter, or they may have a fist-fight to settle their differences. If these methods failed to alleviate the source of social conflict, individuals could migrate away from those at the heart of the social conflict. Or, if all else failed, a coalition wielding projectile weapons could assassinate a particular trouble-maker. As the hierarchical nature of society changed with the emergence of gardening and farming, selection pressures favored the elaboration of this informal system of sanctions.

Although foraging societies were often pervaded by an ethic of egalitarianism where all adults were able to contribute to group decisions, elderly individuals were often
afforded slightly more status than the younger members of their society (Flannery and Marcus 2012). When certain individuals were able to capitalize on the bottlenecks of power that emerged with the appearance of agriculture to create chiefdoms, the lineages associated with the new chiefs gained increased prestige compared to the other lineages within the chiefdom, and as a result the elderly individuals associated with the chiefly lineage would come to hold an even greater level of status than they already held as mere elders. Given their enhanced status, the elderly individuals associated with chiefly lineages could serve as informal judges when a third party was needed to help deal with a social conflict. It was from this system, whereby elderly individuals holding high status because of their family line would act as informal judges in the reconciliation of local disputes, that the legal institutions of ancient states would emerge in response to selection pressures for the elaboration of technologies of power.

Ancient states and empires were characterized by a governing body that maintained a monopoly over the legitimate use of violence. To maintain this monopoly, states needed to develop formalized rules and regulations that could settle disputes before the disputants used violence to take the matter into their own hands. Due to the selection pressures associated with this need, ancient states developed the first legal institutions and formal codes of law. These new technologies of power emerged out of the informal system of judges, which characterized earlier chiefdoms (Trigger 2003). From the germ of this informal system, states would develop a hierarchy of law courts corresponding to various levels of socio-political organization. At the lowest level of the hierarchy would be village-level courts. For instance, in ancient Mesopotamia, villages would feature
courts that were presided over by a council of village elders, who acted on behalf of the village mayor (Trigger 2003). The central governments of agrarian states would hold the village courts responsible for handling any misconduct that took place within the village. When village courts adjudicated disputes and reached a verdict, their verdict could be appealed to a higher level court, which represented the governing body of the state. For instance, in ancient Mesopotamia if a village court could not reach a verdict, or if their verdict was appealed, a group of seven professional judges, who were appointed by the king, would hear the case at the city temple. If this group of professional judges was unable to render a satisfactory verdict, the case would be presented to the king, who would have final authority (Trigger 2003).

The legal hearings in ancient states could be quite sophisticated. These hearings were conducted in front of judges who listened to testimony, rendered a legal decision and proposed a settlement or punishment for the matter (Trigger 2003). During the trials, testimony would be heard from both parties and both parties would be able to present evidence to the court. Witnesses would be called to testify before the court and those involved in the case would even be able to question each other’s statements (Trigger 2003). To maintain order in the court and to enact sentences, higher level courts would feature bailiffs, police, jailers and even executioners (Trigger 2003).

Limitations in technology, resources and political will limited the ability of ancient states to successfully adjudicate many of the crimes that took place within their territories, and so in order to make up for their uneven application of the laws, agrarian states would rely on brutal punishments. In Mesopotamia, murder, kidnapping, harboring
an escaped slave, theft and the purchasing of stolen goods were all punishable by death, as was incest. Wounding would often be punished with a retributive wound (Trigger 2003). As the Mesopotamian legal record indicates, death was a common punishment and in many cases the method used to enact death sentences could be quite extreme. Beheading, impaling, drowning, fatally mutilating, working to death with slave labor, burning and boiling were all methods used to execute criminals in agrarian states and empires (Trigger 2003). Furthermore, the law codes of agrarian states were backed by the threat of supernatural punishment. If the state failed to punish a criminal for their actions, the gods would make sure that justice prevailed (Trigger 2003). So, while there were numerous factors that limited the ability of the state to enforce the law in agricultural civilizations, the threats of both brutal and divine punishment were there to help encourage legal compliance.

Formal legal institutions emerged with the first states as these states experienced selection pressures favoring elaborations in technologies of power, but it isn’t until around 4,000 years ago with the Third Dynasty of Ur in ancient Mesopotamia that the first written law codes begin to appear. The most complete early Mesopotamian law code is Hammurabi’s code, a code of law associated with King Hammurabi from about 3,700 years ago (Trigger 2003). Hammurabi’s code consists of 282 laws that deal with a variety of matters including prices, trade, marriage, criminal offenses, slavery and debt. A prologue to the code states that the law code was written ‘to cause justice to prevail’ and that the law ensures that the ‘strong might not oppress the weak’. Furthermore, in keeping with the theme of divine enforcement, Hammurabi’s code ends by stating that all
people must obey the laws contained within the code and that any future kings who ignore the laws will experience divine retribution (Trigger 2003).

Throughout the agricultural era the institution of law would continue to evolve in response to selection pressures favoring the elaboration of technologies of power and by the Roman Empire, legal institutions were quite sophisticated (Turner and Maryanski 2008). The states and empires that emerged during the agrarian era increasingly relied on formalized systems of law, which consisted of written legal codes and a hierarchy of courts, with specialized legal staffs, to minimize social conflict. Along with the legal institutions that would emerge in the early civilizations, the selection pressures associated with the need for new technologies of power, which could regulate social conflict, would also lead to the evolution of new forms of religion.

In response to selection pressures favoring the elaboration of technologies of power, which acted on the societal organisms of the agricultural era, the nature of religion and its role as a regulatory force in society would transform. The religious systems of foragers can best be described as animistic (Lenski and Lenski 1987; Turner and Maryanski 2008; Chase-Dunn and Lerro 2013; Sanderson 2014). As chiefdom, states and empires emerged, the animistic beliefs of prehistoric foraging societies would transform into the polytheistic and monotheistic religions of chiefdoms, states and empires (Lenski and Lenski 1987; Turner and Maryanski 2008; Chase-Dunn and Lerro 2013; Sanderson 2014) and as these new polytheistic and monotheistic religions would emerge, they would take on an increasingly important role in regulating the affairs of the individuals living in the societal organisms of the agricultural era.
The first states that emerged in Mesopotamia and Egypt around 5,000 years ago would all be organized around polytheistic religions. The Sumerians, ancient Egyptians, Greeks and Romans would all worship many gods. The states that emerged in the New World, such as the Inca, the Maya, the Aztec and the Tarascan state would all be organized around polytheism as well. The polytheistic religions that appeared as selection pressures acted on the technologies of power within the first states were different from the animisms of foragers in many ways. Polytheistic religions were characterized by the presence of multiple anthropomorphic gods, who could have all of the tendencies, both positive and negative, of humans. Gods could be good or evil, they could be wise or foolish, and they liked to go to war, drink and have sex, sometimes even with humans (Sanderson 2014). The polytheistic gods were much more active in human affairs than were the spirits of the foraging world and because of this active interest in human affairs, a significant amount of time was dedicated to performing religious rituals meant to appease these very gods (Sanderson 2014). The increasing prevalence of religious ritual would have important regulatory functions in the emerging agricultural states. The polytheisms of the agrarian era were directly tied to the affairs of the state; more specifically, the state was the institution that mediated the relationship between the gods and the people (Bellah 2011). This is important because as appeasing the gods meant engaging in religious ritual, the feelings of solidarity and the commitment to moral codes that would emerge as a natural outcome of participation in ritual would be directed not only towards the gods, but also towards the state.
To appease the gods of the new polytheistic religions believers were required to participate in a number of religious rituals, both in public and private domains (Sanderson 2014). Sociological research (Collins 2004) has found that when individuals interact in situations featuring the following four characteristics: bodily co-presence, a clear group boundary, a mutual focus of attention and a shared mood; and when the interaction also features a rhythmic character; the individuals engaged in the interaction will develop feelings of solidarity with each other. They will also take on an increased commitment to the sacred symbols and the moral codes of their social group. The religious rituals that came to characterize the polytheistic religions of ancient states were structured around the aforementioned situational characteristics. For instance, in ancient Greece much religious ritual was organized around the practice of ritual sacrifice. The Greek religious calendar was a calendar specifying which god should receive a sacrifice on which day (Parker 1986). Most sacrifices would involve a group of individuals burning the bones and fat of a slaughtered animal, these individuals would then recite chants or sing hymns to the god receiving the sacrifice before they would eat the flesh of the sacrificial animal (Parker 1986). In congregating together to sacrifice an animal, sing to a god and have a shared meal, individuals in Greek society were interacting in situations featuring the interaction ritual ingredients outlined by Collins (2004). Interacting in such situations, the individuals participating in the ritual would develop feelings of solidarity, and they would also develop an increasingly strong commitment to the symbols and moral codes of the state-sponsored religions. The moral codes of the state-sponsored polytheisms would reinforce the legal codes of agrarian states, and so as individuals strengthened their
commitment to their polytheistic religious beliefs, they would as a consequence, develop a stronger commitment to the legal order of the state.

Whereas explicit behavioral prescriptions and proscriptions were largely absent from the animistic religions of foraging societies, as selection pressures favored the elaboration of technologies of power in the growing societal organisms of the agricultural era, polytheistic religions would become more oriented towards the making of moral proclamations, which regulated behavior (Flannery and Marcus 2012). In turn, the ritual element of religion would strengthen the commitment of individuals to the moral codes of polytheistic religions. In the polytheistic religious system that emerged in ancient Sumer, obedience would become a prime religious virtue (Flannery and Marcus 2012). When individuals in Sumer performed religious rituals, their commitment to obedience would increase as an outcome of the ritual interaction. A commitment to obedience, a commitment that would be re-affirmed whenever Sumerians performed religious rituals, would be important for maintaining social order in Sumerian society. The ancient states that emerged around 5,000 years ago featured history’s first ever codes of law. For law to be an effective means of societal regulation, aggrieved individuals have to trust that the state will adjudicate justice on their behalf, so that they do not need to take matters into their own hands. Recall that in many foraging societies such as the Ju/'hoansi, fist-fights and even lethal aggression are potential tools for regulating social conflict (Lee 2003; Kelly 2013). The commitment to obedience that was forged through the ritual practices of Sumerian religion would help motivate individuals to be obedient to Sumerian law,
convincing them to relinquish their own individual right to violence, instead letting the state take a monopoly on legitimate violence.

