

SEX MATES GENDER

by

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Sex Mates Gender: Part One

The Primacy of Reproduction

Feminism and evolutionary science meet in the realm of reproduction. So do ecology and bioethics. Human reproduction figures prominently in the subject matter of feminism, evolutionary theory, ecology, and bioethics. Thoughtful individuals have envisioned links among these disciplines. The concerns of our time revolve around issues of human reproduction and the reproduction of life. Darwinian feminists begin to reconstruct evolution from a woman's point-of-view, challenging the monopoly of male-oriented perspectives. Ecofeminists trace common features in the domination of patriarchal culture over women and of global civilization over the natural environment.¹ Environmental scientists point toward an "Anthropocene Era" when human impact is the dominant factor shaping the planetary environment.² Developments in biotechnology call for a bioethics focused not only on medical and religious discourse but also on evaluating real-life impacts of these technologies on human, animal, and plant reproduction.³ Under current global conditions, reproducing sustainable generations of human and nonhuman life is a daunting task.

No philosophy proposes that to reproduce is the purpose of human life. To be human is to construct meaning, make commitments, and to engage in other tasks of self-actualization that transcend biological mandates. The existentialism movement in twentieth-century philosophy proposed that the life of a human being must be self-constructed. Neither sensory experience nor adherence to a transcendent order can solve human angst. Confronted with the recognition of nonexistence, the individual is compelled to construct

life out of meaning and commitment.⁴ Civilization consists of social structures that mediate and often overwhelm the mental and physical capacities sensory existence.

Even if reproduction is understood as the goal of life, success in reaching this goal cannot determined by a simple numbers game of who leaves the most offspring. A true measure of reproductive fitness would take into consideration an individual's participation in a gene pool stretching across lateral kin and over multiple generations. In evolutionary biology, this is the concept of inclusive fitness. Because of the dual axes of genetic relatedness (horizontal and vertical), once a few points of relational distance are reached, inclusive fitness is almost impossible to measure.

In the wake of the "demographic transition" (a model predicting that as nations industrialize birth rates also lower)⁵ women in western nations have gained for the first time in history a degree of relief from the burdens of extended, multiple maternity. From the time of the institution of agriculture until the 18th century, the average women spent approximately years of her prime adult life pregnant, nursing or caring for a small child or children. Domestic labor varies in valuation from 1/4 to 1/2 of total labor, depending on level of industrialization.⁶

The family, the basic unit of reproduction, incorporates several forms in addition to more traditional forms of nuclear and extended families, such as polygyny, polyandry, adoption, step-parenting, wet-nursing, and care by servants or other surrogates. The single parent family has historically persisted despite its lower status and difficulties. Recent and innovative family forms include time-shared parenting between divorced couples, the

kibbutz and communal parenting, public and community preschool care, gay parenting, multifamily residential coops, and neighborhood-based child-care exchange. In the US, the nuclear family is now a minority family form.⁷

More and more people now view bearing a child into the world as an option requiring thoughtful decision rather than compulsion and as one among several life goals. Enhancing the argument for thoughtful rather than profligate breeding is the biological fact that mammalian, primate, and hominid lineage embody an overall trend toward quality over quantity in producing offspring. Various dating techniques in genetics and paleontology reveal that early humans evolved in relatively stable populations for at least 100,000, before population increases are apparent.⁸ Only a misguided few would harness the female sex, or sexuality itself, to the age-old Biblical mandate, "be fruitful and multiply."⁹ The Dalai Lama quips, "All life is precious, but so much precious life!"¹⁰

Compared with the long list of tantalizing inventions of the productive sector (cybernetic technology, hypermedia, space exploration, etc.) the domestic sphere of reproduction seems an endless routine of childcare, food provision, and household maintenance.¹¹ The stream of experience associated with reproduction brings to mind the unvarying repetition by a medieval alchemist of a series of predetermined procedures in hopes of attaining the perfect performance, the one that turns the mundane matrix into gold.¹² Whether mundane or ecstatic, however, the experiences of reproduction are crucial, determining whether or not a person is born, early childhood, subsistence, family membership, socialization, mating, and parenting. The reproduction of plant and animal life

forms the foundation of human life, therefore, reproduction functionally enacts the unity of life.