Not only did the effectiveness of the law require individuals to be committed to the moral and legal cods of agrarian states, it also depended on the legitimacy of the king. In order to maximize legitimacy in the eyes of their people, the kings of early states would use their power over religious specialists to have their state’s religious cosmologies refashioned in a way that would give kings higher status in the supernatural/natural hierarchy than their subjects (Flannery and Marcus 2012). For instance, in the cosmology of Sumerian religion the earth appeared out of the mists of the cosmos, floating on the freshwater sea. As the freshwater sea mated with the ocean, the sun, the moon, the wind, and the heavens came to be. From the heavens descended the first Sumerian kings who, according to myth, ruled for periods of thousands of years. After a period of eight mythical kings, a flood covered the earth and kings had to descend from heaven once again. Through this second group of mythical kings, the actual kings of Sumer would trace their ancestry (Flannery and Marcus 2012). By making the current king the real-life ancestors of the mythical kings who descended directly from heaven, the cosmology of Sumerian society gave the king an elevated position compared to the rest of society in the supernatural/natural hierarchy. In Sumer, the gods were still the alphas, but now kings took on the role of beta and everybody else was left to fill in the ranks of gamma and below (Flannery and Marcus 2012). A similar process of kings using religious cosmology to elevate their status would be a common feature of agrarian state religions (Flannery and Marcus 2012). In Egypt this process would be even more
extreme, with kings being promoted all the way to alpha status in the cosmological order of things. By using ideological power to elevate their own status compared to that of their people, the kings of agrarian states were able to provide cosmological justification for the state’s monopoly of force.

Through the performance of god appeasing rituals, which would cause the members of agrarian states to develop commitments to the state’s moral and legal codes and by allowing kings to legitimize the state’s monopoly on violence, the polytheistic religions that emerged in agrarian states in response to selection pressures favoring the elaboration of technologies of power helped to regulate societal conflict. Despite their success in regulating conflict, as the agrarian era progressed and selection pressures continued to favor the elaboration of technologies of power in the societal organism, a shift in the religious landscape would take place and polytheisms would see themselves replaced by monotheistic belief systems in many agrarian civilizations. Monotheistic religions are characterized by belief in a single god, whom believers profess to be the ‘one true god’. In contrast to the anthropomorphic gods of polytheism, the singular god of monotheistic religions was believed to be transcendent, that is beyond the realm of this universe. Furthermore, the singular god of monotheisms is believed by adherents to be omnipotent and omniscient. Monotheisms also put an increasing focus on salvation, instilling in adherents a belief in the existence of both a utopian and a tortuous afterlife, either of which individuals can be sent to when they die depending on their earthly piety.

Monotheistic religions emerged throughout the world during a time period known as the Axial Age, which ranges from about 600 BCE to 1 CE (Sanderson 2014). The first
monotheism to emerge was Zoroastrianism, which emerged in Iran during the 6th century BCE. At around the same time, Judaism, which already existed as a polytheistic religion, made a monotheist turn, elevating the god Yahweh to the position of the ‘one true god’ (Sanderson 2014). Several hundred years after Judaism made the turn towards monotheism, Christianity would emerge from Jewish messianic movements in Roman controlled Jerusalem (Sanderson 2014). As monotheistic religions emerged after 600 BCE, they quickly spread throughout the Old World, and by 380 CE Constantine would declare Christianity to be the official state church of the Roman Empire. Of the world’s three major monotheist religions, Islam would arrive late; Islam emerged in the Arabian Peninsula during the 7th century CE.

The emergence and spread of monotheistic religions correlated with a series of changes that were taking place within agrarian civilization as agrarian states grew into agrarian empires. As states turned into empires and as empires became increasingly large and powerful during the agrarian era the intensity of warfare increased (Sanderson 2014). Advances in military technology, such as the invention of iron weapons, allowed warriors to kill with increasing efficiency. To escape the deadliness of war, more and more individuals flocked to the growing urban areas of agrarian civilizations. For all of their benefits, urban areas were dirty and riddled with disease; epidemics were frequent occurrences in the urban centers of agrarian states and empires. As the killing power of warriors increased due to advances in military technology and as the deadliness of urban areas increased as viruses and bacteria evolved in the crowded conditions, religions that offered believers a utopian afterlife took on a heightened appeal and thus, monotheistic
religions spread like wildfire through the populations of agrarian empires (Sanderson 2014). With the emergence and spread of monotheistic religions, rulers would uncover a new technology of power, a new method of societal regulation.

The single god of monotheistic religions is conceived to be all powerful. This means that not only can the god do anything it wishes; the god can see and hear all that takes place in the universe. Furthermore, the god itself has the power to reward an individual with eternal life in the utopia of heaven, or to punish an individual with eternal torment in the torture chambers of hell. This combination of traits creates a situation whereby believers perceive themselves to be under the constant watch of a supreme being, a supreme being who has the ultimate reward and punishment power. Essentially, the adherents of monotheistic religions live in a celestial panopticon, where any action or even thought is known by god and thus any action or thought can lead to spiritual consequences. 

Reputations are important sources of information for social creatures and because of this importance, humans evolved a propensity to engage in prosocial behaviors when they believe that their reputation is being monitored (Alexander 1987; Bateson et al. 2006; Bateson et al. 2013). As the omniscient nature of monotheistic gods induces a feeling of constant monitoring in believers, monotheistic religious beliefs would play an important role in motivating prosocial behavior in the diverse and chaotic urban centers of agrarian civilizations (Norenzayan 2013).

Social psychological research (Norenzayan and Shariff 2008; Shariff and Norenzayan 2007; Norenzayan 2013) has found that experimentally induced thoughts about monotheistic gods reduce the incidence of cheating as well as increase the
incidence of altruistic behavior between strangers. Furthermore, this research has found an association between self-professed religious devotion and higher levels of generalized trust. As belief in an all-powerful god leads to constant activation of the reputational concerns of believers, belief in an all-powerful god motivates believers to engage in prosocial behavior. From these findings it is reasonable to conclude that as more individuals came to believe in a singular, all-powerful god, more individuals would self-regulate their behavior in fear of supernatural sanction. While the state had the power to punish malfeasance, the state was not always present to observe such malfeasance; however, the all-knowing deity would be privy to every misdeed. Because of god’s ever watchful eye, belief in a monotheistic god encouraged prosocial behavior among the populations of agrarian civilizations, joining law as a vital source of societal regulation.

Beyond motivating individuals to self-regulate their own behavior, believe in a monotheistic god also correlates with higher levels of generalized trust among believers (Norenzayan and Sharrif 2008). As was mentioned above, for the state to maintain a monopoly on legitimate violence, individuals must forfeit their right to use violence as a means for solving their personal grievances. This requires individuals trust that the state will be able to use its centralized authority to redress societal grievances. As belief in a monotheistic god leads to higher levels of generalized trust, belief in a monotheistic god would make individuals more trusting and therefore more willing to cede their rights to violent retribution to the state. In this way, the monotheistic belief systems that emerged in agrarian civilizations would further act as a source of societal regulation by encouraging individuals to turn to the state to enact justice rather than to their own
violent means. Through both inducing prosocial behaviors due to the constant threat of having one’s anti-social behavior monitored by a god and through the increased levels of trust that are created by belief in a god, the monotheisms that emerged during the agricultural era would, just like the polytheisms that preceded them, act as technologies of power, regulating conflict in the growing societal organisms of the agricultural era.

As agricultural civilizations, societal organisms, grew larger and more complex they experienced selection pressures favoring the elaboration of technologies of power, which could act to regulate conflict within the societal organism. In response to such selection pressures, human societies saw the emergence of both formalized systems of law, and polytheistic and monotheistic religions. Due to the operation of these technologies of power, the societal organisms of agricultural civilizations saw a drop in levels of societal violence compared to the societal organisms of foraging societies. As foragers became sedentary and began to rely more on the cultivation of plants and animals, land became something worth fighting for and rates of societal violence initially increased (Wrangham et al. 2006; Turchin 2016). As both the iteration model (Chase-Dunn and Lerro 2013), simulation modeling (Turchin et al. 2013), and the archeological record (Flannery and Marcus 2012) show, societal conflict leads to hierarchy formation, so as rates of societal violence increased early in the agricultural era, chiefdoms, states and empires emerged as the dominant forms of socio-political organization.

When states and civilizations emerged, states would experience selection pressures for the elaboration of technologies of power. When formalized systems of law, polytheistic and monotheistic religions emerged, the states characterized by these
developments would be able to marshal these new technologies of power to regulate conflict within the societal organism, which would enable the persistence of these states. As states characterized by formalized systems of law and polytheistic religions were able to persist, whereas the states without these technologies of power would succumb to the disintegrative effects of societal conflict, civilizations would come to be characterized by states featuring formalized systems of law and complex systems of religious belief. As this process took place, rates of violence would decline in the societal organisms of agricultural civilizations compared to rates of violence in the societal organisms of foraging societies. Certainly violence and crime were present in the societies of the agrarian era, for instance Trigger (2003) notes that in the urban areas of ancient civilizations the houses of elites would be built with no street-facing windows, instead all windows would open to internal courtyards; but the violence present within agrarian states and empires was lower than the violence present in foraging societies.

The existence of states and empires often required these entities to expand at their frontiers and to do this states and empires would engage in conquest warfare. While this situation would produce high levels of violence along the frontier, within the boundaries of states and empires living standards would be higher and rates of violence would be lower than they were in the first gardening and farming villages of the agricultural era (Mann 1986; Morris 2014). Morris (2014) provides estimates of the rate of violent death across history. Morris (2014) estimates that prehistoric foraging societies had rates of violent death that ranged anywhere between 10% to 20% of the adult male population; during the era of agricultural states and empires Morris (2014) estimates agrarian states
and empires had rates of violent death between 3% to 5% of the adult male population. From the era of prehistoric foraging societies to the era of agrarian states and empires, rates of violent death fell by over half and this decline can be attributed, at least in part, to the ability of the state to use technologies of power to regulate societal conflict (Morris 2014).

As the prior discussion has attempted to illustrate, throughout the course of the agricultural era, running from the first appearance of agriculture in Southwest Asia around 11,500 years ago to the emergence of agrarian civilizations around 5,000 years ago in Egypt and Mesopotamia, to the dawn of the Industrial revolution in Britain in 1760 CE, the organismic character of human society, in general, increased. As foraging societies became sedentary and slowly adopted agriculture, growth in the size of the societal organism, along with increases in socio-political hierarchy, would initiate selection pressures favoring the elaboration of technologies of power and technologies of distribution. In response to these selection pressures, the societal organisms of the agricultural era would come to be increasingly characterized by both inter-community and intra-community networks of exchange and divisions of labor, which would enable cooperation throughout the societal organism; the societal organisms of the agricultural era would also come to be characterized by formalized systems of law, and by polytheistic and monotheistic religions, which all acted to regulate conflict within the societal organism. As this process played out, the simple organisms of foraging societies transformed into the complex organisms of agricultural civilizations; the organismic character of human society increased. Enabling this increase was one more technological
invention, which must be mentioned before moving on to discuss how the organismic
close character of human society continued to increase with the industrial revolution. This
invention is writing.

The invention of writing as a system of communication made the advances in
commercialization, law and religion that took place during the agricultural era possible;
in short, writing made civilization possible (Harari 2015). Although most individuals in
the agrarian era were illiterate, writing was a vital technological advance because it
allowed for information to be communicated between two speakers who are not present
in the same location. Language itself allows individuals to communicate information
about the past or about future situations, but when language is spoken (in the absence of
20th and 21st century technologies), speakers must be co-present to communicate
information. Writing allows individuals to communicate information to other individuals
who are not currently present in the encounter (Chase-Dunn and Lerro 2013). The
invention of writing vastly increases the number of people with whom one can
communicate, which has vital importance for societal cooperation. Situations that
involve cooperation require individuals to coordinate their behaviors and one way to
coordinate behaviors is through signaling one’s intentions (Skyrms 2004). As spoken
language allows one to signal one’s intentions, language facilitates cooperation between
co-present individuals; as written language allows one to signal one’s intentions to other
individuals who are not even present in the encounter, written language facilitates
cooperation between individuals across time and space. Due to this fact, the invention of
writing played a key role in integrating the complex societal organisms that would evolve during the agricultural era.

Writing emerged in the temple complexes of the first agrarian states (Maryanski and Turner 2008; Chase-Dunn and Lerro 2013). Within agrarian states writing had at least three functions and all three of these functions served to either facilitate cooperation or to regulate conflict within the societal organism. First, writing functioned as a way to commemorate kings and their deeds (Trigger 2003). By representing kings and their accomplishments through various forms of early writing, agricultural states and empires were able to enhance social control by providing legitimacy for their rulers. Second, writing served a religious function (Trigger 2003). Writing was used as a way to maintain religious rituals and traditions. For instance, in ancient Mesopotamian states, rituals and prayers were written down to ensure that no mistakes would be made in their transmission to future generations. In ancient Egyptian states procedures for provisioning the dead were also written down to avoid mistakes in the performance of the ritual ceremonies, which surrounded death. Finally, writing served an economic purpose in the states and empires that would emerge during the agricultural era (Trigger 2003). Writing emerged in the temple complexes of ancient states and these temple complexes acted as the economic hubs of early agrarian civilizations. The first records of writing in ancient Mesopotamia are records regarding the ownership and sale of goods, the sale of land, the sale of houses, the sale of slaves, the terms of loans and royal decrees relating to commerce (Trigger 2003). Writing played a vital role in law and religion, it also played a vital role in organizing the emerging economies of agricultural civilizations; in
performing these functions writing facilitated the technologies of distribution and power, which would both enabled cooperation and regulated conflict in the growing societal organisms of the agricultural era.

The basic organismic character of human societies had emerged by the dawn of the Upper Paleolithic around 50,000 years ago. Slightly over 35,000 years later, as populations of mobile foragers settled down in areas of local resource abundance and slowly began to cultivate plants and to domesticate animals, the stage was set for the emergence of agricultural civilizations. With the appearance of agricultural civilizations in Mesopotamia and Egypt around 5,000 years ago, the simple organismic character of foraging societies was transformed into the complex organismic character of agrarian civilizations. When members of the Central civilization tapped into fossilized sources of energy, which led to a revolution in energy capture, the organismic character of human civilizations would be transformed even further.

FROM AGRICULTURAL TO INDUSTRIAL CIVILIZATION

From the emergence of agriculture in Southwest Asia around 11,500 years ago all the way until the late 18th century, humans relied primarily on domesticated plants and animals for their energy. Although the emergence and evolution of agriculture dramatically increased the energy available to the members of human societies, which set in motion a series of societal dynamics that would lead to the evolution of human civilizations and the transformation of the societal organism there were limits to what was possible in an agricultural world. Morris (2013) points out that although societies that were able to harness up to 27,000 kcal of energy per capita per day were able to
house cities of up to a million residents, cities of multimillions required societies to capture at least 45,000 kcal of energy per capita per day. As humans came to rely on the energy contained in fossil fuels, the limits imposed by the agricultural mode of production where overcome and the organismic character of human civilizations was further transformed. With growth in energy capture provided by the use of fossil fuels, the societal organism would experience selection pressures for the continued elaboration of technologies of distribution and technologies of power. Technologies, which could further enable cooperation and regulate conflict in the growing societal organism. As societies developed socio-cultural mechanisms in response to such selection pressures, the organismic character of the societal organism would continue to increase up to the present era.

The industrial revolution took place first in Britain during the late 18th century. In the early 19th century, France, Belgium, Germany and the United States followed in Britain’s footsteps. By the end of the 19th century, the Netherlands, Austria, the Scandinavian countries and Japan had all embarked on the path towards industrialization. Today industrialized nations include the United States, Britain, France, Germany, Japan, Canada, Australia and the other nations that have signed the Convention on the Organization for Economic Cooperation and Development (OECD). Those societies that have not yet fully industrialized are considered to be industrializing societies. Lenski and Lenski (1987) differentiate between industrializing-agricultural and industrializing-horticultural societies. Although industrialized societies represent a minority of the global population, industrialized nations dominate the world-system both economically
and militarily and in most instances industrialized nations exploit the labor and resources of industrializing societies. Due to the advantages of the industrial mode of production, one specific societal organism, the Central civilization, which saw the evolution of both capitalism and industry, was able to engulf every other societal organism on the planet by the end of the 19th century.

As the industrial revolution progressed, the amount of energy available to the members of industrial societies skyrocketed and as the Central civilization engulfed the civilizations of the New World and Asia, a singular, global, fossil fuel-fed organism was born. With the emergence of a singular, globalized societal organism, a new set of selection pressures were enacted and these selection pressures would continue to favor the elaboration of technologies of distribution and technologies of power, technologies that could enable cooperation and regulate conflict within the global societal organism. In response to such selection pressures, the global societal organism would come to be characterized by globalized networks of trade and a globalized division of labor, which act to distribute matter, energy and information throughout the global societal organism. The societal organism would also come to be increasingly characterized by democratic forms of governance and by international peacekeeping efforts, which act to regulate conflict in the global societal organism.

CHARACTERISTICS OF THE INDUSTRIAL MODE OF SUBISTENCE

In subsistence systems based on industry the most important source of energy comes from fossil fuels, such as coal, gas and oil (Morris 2015). Humans in industrial societies still rely on domesticated plants and animals for their food energy; however, in industrial
societies the production of such food is greatly enhanced by the use of fossil fuels at
different points in the production and distribution process. The members of industrial
societies consume an enormous amount of energy compared to their farming, gardening
and foraging counterparts. Morris (2013) estimates that in London in 1700 CE, the
Central civilization’s largest city at the time, 32,000 kcal of energy per capita per day was
consumed; by 1800 CE, that number had jumped to 38,000 kcal per capita per day; and
by 1900 CE, it had jumped even further to 92,000 kcal of energy consumed per capita per
day. By the year 2000 CE, energy consumption in the most developed region of the
Central civilization (New York City) had reached an astonishing 230,000 kcal of energy
per capita per day (Morris 2013). In industrial societies the vast majority of the energy
consumed is consumed in the form of fossil fuels and in non-food biomass. Morris
(2013) estimates that in 20th century London, about 45% of the 92,000 kcal of energy
used per capita per day would be consumed in the form of fossil fuels, about 47% of the
energy would be consumed in the form of non-food biomass and about 8% of the energy
would be consumed as food or as animal feed. Whereas in agricultural societies the
majority of the population engaged in subsistence related tasks, in industrial societies the
majority of individuals work in tasks that are far removed from subsistence. For instance,
in the United States in 2014, less than 2% of the population worked in tasks related to
farming, fishing, forestry and hunting (Bureau of Labor Statistics 2015), whereas in
agricultural states and empires around 90% of the population could be engaged in
subsistence labor (Lenski and Lenski 1987).
Morris’s estimates demonstrate that as humans began to rely more and more on fossil fuels, the amount of energy available to humans skyrocketed. When the amount of energy increased, this growth in the societal organism initiated selection pressures favoring the elaboration of technologies of distribution and technologies of power; and as these technologies were elaborated they would enable the further growth of the societal organism. Thus, through the operation of this size-complexity feedback dynamic, the organismic character of human societies would continue to increase as the world continues to industrialize. The rest of this section will outline the evolutionary processes that led societies centered in Northwestern Europe to innovate, harnessing the fossilized sunlight contained in coal, oil and gas, which would, in turn, allow one societal organism, the Central civilization, to engulf all of the other societal organisms on the planet. After outlining this process, the rest of this chapter will attempt to illustrate how as the Central civilization came to be characterized by industrial power, and as the Central civilization engulfed the globe, selection pressures favoring the elaboration of technologies of distribution and technologies of power led to the emergence of globalized networks of trade and a globalized division of labor, which operate to enable cooperation throughout the global, societal organism. These selection pressures also, it will be argued, led to the emergence of democratic forms of government in much of the societal organism starting in the 19th century. Finally, they led to the rise of international peacekeeping efforts in the late 20th and early 21st century. As the global societal organism has responded to selection pressures favoring the elaboration of technologies of distribution and technologies of power in these ways, the overall level of cooperation exhibited by the
societal organism has increased, while the societal organism has become increasingly efficient at regulating conflict. Through this process, the organismic character of human society increased with the emergence of industrial power and globalization.

FROM AGRARIAN CIVILIZATIONS TO AN INDUSTRIAL CIVILIZATION

Moving from the first civilizations of the agrarian era, to the rise and demise of the Roman Empire, to the time period just before the industrial revolution, the overall level of world commercialization increased substantially. For instance, from 1 CE to 1700 CE the GDP per capita of Western Europe as a whole nearly doubled (Bolt and van Zanden 2014). As commercialization increased throughout the agrarian era, the motivation to expand one’s territory, which was the motivation underlying the formation of the first chiefdoms, states and empires would fuse with the motivation to accumulate wealth, setting in motion a series of societal dynamics that would allow for the emergence of industrial power in the Central civilization. These dynamics would also allow one societal organism, the Central civilization, to take over the entire globe by the middle of the 19th century, locking the world into one global societal organism.

As commercialization expanded throughout the agrarian era, merchants continually sought out new opportunities to procure goods, which could then be sold in urban markets for a profit. One vital source of new goods came from uncovering new lands with abundant resources; however, the ability of entrepreneurs to pillage the wealth of far-away lands was limited by the transportation methods of the era. Ships, for instance, were limited by their inability to navigate out of sight of land. Prior to the introduction of the compass, sailors would be limited to sailing either highly familiar
shipping routes, such as across the Mediterranean Sea, or they would be limited to sailing within eyesight of the coast. When the compass was introduced into Europe from China during the 13th century it alleviated this restriction, allowing sailors to travel out of sight of land without the fear of becoming lost at sea. Along with the introduction of the compass into Europe, European shipbuilders would stumble upon a series of innovations that would overcome the limitations of agrarian era transportation, including the stern rudder, the ability to construct larger ships with multiple masts, and a change in the geometric proportions of ships that allowed them to be more maneuverable in the water (Lenski and Lenski 1987). With these inventions European sailors were able to sail the seas in search of new lands and new sources of wealth and by the 15th century, a series of voyages undertaken to discover new trade routes to China and India led Europeans to the New World. When Europeans reached the New World the seams of Pangaea, which were ripped apart by geological activity hundreds of millions of years ago were permanently stitched back together through human ingenuity (Mann 2011b).