A focus on reproduction places humanity within nature, not above it. Reproduction of species involve countless minute decisions of individuals, and factors beyond the reach of any person, such as the behavior of nations and the forces of nature. The sum of these nonlinear factors is evolution and for human beings it is the co-evolution of genes and culture. Great strides forward in reproductive technologies are not been met with equal understanding of the real-life present and future impacts of these technologies on women, children, and men. Reproductive freedom is more at stake than ever before. Yet no encompassing perspective, strategy for action, or set of policies has effectively addressed reproductive control and reproductive freedom.

My interest in reproductive theory centers on my personal history and on larger questions unfolding in my time and place. I have been acutely aware of the interplay between self-realization and my embodiment as a woman, this despite freedoms and opportunities unknown to most women throughout history. How can a human-nature connection be forged that will halt and reverse the environmental crisis? Do power inequalities between the sexes rest primarily in biology or society or both; if in both, how and where do nature and nurture intersect? Are tabooed or controversial behaviors like adultery, homosexuality, and abortion contrary to nature? How will social forms like families and village-type communities survive, given contemporary global politics and economic realities?¹³ Is it necessary that such basic forms of society survive? Should

societies prohibit reproductive technologies like human or animal cloning? If so, on what basis and where draw the line?

As a young woman during the 1960s and early 1970s, I joined the feminist second wave, a transformative period in the relationship of the sexes. I was able to re-examine theories and strategies of this movement when teaching the history of the second wave during the 1990s.¹⁴ The author I found most inspiring was a member of the Redstockings Collective in New York. In *The Dialectics of Sex*, in 1970, Shulamith Firestone proposed an agenda to "seize the means of reproduction." She traced women's subordination to conditions arising from differences in the reproductive biology of the sexes.¹⁵

In 1989, I studied environmental philosophy under the historian of science and ecology, Carolyn Merchant. Over subsequent decades, I delved into her work on ecology and her analysis of the "human-nature relation". Merchant argues that underpinning the relationship of the sexes is a deeper substructure of the relationship between humanity and nonhuman nature. In *Ecological Revolutions*, she constructs a model of human existence identifying reproductive and productive modes.¹⁶ Merchant places within the realm of reproduction subsistence, daily life and household maintenance, socialization (family, church, community), and symbolic complex, which she assembles under the term "social reproduction."¹⁷

In the mid-nineteen nineties, I discovered Gena Correa's illuminating work on reproductive technologies, *The Mother Machine*,¹⁸ on which she compares animal husbandry with fertility medicine, observing that technologies of animal husbandry

eventually are employed on women. In 1997, in response to news of the cloning of "Dolly", the first mammal, I studied and wrote of associations between fertility exploitation and subordinate status.¹⁹

In 2005, I studied evolutionary psychology under Frank Sulloway.²⁰ In earlier work in physical anthropology I had learned the basics of evolutionary science,²¹ however, Sulloway's lectures awakened an understanding of the great explanatory power of evolutionary theory. I also grasped the cross-significance of evolutionary research with feminist theory, not only for the analysis of patriarchy, but also to an analysis of feminism. This sent me back to the bookshelves for a more probing reading of Merchant's *Ecological Revolutions and Ecology*,²² Sarah Hrdy's *Mother Nature*,²³ and works by Patricia Adair Gowaty and Gena Correa, work. In all of these encounters I have returned persistently to a unifying ground: *the mode of reproduction*.

Reproductive theory provides a fresh insight into political economy, feminism, the analysis of patriarchy, and most notably, to the analysis of feminism, itself. Reproductive issues go to the heart of not only what it means to be a human being. Within reproductive processes are located critical features of group processes; literal connections between human beings and non-human nature; human sexuality and sex differences; relations both within and between the sexes, and the bond between parents, children, and families. Whether an individual reproduces or not, she or he is impacted by the conditions of reproduction. The mode of reproduction governs many societal structures and relations.