As Europeans reached the New World, they quickly set to work trying to profit off of the wealth that existed in the freshly uncovered lands, even if this meant enslaving and exterminating the land’s present occupants. For instance, within 50 years of their arrival in America, a confluence of factors including disease, technological superiority and ideological mystification allowed the Spanish Empire to conquer both the Aztec and the Inka, two of the most powerful empires to ever exist in the pre-industrial New World (Lenski and Lenski 1987, Mann 2011a). Before the fall of the Aztec Empire the population of central Mexico was estimated to be around 25 million, by 100 years later
European conquest had brought the population of central Mexico down to around 730,000 (Mann 2011a). With the uncovering of the New World in the 15th century and the brutal pacification of New World populations, the Central civilization engulfed the Mexican, Peruvian and Chibchan civilizations, which had characterized the New World prior to European conquest. Meanwhile, in the Old World at around the same time, the Central civilization engulfed Indonesian and West African Civilizations in similarly brutal fashion. By the end of the 16th century, only three civilizations, three societal organisms, remained on the planet: Central civilization, East Asian civilization, and Japanese civilization (Wilkinson 1987, 1992, 1993).

When European empires conquered the populations of the New World they used their new geographic positioning to construct and dominate a network of global trade. Starting in China, silk, porcelain, slaves and spices would travel across the Pacific to the Americas, in return for the silver that was mined at South American sites, such as Potosí in Bolivia. Silver, along with the goods that came from China would then make their way across the Atlantic to Europe, joined by goods that were produced in the Americas such as sugar, rum, tobacco and fur. Coming back across the Atlantic to the Americas would be slaves, who Europeans stole from their homelands in West Africa (Mann 2011b). Through the newly emerging global trade networks, European empires were able to accumulate massive amounts of wealth and as the accumulation of wealth fuels the desire to accumulate more wealth, the emerging network of global trade would tip the logic of accumulation towards capitalism. As capitalism grew, it would combine with the newly emerging logic of individualism to produce the industrial revolution in Britain.
Both the foraging and the agricultural eras were characterized by a low level of individualism. Foraging societies and agricultural civilizations were characterized by a notion of self that was oriented towards the realm of social meanings rather than the realm of individual meanings (Chase-Dunn and Lerro 2013). Moreover, religion in agricultural civilizations was structured around a heavy dose of both superstition and fatalism (Lenski and Lenski 1987). The combination of a socially-oriented self along with a fatalistic religious ethic tended to limit entrepreneurial activity among the members of agricultural civilizations. This began to change with the invention of the printing press and the Protestant reformation (Lenski and Lenski 1987). Printing was invented in China in the 5th century; however, due to technological limitations such printing was cumbersome and expensive. This all changed in the 15th century when Johann Gutenberg invented a system of movable type. With the invention of the printing press there was a tremendous increase in printed materials in Western Europe. The most influential of these new printed materials were the Bible and the teachings of Protestant reformers.

As the number of printed materials increased, religious attitudes began to slowly change due to the teachings of the Protestant reformers. This change in religious ethic had the effect of undermining many traditional aspects of authority, while also stimulating economic and technological innovation in Western Europe. Not only did the protestant reformation usher in a wave of individualism in Western Europe, it also upset the fatalistic worldview of the agrarian era (Lenski and Lenski 1987). As individuals began to develop their own personal relationship with the Christian god, rather than have
this relationship constructed by some centralized spiritual authority; and as the dominant system of belief moved away from fatalism, towards a view of the cosmos where one’s specific actions on earth where connected to one’s spiritual rewards in the afterlife, the ideological structure of Western Europe began to shift. In the course of this shift, Western Europe became a more favorable place for entrepreneurship and merchant activity (Weber [1904-5] 1950; Lenski and Lenski 1987). When changing attitudes towards economic activity and entrepreneurship converged with increasing commercialization, the stage was set for the emergence of the industrial revolution in Northwestern Europe; all that was needed was a population pressure catalyst.

The agricultural era, as would the industrial era that came after, played witness to the progressive deforestation of the planet Earth (Ponting 1999; Hughes 2001; Williams 2006). During the agricultural era, the primary sources of fuel included both dried wood and charcoal, so as populations grew the demand placed on the world’s forests grew along with it. This led to a timber famine in Britain by the 17th century (Wilkinson 1973; Hughes 2001; Williams 2006). To offset timber scarcity, Britain increasingly relied on imported timber, but this did little to alleviate the timber famine that the country was experiencing. As the timber shortages got worse, the price of timber in Britain rose and the people of Britain had to pay may more to maintain the same standard of living (Wilkinson 1973). The experience of population pressure constrained the budding commercial enterprises of the British economy, so to alleviate these strains entrepreneurs began to rely more on coal for fuel than they did on timber or charcoal (Wilkinson 1973).
Britain is home to large coal deposits, which facilitated the switch to coal in this region (Sanderson 1999).

Although coal provided a viable substitute for timber and charcoal, coal had its limitations (Lenski and Lenski 1987; Morris 2014). Coal has to be mined out of the ground and transported to where it needs to be used. As coal was increasingly used as a source of fuel, the easy-to-reach coal was consumed and coal mines had to be sunk deeper and deeper into the earth. When coal mines were sunk deeper into the earth they were liable to become flooded. To remove the water from coal mines, miners would use either human or animal power to bail out the water. Humans and animals are expensive, which made the problems posed by the flooding of mines a big setback for the coal mining industry. The technological solution to alleviate the coal miner’s woes was invented in 1712 by Thomas Newcomen. Newcomen invented a steam engine that burned coal to boil water, so that the steam produced from the boiling water could drive a piston, which would then pump water out of the mine shaft. The steam engine would burn coal, in order to allow more coal to be mined and burned (Lenski and Lenski 1987; Morris 2014). A revolution in energy capture had begun.

At around the same time that coal was being substituted for timber in Britain, Europe was home to a burgeoning textile industry. The conquest of the New World allowed Europeans to use the climate of America’s South Atlantic coast and the islands of the Caribbean, along with an extensive and violent system of slave labor to produce cotton, which would then be shipped to factories in Europe. From these factories, cotton would be processed and exported to markets around the world; markets, which were often
created through the use of violence. Through this process, European textile manufacturers along with the governments that were able to levy taxes on these manufacturers reaped tremendous profits (Beckert 2014). To be turned into clothing, cotton fibers must be spun together and such spinning is a labor intensive process. Just as the labor required to pump water out of mines limited the profits of coal miners, the need for cotton to be spun limited the potential profits of the growing textile industry. The technological solution to this problem was invented in 1764 by James Hargreaves. Hargreaves invented a machine for spinning cotton, the spinning jenny, which could spin cotton at a much faster rate than could any human. In 1779, Samuel Crompton invented a superior spinning device, Crompton’s mule, and this new invention allowed Britain to produce finer, yet cheaper, cotton than any other region in the world (Morris 2014). In 1785 entrepreneurs in the growing British textile industry combined their spinning technologies to steam engines. The harnessing of the steam engine to spinning technologies allowed for the emergence of the first textile factories in Britain (Morris 2014). Relying on imported cotton and a series of technological innovations, by the 18th century Britain had become the textile capital of the world. As the textile industry took off, coal would be used to revolutionize other industries as well (Lenski and Lenski 1978; Morris 2014; Beckert 2014).

Throughout the late agricultural era the demand for iron rose tremendously, but despite this increased demand the production of iron was limited by the limited supply of timber (Wilkinson 1973; Lenski and Lenski 1987). Charcoal was used to smelt and refine iron, which was a time consuming process and because of this time consuming
nature, the production process limited the profitability of the iron industry. To overcome this limitation, entrepreneurs in Britain invented a coal-fired blast furnace, which could be used to produce greater quantities of iron at a much cheaper price. For instance, in 1788 CE, Britain produced around 68,000 tons of iron; by 1845 CE, Britain produced over 1.6 million tons of iron (Lenski and Lenski 1987). Not only did the new coal-fired blast furnace make the production of iron more efficient, it also allowed huge quantities of iron to be produced in a single location. Just as coal power made the factory system possible in the textile industry, coal power made the factory system possible in the iron industry. As the use of coal power increased in British industry, Britain became the first society where machine-based industry rather than agriculture was the society’s most significant economic activity (Lenski and Lenski 1987). The era of the industrial organism had truly begun.

By the middle decades of the 19th century the breakthroughs that took place in Britain’s coal, textile and iron industries had spread to other industries. By the end of the 19th century, most segments of the British economy had been industrialized (Lenski and Lenski 1987). During this time period, steam power was applied to transportation and by the year 1850 most of Britain was linked together by a network of railroads (Lenski and Lenski 1987). Railroads significantly reduced the cost of transporting goods between the regions where the goods were produced and the regions where individuals purchased goods, so the emergence of the railroad system in Britain led to the falling price of goods. When the price of goods fell, commerce flourished. While steam power was being applied to transportation on land, it was also being applied to transportation over the seas,
which led to the invention of the first steam powered ships (Lenski and Lenski 1987). Meanwhile the iron industry was finding new and cheaper ways to produce steel. Advances in iron and steel were combined with advances in steam-powered transportation to produce steam-powered ships constructed of steel and iron (Lenski and Lenski 1987). The wooden sailing vessels of the agricultural era were no match for these new ships; the superiority of British naval technology would allow the British Navy to take-over the seas (Morris 2014).

As Britain industrialized, other nations were forced to adopt an industrial mode of production or risk falling too far behind Britain’s advances. After Britain industrialized, the United States, France, Belgium and Germany followed suit. Shortly thereafter, the Netherlands, Austria, the Scandinavian countries and Italy would begin to industrialize as well (Sanderson 1999). The power of industrialized nations dwarfed the power of those nations that had yet to industrialize and this asymmetry in power would allow the Central civilization to engulf the world’s two remaining civilizations, locking the entire globe into one giant socio-political interaction network. In 1842, after a series of military confrontations known as the First Opium War, Britain’s technological superiority allowed the British to overcome the will of the Qing Empire, opening up Chinese ports for Western merchants; slightly over ten years later in 1853, a fleet of American ships opened up Japanese ports to Western merchants (Morris 2014). With the opening of Chinese and Japanese ports to Western merchants in the middle decades of the 19th century, the Central civilization engulfed both East Asian and Japanese civilizations (Wilkinson 1987, 1992, 1993). Human society had now come to be composed of a
global, societal organism; an organism that was increasingly organized around the energy provided by fossil fuels.