The mode of reproduction has never been more fragile, and more the handmaiden of

production. Human technologies endanger (and in many cases have destroyed) the reproductive capacity of many species leading to their extinction, leading toward a planetary crisis in the reproduction of life. Strategies to mediate the global catastrophe we have created, we must be informed by thorough understanding of the principles of reproduction.

The Importance of Being an Animal

Reproduction is the one remaining realm of modern life that is categorically of biological origin and basing human nature within the animal kingdom. Animal nature is the ground on which human beings stand. Even the most abstract metaphysician cannot overlook the fact that women, like all mammals, lactate and nurse our young. In the past, philosophers and even a few "scientists" simply classified women and animals as of an inferior order. Feminism has made sufficient inroads to cause this rationale to fall into disrepute, clearing the way for understanding that animal traits and behaviors underlie the human nature of both sexes.

Human behavior and consciousness is not a peripatetic array of "uniquely human" born-yesterday phenomena but a range of capacities and predispositions rooted in the long history of life on the planet. Continuity in the psychic structure of humans and animals, especially this higher primates, has been demonstrated. Samuel Gosling and Oliver John have shown that personality characteristics tested by the "Five-Factor Model" show cross-species correlations among personality traits, including agreeableness, openness, and

(among chimpanzees), conscientiousness. In cross-species tests, the trait of "dominance" shows the least correlation between humans and animals (suggesting that human social organization weighs in heavily in predicting social rank). More innate traits, however, like agreeableness and aggressiveness, are expressed fairly consistently by both humans and the animals tested.²⁴

Those who view our species as the rootless wonder of nature seldom tire of elaborating on traits peculiar to "man." Yet, one by one, the very advances that distinguish our species have produced evidence refuting these claims. A short list of skills once thought only the province of man, yet found at least on a rudimentary basis among animals includes, in addition to tool-making, language acquisition, training of the young, social structure and control, and strategic thinking. Human nature is not qualitatively different from that of our closest phylogenic relations.²⁵

Prior to the great rift between human in identity and "nature," hominid and the human evolution preoccupied vast epochs of time. Human consciousness and behavior is largely soft-wired, yet our mind contains genetically hardwired components inherited from ancestors including earlier humans and human forms, primates, mammals, and even farther back in the course in the evolution of life. The fate of individuals and of the species emerges from an interplay of autonomous acts, socialization, biological predispositions that are sometimes expressed or remain unexpressed, and of pockets of pure inherited determinism.

Primate and prehomimid culture(s) began the effort to maximize gain from the environment through ingenuous problem solving and the use of rudimentary tools.²⁶ Modern

human fossils at a site in Kibish, Ethiopia recently discovered in a stratum between two volcanic layers are estimated to be up to 195,000 years old. Frank Brown, who headed the study, notes that, "the cultural aspects of humanity in most cases appear much later in the record – only 50,000 years ago." Therefore, the human species existed for between 100 and 145 millennia, "without cultural stuff, such as evidence of eating fish, of harpoons, anything to do with music (flutes and that sort of thing), needles, even tools. This stuff all comes in very late, except for stone knife blades..."²⁷ This is a great deal of time; it is 3 to 4 times as long as the known Paleolithic era and 10 to 15 times as long as the Neolithic era, in which we now live. One is left to muse about what the human population was doing for these approximately 600 generations and 100 millennia.

It seems during this vast period, the human species sustained a stable, small population of perhaps 10,000 individuals in total. One of the concepts accounting for the small early human population is the "bottleneck theory" that supposes the human population might have been greater but experienced a diminished population due to a period of aridity, then expanded.²⁸ Several writers attempt to ascribe special features of human traits or behavior to such bottlenecks. (Such efforts beg the question of why bottlenecks occurred so much more frequently among humans than among our closest relatives, who often shared similar habitats.)