By the end of the 19th century the Central civilization represented a global, societal organism. Prior to the industrial revolution in 1700 CE, individuals in the core areas of the Central civilization were using 32,000 kcal of energy per capita per day (Morris 2013). By the end of the 19th century, individuals in the core of the Central civilization were using 92,000 kcal of energy per capita per day, and by the year 2000 CE individuals in the core of the Central civilization were using around 230,000 kcal of energy per capita per day (Morris 2013). As the energy capture capabilities of the societal organism grew, it set in motion a series of selection pressure that would favor the elaboration of technologies of distribution and technologies of power in the societal organism. In response to selection pressures favoring the elaboration of technologies of distribution, the global societal organism would come to be characterized by globalized networks of trade and by a globalized division of labor, which would function to enable cooperation throughout the societal organism. In response to selection pressures favoring the elaboration of technologies of power, the societal organism would come to be increasingly characterized by democratic forms of governance; also, the societal organism would see the rise of international peacekeeping efforts. Through these mechanisms, the societal organism would become better able to regulate internal conflict. As these technologies of distribution and power have enabled the further growth and persistence of the societal organism, the organismic character of the human societal organism has continued to increase up to the present era.
COOPERATION AND CONFLICT IN INDUSTRIAL CIVILIZATIONS

As processes of societal evolution caused agricultural civilizations to slowly transform into one global societal organism, the organismic character of human society continued to transform. This transformation happened as the growing energy capture capacity of the societal organism, initiated selection pressures favoring the continued elaboration of technologies of distribution and technologies of power. The societal organisms of the agricultural era were characterized by both intra- and inter-community networks of exchange, as well as intra- and inter-community divisions of labor. As the global societal organism emerged, these networks of exchange and divisions of labor would become elaborated and globalized networks of exchange and a globalized division of labor would emerge. The societal organisms of the agricultural era were also characterized by formalized systems of law, and by polytheistic and monotheistic religions. As selection pressures acted on the emerging global societal organism, these already existing socio-cultural mechanisms would be joined by the emergence of democracy and international peacekeeping efforts. Through the aforementioned mechanisms, the global societal organism would be able to mobilize cooperation and regulate conflict within the organism, allowing for the societal organism’s continued persistence. The following section will trace these evolutionary developments, first looking at the emergence globalized networks of exchange and a globalized division of labor, before looking at the emergence of democracy and international peacekeeping efforts in the societal organism.

With the emergence of capitalism during the long 16th century the rate of global commercialization exploded, but by the middle of the 17th century this expansion had
slowed down. By the mid to later parts of the 18th century the rate of global commercialization would begin to expand again, and this time it would expand in a quite dramatic fashion (Sanderson 1999). With this expansion, the level of cooperation found within the global, societal organism would increase. As the discovery of the New World opened up new markets and as advances in industrial technology revolutionized production and transportation, the level of global commercialization expanded dramatically. Chase-Dunn and Lerro (2013) provide data on world imports as a percentage of world GDP, which serves as a measure of globalization. In the year 1820 CE, about 0.05% of the world GDP was accounted for by world imports. This figure increased to about 0.15% by 1880, at which time it would decline and then rise in saw-tooth pattern until it reached a low of around 0.05% at the end of WWII. After WWII, the percentage of world GDP accounted for by world imports would continue to grow reaching a high of almost 0.3% around the year 2005 CE. As this data shows, since the industrial revolution the overall level of global commercialization has increased in response to selection pressures favoring the elaboration of technologies of distribution within the societal organism.

On way to assess increasing levels of global commercialization in the era after the industrial revolution is to look at how the production and consumption of goods changed during this time period. Britain was the leader of the industrial revolution, so looking at changes in the production and consumption of valued goods in Britain can be used as a window for assessing the overall increase in commercialization that took place during this time. Sugar is an important commodity; among many other things the British use
sugar to sweeten their tea. Maddison (2001, 2003) provides estimates of sugar production in the British Caribbean from 1700 to 1894 CE. In the British Caribbean sugar production increased from 22,000 metric tons in 1700; to 71,000 metric tons in 1760; to 106,000 metric tons in 1787; to 168,000 metric tons in 1815; to 260,200 metric tons in 1894. At the same time that the production of sugar in the British Caribbean was increasing, the consumption of both sugar and tea back in Britain were increasing as well. Hobsbawm (1968) provides estimates of British sugar and tea consumption from 1800 CE to 1900 CE. In 1800 CE, the average British resident consumed about 20lbs of sugar and 15lbs of tea per year; by 1900 CE, this figure had increased to a whopping 80lbs of sugar and 60lbs of tea consumed per year. As the data on sugar production and consumption show, throughout the 1800 and 1900’s the production of sugar in the British Caribbean was increasing, at this same time the consumption of sugar in Britain was increasing as well. This pattern is indicative of an overall increase in global commercialization during this time period.

Another way to assess increases in global commercialization in the period after the industrial revolution is to look at data on the GDP per capita of different countries around the world. If GDP per capita is rising, on average, during this period it signifies increasing levels of commercialization. The expansion in the level of worldwide commercialization in the time period after the industrial revolution is evidenced in worldwide GDP growth during this time. Maddison (2001, 2003) provides estimates of the GDP per capita (in 1990 international dollars) for a number of countries from 1700 to 1998. The data summarized here can be found in Table 2. In Britain in 1700 CE, the
GDP per capita was $1,405; in 1820 it was $2,121; in 1913 it was $5,150; in 1950 it was $6,907; and in 1998 it was $18,714. In the United States in 1700 CE, the GDP per capita was $527; in 1820 it was $1,257; in 1913 it was $5,301; in 1950 it was $9,561 and in 1998 it was $27,331. In China in 1700 CE, the GDP per capita was $600; in 1820 it was still $600; in 1913 it had declined to $552; in 1950 it had declined again to $439; but by 1998, GDP per capita in China shot up to $3,117. Finally, in Brazil in 1700 CE, the GDP per capita was $460; in 1820 it was $646; in 1913 it was $811; by 1950 it was $1,672; and by 1998 it had increased to $5,459. As the data on GDP show, in response to selection pressures favoring the elaboration of technologies of distribution, global commercial exchange has increased remarkably.

<table>
<thead>
<tr>
<th>Year</th>
<th>Britain</th>
<th>USA</th>
<th>China</th>
<th>Brazil</th>
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<tr>
<td>1700 CE</td>
<td>1,405</td>
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<tr>
<td>1820 CE</td>
<td>2,121</td>
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<td>1913 CE</td>
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<td>811</td>
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<tr>
<td>1950 CE</td>
<td>6,907</td>
<td>9,561</td>
<td>439</td>
<td>1,672</td>
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<td>1998 CE</td>
<td>18,714</td>
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Table 2: GDP per capita estimates in 1990 international dollars for select countries from 1700 CE to 1998 CE (from Maddison 2001, 2003)

As the global societal organism has continued to experience selection pressures favoring the elaboration of technologies of distribution, a more sophisticated division of labor has emerged. Technological advances have required fewer individuals to work in agriculture, which has, in turn, allowed more individuals to find employment in industrial
and service sectors. This dynamic has led to an explosion of occupational specialization in industrial and industrializing societies; for instance, Lenski and Lenski (1987) state that there are over 20,000 different occupational specializations in the United States alone. This represents a dramatic increase over the level of occupational specialization observed in agricultural states and empires. With elaborations in the division of labor, the overall level of mutual interdependence among the members of the global societal organism has increased; the survival of most individuals in the population is now completely dependent on the subsistence labors of a small subset of others. Furthermore, due to processes of globalization, in many cases the individuals who produce food, live and work in completely different countries than those individuals who consume the food. For instance, most of the broccoli purchased and consumed on the East Coast of the United States is grown in Guatemala rather than in the USA (Fischer and Benson 2006). Due to the growing requirements of broccoli, broccoli can only be grown on the West Coast of the United States. Given the distances between California and New York and Guatemala and New York, it is actually cheaper to grow broccoli in Guatemala and ship it to the East Coast than it is to grow the broccoli in California and ship it to the East Coast. As the broccoli consumed in New York is produced by farmers in Guatemala, the ability of New Yorkers to eat broccoli and the ability of farmers in Guatemala to earn a profit are fundamentally connected (Fischer and Benson 2006). As the societal organism has become increasingly globalized, the needs and desires of individuals all around the planet have become increasingly intertwined.
Maddison (2001, 2003) provides data on changes in the division of labor in the Netherlands, the United Kingdom, and the United States from 1700 to 1998 CE. This data helps to demonstrate the changing nature of the division of labor in the era of the global, societal organism. In the Netherlands in the year 1700 CE, about 40% of employment was in agriculture, about 33% was in industry, and about 27% was in the service sector. By 1998, only 3% of total employment in the Netherlands was in agriculture, 22% was in industry, and 75% was in the service sector. In the United Kingdom in the year 1700 CE, 56% of employment was in agriculture, 22% was in industry and 22% was in services. In the United Kingdom in 1998, only 2% of employment was in agriculture, 26% was in industry, and 72% was in services. Finally, in the United States in the year 1820 CE, 70% of employment was in agriculture, 15% was in industry, and 15% was in services. In the year 1998 in the United States, 3% of employment was in agriculture, 23% was in industry, and 74% was in services. As the data provided by Maddison (2001, 2003) show, during the industrial era the division of labor has changed so that in industrialized nations, fewer individuals work in agriculture, while more individuals work in industry and the service sector. As technological advances required fewer individuals to be engaged in agricultural production, the level of mutual interdependence exhibited by the citizens of the industrial societies of the global, societal organism has increased.

Not only would the changing nature of the division of labor lead to increases in the level of mutual interdependence of the individuals who populate the global societal organism, industrialization would also bring about higher standards of living for the
members of industrial societies. Such higher living standards would further this mutual interdependence. When humans go about their daily activities they use their experiences to develop expectations about how the world should be. If these expectations are then violated, individuals experience negative emotions, which motivates them to alter their experience of the world in order to bring their experience back in line with their expectations (Turner 2007; Burke and Stets 2009). Due to this psychological dynamic, as the technological advances of industrialization have brought about a higher standard of living, individuals have come to psychologically depend on the accoutrements provided by this higher standard of living. Dependent on the benefits of living in an industrialized nation, individuals in industrialized nations have become dependent on those others whose labor makes such a higher standard of living possible. Individuals in industrial societies live in houses with heating and air conditioning, plumbing, electricity, television and the internet. Individuals in industrial societies drive cars and ride in air planes. They eat so much food that they regularly die from diseases associated with over-consumption. They work in skyscrapers that tower over their cities. As living in industrial society has socialized the members of these societies to expect such accoutrements, the individuals living in these societies have become fundamentally dependent on those others whose labor makes such a standard of living possible. Overall, the efficiency of agricultural production, along with the higher standard of living made possible by industrialization has bound the members of the global societal organism into webs of mutual dependence that are denser than those seen at any other time in human history.
In response to selection pressures favoring the elaboration of technologies of
distribution, the global societal organism would come to be characterized by globalized
networks of commercial exchange and by globalized divisions of labor. As these changes
have taken place, the overall level of cooperation observed in the global, societal
organism has increased, which has enabled the persistence of the global societal
organism. Just as writing facilitated the technologies of distribution that emerged in
response to selection pressures during the early parts of the agricultural era; 20th and 21st
century advances in communication technology helped facilitate the elaborated
technologies of distribution, which have come to characterize the global societal
organism. For instance, the invention of the telephone would allow individuals to
communicate with others in real time even if they were separated by vast distances. First
patented by Alexander Graham Bell in 1876 CE, in 1900 there were an estimated 1.4
million telephones in the United States; by 1940 this number had increased to over 20
million telephones (Lenski and Lenski 1987). Another technological advance that has
revolutionized the communication capacities of humans has been the invention of the
personal computer and the internet. Making their first appearance in the late 20th century,
home computers that are connected to the internet allow individuals to communicate
through text, voice, or video with any other individual on the planet, who is also
connected to the internet. The invention of smart phones in the early part of the 21st
century has made computers with internet access pocket-sized, leading to further
increases in the communication capacity of humankind. As commercialization and the
division of labor have expanded, advances in communication technology have made the
global, societal organism an increasingly interconnected place. Not only did the global societal organism experience selection pressures favoring the elaboration of technologies of distribution, which could facilitate cooperation in the growing societal organism; as the societal organism grew in the era after the industrial revolution, it would also experience selection pressures for the elaboration of technologies of power, which could regulate conflict in the growing organism.

For the Central civilization to maintain its organismic character, the global societal organism would need to develop increasingly sophisticated mechanisms for regulating the conflict that could emerge within the societal organism. In the era of agricultural organisms, selection pressures favoring the elaboration of technologies of power led to the evolution of legal codes, as well as to polytheistic and monotheistic religions, which functioned to regulate conflict within the agrarian organism. As societal evolution unfolded both law and religion would remain important sources of regulation, but the regulatory nature of law and religion would change as the global societal organism was shaped by continuing selection pressures favoring the elaboration of technologies of power. Compared to the legal codes of agricultural era, the legal codes of the industrial era are quite sophisticated (Turner and Maryanski 2008). As the many societal organisms of the agricultural era transformed into the single societal organism of the industrial era, the body of laws found in the societies that made up the global societal organism were elaborated. As legal codes were elaborated, the body of laws that regulate both criminal and civil affairs would expand; there would also be a rapid expansion in the body of laws, which regulate the relations between state bureaucracies and private
citizens (Turner and Maryanski 2008). With law being elaborated as the societal organism evolved, the ability of governments to regulate the affairs and conduct of their citizens has increased overtime (Chase-Dunn and Lerro 2013).

The elaboration of the body of laws found in industrial societies co-evolved with an elaboration of the court system (Turner and Maryanski 2008). Industrial societies feature an increasingly specialized system of courts, where different courts exist to focus on various aspects of the law such as criminal law, civil law, patent law, military law, and family law. Although the legal systems found within the global societal organism evolved to reflect increasing selection pressures for mechanisms, which could suppress conflict within the societal organism, perhaps the most revolutionary advance regarding law in the global societal organism was a fundamental change in the relationship between those who wrote and enforced the law and those who were governed by the law. This change reflects the emergence of democracy in many of the societies that make up the global societal organism, starting in the 19th century and continuing to the present.

Democracy is a system of socio-political organization whereby the state, that entity that has a monopoly on legitimate violence within a specific territory, operates in conformity with the expressed demands of the state’s citizens. Democracy is defined by a government’s ability to produce and maintain political relations between the state and its citizens, which exhibit broad, equal, protected and mutually binding consultation (Tilly 2007). By broad, equal, protected and mutually binding consultation, Tilly (2007) means that the state allows diverse groups of citizens to express their demands; the state favors equality in how it allows diverse groups to translate their demands into state
behavior; the state works to protect the views of diverse groups of citizens; and the state has a clear and enforceable obligation to meet the demands of its citizenry. When these four elements are present, a socio-political system can be considered democratic; moreover, to the extent that these four elements are either increasing or decreasing within a society, the state can be considered to be democratizing or de-democratizing (Tilly 2007). As the basis of democracy is a state’s ability to translate the demands of its citizens into state behavior, democracy is a far cry from the monarchies of the agricultural era, where the whims of the king or queen determined the law.

According to Sanderson (1999), democracies are characterized by the following three characteristics: congressional or parliamentary bodies that constitute bases of power separate from the president or prime minister; regular and fair elections of government officials that are open to all adult residents; and the allocation of rights and liberties to the vast majority of the population. In being organized around these three characteristics, democracies are able to shape state behavior around the expressed demands of the citizenry. By investigating the appearance of these three characteristics in societies over the course of societal evolution, the history of democracy can be traced. The origin of democracy is often traced back to the ancient Greek city-states. While the governments of these city-states were important pre-cursors for the democratic forms of government that would first emerge in Europe in the 19th century, the ancient Greek city-states were not democracies in the sense outlined above. Although Greek city-states held elections, these elections were restricted to adult, male citizens. As political rights were restricted to male citizens, women, slaves and resident foreigners were unable to have their
demands translated into state behavior. Given these facts, the ancient Greek city-states were not true democracies, but they did serve as an important pre-cursor for the emergence of true democracies in Europe in the 19th century (Tilly 2007).

Democracy emerged in Europe in the 19th and 20th centuries with the appearance of congressional or parliamentary bodies, elections, and individual rights (Sanderson 1999). The first congressional or parliamentary bodies emerged in England in 1640 and in the United States in 1776. After congressional and parliamentary bodies emerged in England and the United States, the next step in the evolutionary emergence of democracy was mass suffrage and the granting of individual rights. It isn’t until well into the 19th century that mass suffrage and individual rights began to appear. According to Sanderson (1999) the first countries to grant mass suffrage to males were Switzerland, France, Norway, Denmark, Sweden, the United Kingdom, The United States, the Netherlands, and Belgium, which all did so between 1848 and 1919. It wasn’t until the 20th century, for instance, in 1918 in Denmark and in 1920 in the United States, that women would be given the right to vote in these democracies. As democracy first emerged as a form of government in Europe and the United States throughout the 19th and 20th centuries, it slowly spread around the globe (Sanderson 1999). According to research conducted by the NGO Freedom House, by the year 2014, 125 of the world’s 195 polities were considered democratic. Of these democracies, 89 were considered free democracies. This means that in the year 2014, about 2.9 billion people, or about 40% of the world’s population, were living under the rule of free, democratic governments. First emerging as a coherent form of government in just the 19th century, within the last 200
years nearly half of the world’s population has come to live under the rule of free, democratic governments.

Democracy de-centralizes power by taking power away from the hands of a monarch and putting this power into the hands of citizens. In so doing, democracy allows citizens an element of control over how the state regulates their behavior. The shift towards democracy represents the invention of a new technology of power; democracy has played an important regulatory role for the global societal organism. Dahl (1998) lists 10 advantages that democracies have compared to other methods of socio-political regulation and these 10 advantages can be used to demonstrate the importance of democracy as a technology of power, which can operate to suppress conflict within the global, societal organism. First, democracy avoids tyranny (Dahl 1998). In allowing societies to avoid the leadership of tyrants, democracy frees citizens from the potential caprices of tyrannical authorities, thereby reducing the likelihood of societal conflict aimed at the overthrow of a tyrant. Democracies ensure their citizens a number of fundamental rights, while granting their citizens a broader range of personal freedoms than any other system of government (Dahl 1998). Democracies also help citizens protect their own fundamental rights and to live under laws of their own choosing (Dahl 1998). In allowing citizens to have some control over the laws that are written and enacted, democracies allow citizens to develop their own sense of morality and to attempt to build the government around this moral sense (Dahl 1998). Democracies also foster human development and equality more so than does any other form of government (Dahl 1998). Although humans have evolved to be social creatures, at their hominin core
humans are an ape with a propensity for individualism and autonomy; humans are most content when they feel like they have some individual control over their own lived experience (Turner and Maryanski 2008). In affording the citizenry basic rights and freedoms, in allowing the citizenry an element of self-determination, and in fostering equality and human development, democracy allows humans the freedom to express their individualistic and autonomous nature.

Finally, Dahl (1998) points out, democracies, historically, do not fight wars with other democracies. For instance, of the 34 international wars that were fought between the years 1945 and 1989, none occurred between democratic countries. Of course, democracies have historically gone to war with other non-democratic countries and democratic countries have engaged in the colonial rule by military force of conquered peoples, but democracies tend not to go to war with other democracies (Dahl 1998). As an increasing percentage of the world democratizes, an increasing percentage of the world should, in principle, be unlikely to go to war with each other. Also, countries with democratic governments tend to be more prosperous than do countries without democratic governments (Dahl 1998). There tends to be a positive relationship between market economies and democracies. According to Dahl (1998), market economies require a mobile labor force, privately owned firms in competition with each other, and consumers who can choose among different producers. In fostering the development of individuals by affording individuals with freedoms, rights and an element of self-determination, democracies produce the types of citizens necessary for the functioning of a vibrant economy.
As Dahl (1998) has shown, democracies have a number of socio-political advantages compared to non-democratic forms of government and these advantages have allowed democratic governance to function as an important technology of power, regulating conflict in the societies that make up the global societal organism. By providing individuals with a political voice, democracy allows individuals a sense of autonomy, which aligns with humankind’s evolved propensity for individualism (Turner and Maryanski 2008). In so doing, democratic forms of government play an important role in allowing humans to realize their full potential, which has the effect of reducing the potential for conflict within democratic societies. Furthermore, by providing citizens with a voice in the political process, democracy reduces the likelihood that citizens will use violent rebellion as a means to achieve their political will. Lastly, not only has democracy functioned to suppress intra-societal conflict, as democracies tend not go to war with other democracies, the proliferation of democratic forms of governance throughout global societal organism within the last 200 years has played an important role in suppressing inter-societal conflict in the global, societal organism. Another technology of power that emerged in response to selection pressures acting on the global societal organism is the proliferation of international peacekeeping efforts since the end of World War II.

Although the global, societal organism of the 20th century saw two of the bloodiest conflicts that have ever taken place in World War I and World War II10, by the

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10 Although the occurrence of two horribly bloody conflicts during the 20th century may be taken as evidence against the organismic character of the global societal organism, it is important to remember that while costly, neither WWI nor WWII led to the destruction of
late 20th and early 21st century the global organism had recovered, becoming a more peaceful and less violent place than ever before. Worldwide, the number of individuals who have died in violent conflicts has steadily fallen since the 1980’s (Goldstein 2011). According to data presented by Goldstein (2011), the years from 1980 to 1984 averaged around 230,000 battle deaths per year. The years 1985 to 1989 averaged around 211,000 battle deaths per year; the years 1990 to 1994 averaged around 109,000 battle deaths per year; the years 1995 to 1999 averaged around 83,000 battle deaths per year; the years 2000 to 2004 averaged around 55,000 battle deaths per year; and the years from 2005 to 2009 were the most peaceful yet, averaging only 53,000 battle deaths per year. As the data presented by Goldstein (2011) show, since the 1980’s the number of individuals who have been killed in battle worldwide has steadily declined. While there are many possible explanations for this trend, one likely reason for the overall decrease in global violence is the rise of international peacekeeping missions (Goldstein 2011).