During this "Era of Reproduction", an era in which contacts between humans were rare,²⁹ and creative consciousness and diverse societal forms matched zero population growth. Consciousness of the natural world among human beings during these (+-) 100,000

years might not have differed a great deal from that other primates, except that perceptions of natural phenomena and of fellow creatures attained increasingly rich and defined conceptualization. The objects of observation were increasingly imbued with specific forces and powers, and the obverse case was made, that the individual and group could invoke or develop similar powers and forces. Language was probably still rudimentary, but dreams abounded, and the frontal cortex filled up increasingly with symbols. Erich Neumann's metaphor of the *uroboros* probably well described *Homo sapiens* consciousness during vast period of the Paleolithic: "...the world and psyche are still one."³⁰

Individuals and coalitions within the breeding group did function "consciously" to ensure survival and status and to protect and nourish kin and offspring. Human comprehension of nonhuman nature (including animals, plants, geographic and climatological phenomena) was that of a participant, of a creature located not above, but within the natural world.

Sarah Hrdy notes that one trait still considered unique to human beings is a sophisticated self-perception.³¹ This is an example of the coevolution of genes and culture, in that the possession of language and symbolic thought has enabled this self-perception. Chimpanzees look at themselves in the mirror as do human beings, but human language and more recently media, extend and intensify this "mirror-image" to produce a self-image more saturated by external social standards. It is time we utilize human self-consciousness better to understand our animal nature.

In the midst of numerous advances in medicine and biological science based on

principles of evolution, many people still do not "believe" in evolution,³² providing compelling evidence of the power of archaic influences in the human psyche. For those who have moved beyond creationism, it is not enough to "believe" in evolution. Briefly defined, evolution is biological descent with modification that occurs by changes in gene frequencies over generations altering the history of genealogies of organisms and species and even, over vast numbers of generations, producing large-scale modifications in the descent of different species from a common ancestor. It is important to have a clear idea of how evolution operates and of how it relates to human history and to the present, including our current environmental crisis.

The proliferation of new forms of adaptive bacteria resistant to antibiotics is a vivid example of evolution in action. But what do humans have in common with bacteria? Many who believe in the science of evolution are inclined to view its principles as laws of "nature" (meaning everything nonhuman). Evolution did not end when civilization began. Take, for example, the diseases that swept across the newly colonized Americas during the imperial era, infecting and decimating Native American in violent epidemics. Inhabitants of the Americas had migrated there mostly over the Bering Strait from Asia.³³ Geological forces then sealed off the Strait, isolating these populations from the multiple diseases visited upon urbanized Europe. This migration occurred from ten to twenty millennia ago, before mass urbanization, with its concomitants of rats and disease epidemics, had spread outward from Mesopotamia. Epidemic survivors developed genetic immunity against the biotics they carried within. When these Europeans tread across North, Central, and South America, the

germs they hosted were their weapons of mass destruction. As Jared Diamond points out, imperialist victory was practically before guns were fired, since native peoples began to collapse with disease as soon as the strangers entered their midst.. Immunity to these diseases gained through evolutionary adaptation, was not part of the Native American genetic inheritance, since Native Americans did not experience these plagues.³⁴

Reproductive analysis incorporates evolutionary theory into feminist analysis to encompass a cosexual perspective. The human experience begins with physical embodiment and its history. In contrast to a proximal cause that relates to the associated biological or neurological structure(s), "distal causes" relate to the developmental history of a trait or behavior.³⁵ For example, hunger is caused proximally by physiological cues such as growling stomach, a decrease in blood glucose levels and shifts in hormonal levels, while the distal cause for hunger is that it motivates the individual search for food. The forces of nature through evolutionary processes (natural history) encompass distal causes that shape every cell of our body and brain, our neuropsychological capacities and propensities, basic emotions and behavioral complexes. This is especially true of traits and behaviors surrounding the crucial realm of reproduction of the species.

Even acknowledging that the speed of human civilization eclipses biological evolution (a premise that requires serious assessment), the human species must deal with the imprinted consequences of millions of years of hominid evolution and billions of years of the evolution of life. Yet, social policy is both proposed and carried out in the absence of any comprehension of the powers and limitations of the human animal.