International peacekeeping missions emerged as selection pressures favoring new technologies of power acting on the global societal organism led to the formation of the United Nations in 1945. The emergence of international peacekeeping missions during the latter half of the 20th century is the final technology of power, the final mechanism of conflict regulation, that will be outlined in this discussion of the societal organism.

the global societal organism. While WWI and WWII were setbacks to the organismic character of the global societal organism, the global organism recovered from these setbacks. Concluding that the global societal organism cannot be considered an organism because of the violence of WWI and WWII is akin to concluding that a human individual is not to be considered an organism if this individual were a survivor of some near-fatal illness at an earlier point in her life.
Through the operation of international peacekeeping missions, the disruptive effects that both interstate conflict and civil wars can have on the coherence of the global, societal organism have been suppressed.

International peacekeeping missions involve the deployment of international personnel, who help to preserve peace and security after a war (Fortna 2008). The United Nations is the main international body involved in executing peacekeeping missions around the globe, but various NGOs and social movement organizations also take part in the peacekeeping process as well (Goldstein 2011). The United Nations was established in 1945 in the aftermath of World War II in an effort to form an international body that could protect the world from the devastation of a future global war. Throughout its early years the UN struggled with its own internal organization and with its role in the international sphere, which led to many blunders and missteps, but by the 1990’s the UN had become an increasingly important peacekeeping force. For instance, United Nations peacekeeping efforts played a key role in helping Namibia gain its independence from South Africa in 1990.

In 1966 armed conflict broke out between the South African government and the South West Africa People’s Organization (SWAPO) in what was then South West Africa. Although South West Africa was a territory controlled by South Africa, when the UN got involved in the negotiation process they recognized SWAPO as the legitimate governing body of South West Africa. Conflict between the South African government and SWAPO supporters continued and in 1989 the UN began peacekeeping operations in the region. These operations played a key role in ushering in Namibia’s independence. UN
peacekeepers were successfully able to educate the public about upcoming elections, disarm military forces from both sides of the conflict, integrate demobilized soldiers into a national army, and train police officers. The UN was also able to relocate 40,000 war refugees from the region to Angola and Zambia. Despite efforts by the South African government to subvert the UN mission in South West Africa, elections, which were won by SWAPO, were held in 1989. Shortly after the elections, a constitution was drafted and in 1990 Namibia gained its independence from South Africa. The story of Namibia’s independence is a major success story for UN peacekeeping (Goldstein 2011).

Another UN success story involves the UN’s peacekeeping efforts in El Salvador. In 1980 a civil war erupted in El Salvador between the right-wing government and leftist guerillas. Along with a bloody civil war, during the 1980’s the Salvadorian economy would be ravaged by the falling price of their main export, coffee. El Salvador would also experience a massive earthquake in 1986. The woes brought on by a poor economy and a natural disaster would only exacerbate the already brutal civil war that the country was experiencing. In 1989, after nearly a decade of fierce fighting and misery, peace talks between the government and leftist guerillas began, but despite such talks violence would continue. The UN got involved in El Salvador in 1991. The UN helped mediate a cease-fire between the two groups and although tenuous, the UN-mediated cease-fire would hold, thereby putting an official end to the violence in 1992. Along with negotiating a cease-fire between the two sides of the conflict, the UN established a truth commission to uncover human rights violations that had been perpetuated by both sides during the civil war. Ultimately the elections that were held would be won by
government officials, but by 2009 the party of the former guerillas would be a major political player in Salvadorian politics, showing that in the end peace and democracy allowed the guerillas to achieve what they had been unable to achieve with warfare (Goldstein 2011). As the cases of Namibia and El Salvador show, UN peacekeepers can play a major role in both ending conflicts and enforcing peace in a conflict’s aftermath.

Peacekeeping missions can be classified by the types of operations around which the peacekeeping mission is organized. Fortna (2008) outlines four broad types of peacekeeping missions. The first type of peacekeeping mission is what Fortna (2008) calls an observation mission. Observation missions involve the deployment of unarmed military or civilian observers to monitor cease-fires and elections. Traditional peacekeeping missions are the second type of peacekeeping mission (Fortna 2008). Traditional peacekeeping missions involve the deployment of lightly armed military personnel to a conflict zone to monitor compliance with agreements. The third type of peacekeeping mission is what Fortna (2008) calls a multidimensional mission. Multidimensional missions involve the deployment of both armed military personnel and civilians into a conflict zone to assist in the building of peace after a war. Multidimensional missions involve the organizing of elections, human rights training, police training and economic development. The final type of peacekeeping mission is what Fortna (2008) calls a peace enforcement mission. Peace enforcement missions are the most intense type of peacekeeping mission. These missions involve the deployment of substantial military forces into a conflict zone. These forces act as a defensive force in conflict zones, enforcing compliance with cease-fire agreements. As Fortna (2008)
points out, many peace enforcement missions also involve elements of multidimensional peacekeeping as well. Through these four types of missions, international peacekeepers, led by the United Nations, have been able to significantly reduce the number of worldwide battle deaths in the late 20th and early 21st centuries (Goldstein 2011).

Since the end of WWII, the majority of wars that have been fought have been civil wars and because of this many of the battle deaths that have occurred after WWII have been the result of civil wars (Fortna 2008). Research on international peacekeeping efforts has found that the presence of international peacekeepers both reduces the duration of civil wars and reduces the likelihood that bloodshed will start again once a civil war has ended (Fortna 2004a, 2008; Doyle and Sambanis 2000). From this research it appears that international peacekeeping missions have played a key role in reducing the number of battle deaths from civil wars. Although many of the battle deaths of the last 35 years have been the result of civil wars, interstate warfare has also been responsible for its fair share of global violence in the late 20th and early 21st century. Just as with civil wars, research has found that the presence of international peacekeepers plays a key role in making peace last in the aftermath of interstate warfare (Fortna 2004b). From this research, it appears that international peacekeeping missions have also played a key role in reducing the number of battle deaths from interstate warfare in the last 35 years. As the fall in worldwide battle deaths correlates with an increase in international peacekeeping activity and as research has found statistically significant correlations between the actions of peacekeepers and the duration of civil and interstate warfare, it is reasonable to conclude that increasing efforts by international peacekeepers have been a
key technology of power, which has helped reduce the level of conflict found in the global, societal organism during the late 20th and early 21st centuries.

While the fact that an average of 53,000 individuals have died per year due to warfare during the years from 2005 to 2009 shows that there is still plenty of conflict present in the societal organism; 53,000 represents a drastic reduction in battle deaths compared to the number of battle deaths reported from just 35 years earlier. The number of 53,000 battle deaths per year is put into perspective when one realizes that around 300,000 Americans die every year due to obesity-related illnesses (Allison et al. 1999). How have international peacekeeping efforts been able to reduce the deadly effects of both civil and interstate warfare? Fortna (2008) provides a causal model that outlines four pathways by which peacekeeping efforts work to keep peace in the aftermath of war. First, by influencing domestic, public opinion; by providing jobs and infrastructure in times of peace; and by providing military deterrence, the presence of international peacekeepers changes the cost-benefit calculus for those belligerents who are contemplating further conflict. Second, by monitoring compliance with agreements and by facilitating communication between warring parties, the presence of international peacekeepers reduces uncertainty in the negotiation process, which helps parties on both sides of the war reach mutually beneficial agreements. Third, by providing on-the-spot mediation; by helping to enforce law and order; and by providing a legal alternative to intensifying the conflict, peacekeepers are able to reduce the likelihood that some sort of accident or unfortunate event will ignite further violence. Finally, by providing neutral, interim leadership; by monitoring elections; by training police and military personnel;
and by helping military groups transform into political organizations, peacekeepers are able to reduce the likelihood that political abuse in the aftermath of a conflict will incite further conflict. Through these four pathways, international peacekeepers have been able to reduce both the duration of wars and the likelihood that violence will re-emerge in the aftermath of conflict (Fortna 2004a,b, Fortna 2008; Doyle and Sambanis 2000). In so doing, international peacekeepers have helped battle deaths drop from around 230,000 deaths per year just 35 years ago to around 53,000 deaths per year in the years between 2004 to 2009 (Goldstein 2011). As international peacekeeping efforts have played a key role in limiting both the duration and re-ignition of civil and interstate wars, international peacekeeping efforts are a relatively recent mechanism, which has emerged in the global societal organism in response to selection pressures favoring the elaboration of technologies of power.

During the 20th century, the world witnessed two of the bloodiest conflicts on record in WWI and WWII; however, despite these world wars, throughout the 20th century and during the early part of the 21st century the world appears to be becoming a more peaceful place (Goldstein 2011; Morris 2014). As the evidence presented by Goldstein (2011) demonstrates, in the late 20th and early 21st centuries the number of worldwide battle deaths has decreased greatly from an average of 230,000 battle deaths per year in the early 1980’s to an average of 53,000 battle deaths per year in the late 2000’s. Evidence presented by Morris (2014) paints a similar picture. According to data presented by Morris (2014), in the prehistoric foraging societies of the late Pleistocene somewhere between 10 to 20% of the population would experience a violent death; in the
empires and states of the agricultural era somewhere between 2 to 10% of the population would experience a violent death; and finally, in modern, industrial societies somewhere between 1 to 2% of the population will experience a violent death.

As the aforementioned data shows, as societal evolution has unfolded and the many societal organisms of the agricultural era were transformed into one global societal organism, selection pressures favoring the elaboration of both technologies of distribution and technologies of power operated to produce new mechanisms for enabling cooperation and new mechanism for regulating conflict in the global societal organism. In response to selection pressures favoring the elaboration of technologies of distribution, the global societal organism came to be characterized by globalized networks of exchange and a globalized division of labor. In response to selection pressures favoring the elaboration of technologies of power, the global societal organism would come to be increasingly characterized by democratic forms of governance. The global societal organism would also see the rise of international peacekeeping efforts. Through the emergence of these mechanisms, the global societal organism would be able to mobilize cooperation and regulate conflict enabling the societal organism’s continued persistence; through the growth of the societal organism and the emergence of these mechanisms, the organismic character of human society would increase.

CONCLUSION

As this rather long chapter has attempted to show, throughout the course of societal evolution the organismic character of human society has, in general, increased as growth-induced selection pressures favored the elaboration of technologies of distribution and
technologies of power, which led to the emergence of new socio-cultural mechanisms for motivating cooperation and regulating conflict in the societal organism. These socio-cultural mechanism, in turn enabled the further growth of the societal organism.

Beginning at least 50,000 years ago, the foraging societies that characterized the globe had taken on the character of simple organisms. When changes in the climate allowed populations of mobile foragers to settle down into permanent villages in areas of local resource abundance, a positive feedback dynamic between population size and societal complexity was set in motion. Through the operation of this size-complexity feedback relationship the simple organisms of foraging societies would be transformed into the complex organisms of agricultural civilizations. Characterized by high levels of cooperation, due to emerging markets and divisions of labor; and low levels of conflict, due to the existence of states regulated by formalized codes of law and polytheistic and monotheistic religions, the organismic character of human society was transformed as agricultural civilizations emerged.

The societal organisms of agricultural civilizations represented a level of organismic complexity previously unknown to human society. As processes of societal evolution continued to unfold, the size-complexity feedback relationship responsible for the transformation of the societal organism would continue to ratchet up the organismic character of human societies. With the emergence of the industrial revolution in Western Europe during the 18th and 19th centuries, the Central civilization would be able to engulf the world’s remaining civilizations leading to the formation of the global societal organism. As the Central civilization locked the globe into a single socio-political
interaction network, selection pressures favoring the elaboration of technologies of distribution and technologies of power led to globalized exchange networks and a globalized division of labor. At the same time these selection pressures led to the emergence of democracy and international peacekeeping efforts. As selection pressures favored the emergence of these mechanisms, the organismic character of the global societal organism continued to increase, making the human societal organism the most complex organism on the planet Earth.
Chapter 6: Conclusion

The prior discussion attempted to argue that human societies can justly be considered societal organisms; thus, despite the current understanding of some contemporary biologists (Queller and Strassmann 2009; Stearns 2007; West et al. 2015) the emergence of human societies represents a major transition in evolution, or an evolutionary transition in individuality. Not only can human societies be considered societal organisms, the prior discussion attempted to make it clear that the organismic character of human societies has, in general, increased over the course of societal evolution. This does not mean to imply that all societies at all times have been becoming more organismic, it simply means that over the long course of societal evolution, from the prehistoric foraging societies of 50,000 years ago to the global civilization of the present era, the ability of human societies to mobilize cooperation and regulate conflict in service of the society’s persistence has increased. Furthermore, prior discussion argued that the organismic character of human societies, along with the organismic character of multicellular organisms and eusocial societies is the product of the same general evolutionary process, thus vindicating the theories presented by Spencer over 100 years ago. The story of the societal organism as outlined in this dissertation is summarized in Table 3 and Table 4, which can be found at the end of this concluding chapter. The rest of this conclusion will briefly re-iterate the evolutionary transformation of the human societal organism.

The LCA of humans and chimpanzees was likely an individualistic primate, with a propensity for social mobility and weak social ties. Despite this individualistic nature,
fossil evidence suggests that by 4 million years ago, hominins were already experiencing selection pressures to be less socially aggressive and more socially cooperative. By 2 million years ago, fossil evidence suggests that members of the species *Homo erectus* were living in small groups organized around cooperative breeding and cooperative foraging. Selection pressures continued to favor adaptations for sociality in hominins and by 50,000 years ago, humans were living in multi-generational groups with both reproductive and non-reproductive divisions of labor. Given these facts, by 50,000 years ago foraging bands already had come to possess the defining features of simple societal organisms. Organisms require high levels of cooperation and low levels of conflict, so that the organism can manifest adaptations, which allow the organism to capture the energy necessary for its persistence. In order to meet the energy demands of the simple societal organism, foraging societies would evolve elaborate networks for the sharing of both meat and non-food items. In order to minimize conflict before it could disrupt the subsistence efforts of the societal organism, foragers relied on systems of graded, informal sanctions. They also relied on the regulating role of animistic religion.

When changes in the climate allowed populations of mobile foragers to become sedentary, more abundant sources of energy allowed the populations of these now sedentary societies to expand. In order to support an expanding population, subsistence efforts had to be intensified and by around 12,000 years ago a positive feedback relationship between societal size and societal complexity would be initiated. Once this feedback relationship had been activated it was only a matter of time before the simple societal organism transformed into a more complex societal organism. As the size-
complexity feedback dynamic played out, civilizations organized around agriculture emerged; and while agricultural civilizations were emerging, these civilizations would experience selection pressures favoring elaborated technologies of distribution, which could enable cooperation throughout the growing societal organism; and elaborated technologies of power, which could regulate conflict throughout the growing societal organism. In response to such selection pressures, as agricultural civilizations emerged they came to be characterized by networks of intra- and inter-community exchange, complex divisions of labor, formalized systems of law, and polytheistic and monotheistic religions.

Agricultural civilizations would dominate the planet for thousands of years, until around 300 years ago, when entrepreneurs driven by the logic of capitalism would discover how to utilize the energy trapped inside of fossil fuels. As Northwest Europe industrialized, the Central Civilization locked the entire globe into one giant socio-political interaction network. A global societal organism had been born. As the global societal organism emerged, this rapid expansion of the societal organism initiated selection pressures favoring the further elaboration of technologies of distribution, which could enable cooperation throughout what was now a global organism; and technologies of power, which could regulate conflict in a societal organism that encompassed every individual on the planet. In response to these selection pressures the societal organism would come to be characterized by globalized networks of exchange and a globalized division of labor. These selection pressures would also lead to an increasing prevalence of democratic governance throughout the societal organism starting in the 19th century
and continuing on to the present, along with an increasing prevalence of international peacekeeping efforts starting after WWII and continuing on to the present. So far, these societal adaptations have enabled the persistence of the global societal organism.

As Menenius Agrippa recognized around 2,500 years ago, humans living in a society are bound together in dense webs of mutual interdependence and this gives human societies the character of biological organisms. Utilizing the insights of contemporary evolutionary theory, it is now possible to conclude that those ancient thinkers, like Menenius Agrippa, and those sociologists of the classical era, like Comte, Spencer and Durkheim, who all propounded the similarities between human societies and biological organisms were right. An organism is an entity that features high levels of cooperation and low levels of conflict, which allows the organism to manifest adaptations at the level of the organism. These adaptations enable the organism’s persistence. Moreover, organisms at a higher-level of complexity emergence as individuals at a lower-level of complexity become bound together through a process of social group formation, maintenance and transformation. Human societies, as the prior arguments have attempted to show, are characterized by high enough levels of cooperation and low enough levels of conflict that they manifest societal-level adaptations, which function to enable the persistence of the societal organism. Moreover, over the course of human societal evolution, the organismic character of human society has transformed from the simple societal organisms of foraging societies to the complex, global societal organism of the present. This transformation has not been without its setbacks and its illnesses, but
as it has played out, human society has been transformed into the most complex organism occupying planet Earth.

<table>
<thead>
<tr>
<th>Stage in an Evolutionary Transition in Individuality</th>
<th>Outcomes for the Human Societal Organism</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social Group Formation</td>
<td>Early hominins experienced selection pressures to be less socially aggressive and more socially tolerant.</td>
<td>6 to 7 million years ago until 2 million years ago.</td>
</tr>
<tr>
<td></td>
<td>A social system based on cooperative breeding and cooperative hunting evolved by the appearance of <em>Homo erectus</em>.</td>
<td></td>
</tr>
<tr>
<td>Social Group Maintenance</td>
<td>Hominins evolved an elaborated sense of territoriality.</td>
<td>6 to 7 million years ago until 50,000 years ago.</td>
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<td></td>
<td>Hominins evolved an elaborated in-group psychology.</td>
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<td></td>
<td>Hominins evolved an elaborated palate of emotions including embarrassment, guilt, and shame.</td>
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<tr>
<td></td>
<td>Hominins developed projectile weapons technology.</td>
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</tr>
<tr>
<td>Social Group Transformation</td>
<td>Changes in climate after the Last Glacial Maximum allowed foragers to become sedentary, leading to the eventual emergence of agricultural civilizations.</td>
<td>Starting 12,000 years ago and continuing to the present.</td>
</tr>
<tr>
<td></td>
<td>A positive feedback relationship between societal size and complexity would lead to the eventual emergence of a singular, global civilization organized around industry.</td>
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Table 3: Human Society as an Evolutionary Transition in Individuality
<table>
<thead>
<tr>
<th>Type of Societal Organism</th>
<th>Societal Type</th>
<th>Energy Use in Core Areas</th>
<th>Technologies of Distribution</th>
<th>Technologies of Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple Societal Organism</td>
<td>Foraging Societies</td>
<td>Between 4,000 and 8,000 kcal of energy per capita per day</td>
<td>Food sharing arrangements</td>
<td>Informal systems of sanctions</td>
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<td></td>
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<td>Non-food exchange networks</td>
<td>Animism</td>
</tr>
<tr>
<td>Complex Societal Organism</td>
<td>Agricultural Civilizations</td>
<td>Between 5,000 and 50,000 kcal of energy per capita per day</td>
<td>Division of labor</td>
<td>Polytheism</td>
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<td></td>
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<td>Market exchange</td>
<td>Monotheism</td>
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<td>Writing</td>
<td></td>
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<tr>
<td>Complex Societal Organism</td>
<td>Global Civilization</td>
<td>Over 50,000 kcal of energy per capita per day</td>
<td>Globalized division of labor</td>
<td>Democracy</td>
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<td></td>
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<td>Globalized networks of exchange</td>
<td>International peacekeeping</td>
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<td>Electronically-mediated communications</td>
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Table 4: The Evolution of the Human Societal Organism
REFERENCES


Henrich, Joseph, Jean Ensminger, Richard McElreath, Abigail Barr, Clark Barrett,
Alexander Bolyanatz, Juan Camilo Cardenas, Michael Gurven, Edwins Gwako,
Natalie Henrich, Carolyn Lesorogol, Frank Marlowe, David Tracer and John

Oxford University Press.

Henshilwood, Christopher, Francesco d’Errico, and Ian Watts. 2009. “Engraved ochres
from the Middle Stone Age levels at Blombos Cave, South Africa.” Journal of
Human Evolution 57: 27-47.

Volvolcine Algae: Transitions in Individuality Through Darwin’s Eye.” Evolution

Herron, Matthew D., Armin Rashidi, Deborah E. Shelton and William W. Driscoll.
2013. “Cellular differentiation and individuality in the ‘minor’ multicellular
taxa.” Biological Reviews 88: 844-861.

Time Allocation to Subsistence Work Among the Aché of Eastern Paraguay.”

hunter-gatherers: Implications for human evolution.” Journal of Human
Evolution 52: 443-454.


Hill, Kim R., Robert S. Walker, Miran Božičević, James Eder, Thomas Headland, Barry
Hewlett, A. Magdalena Hurtado, Frank Marlow, Polly Wiessner, and Brian
Human Social Structure.” Science 331:1286-1289.

reveals consistent fractal pattern in hierarchical mammalian societies.” Biology
Letters 4: 748-751.