Until we reintegrate our sense of selves as biological beings, social and political solutions will continue to fall well short of their goals. This is true even at the highest and most intricate levels. National and international politics is an emergent phenomenon transcending biology. The sophisticated (and cruel) protocols governing mass-structural behavior possess uniquely social strategies and characteristics. Yet they are based in primate politics. The ideal government of both a nation and the world is of laws and not of men, yet history has risen and fallen along with flesh and blood, Machiavellian strategies of power. Human politics emerges from the reproductive sphere, from the small, close-knit community of evolving hominids in competition for access to mates³⁶ and for sufficient status and resources to carry on the reproductive process. The interests of kin in assisting relations and supporting the offspring of their family lent impulse to all the human relational strategies we now exercise at home, at the workplace and in daily life. The basic conundrum of human politics, of balancing individual ambition with collective good, is rooted within the condition of biological reproduction.

It is time for *Homo sapiens* to dig deeply into our roots and contemplate our place as part of the biosphere. Biological reproduction includes a panorama of behaviors, both individual and social, invented over time by a multitude of organisms and species.

Reproductive adaptations feature cooperative strategies and coalition as well as conflict strategies and competition. Social reproduction involves parent-child relations, familial relations³⁷ and social interactions, norms or structures (cooperative or competitive)

within the breeding community that function to produce vigorous offspring and to maintain a safe and sustainable environment for breeding and raising the new generation.

Reproductive Theory

My goal is to sketch out a distinct theory of human reproduction focusing on the intersections of feminist theory with evolutionary science. Unlike most Darwinian feminists, I come from a background in feminist theory rather than evolutionary science. I have no problem admitting that my views are politically weighted toward feminist-humanism.

I understand theory as a map of reality, a reduction of experience that highlights certain features and attempts to explain these features and how they interrelate. A theory might predict outcomes of prospective scenarios or explain historic events. A good theory takes into consideration its assumptions.³⁸

Theories often inspire social movements. Some believe social-political theory is by definition ideology; I do not agree. Social ideas arise creatively from existential conditions, but ideologies form or persist in the face of impressive counter-evidence.

The ideologue is convinced that no amount of data will ever falsify his or her premise, claim scientific validity. But scientific validity requires not only that a premise can be proven, but also that it can be falsified. For example, racial and sexual stereotypes are unscientific not only because they cannot be proven, but because relying generalizations of rather than specific categories, such stereotypes cannot be *disproven*. When social movements encounter new evidence they must transform or they will founder into ideology and irrelevance.

The main feature of ideology is rigidity. A theory can be radical³⁹ without being an ideology, but if it persists in the face of consistent refutation, it becomes an ideology.

Theories may wither not because they are ideological but because they speak to circumstances no longer relevant. When theory begins to wither it is time to tear up the map.

Theory, Science, and Ideology

A good example of a social-political theory is Marxism. Karl Marx and Frederick Engels developed a complex interrelated set of theories about production, capital, labor, and natural resources.⁴⁰ Marxist theory was able to predict periodic crises under capitalism, the inherent impulse of capitalism toward expansion, and the inherent tendency capital to exploit human and natural resources. The theory predicted a collision of capital with labor, though it did not factor in the possibility that in some nations, the problems of capital would be mediated by this clash and by the very successes of the labor movement. They did not that anticipate the growth of a huge service sector could further mediate flaws of capitalism they believed would enhance its collapse. They did not anticipate that demonic capitalist industrialists who were at least preoccupied with their arena of production would be replaced by ever more demonic capitalists who could care less what they were producing as long as they made money. Given the great complexity of political economy and history, it is no wonder Marxist ideas could not anticipate that the "temporary" necessity of state socialism would

develop into long-term tyrannical and bureaucratic incompetence.

Based in dialectical materialism, Marxist theory engaged in its own dialectic with material and historical reality, with results that confounded the visions of its founders and followers. Marx anticipated an international order but mistakenly predicted it would be driven by the labor movement. In fact, capitalists were in a much better position to maintain transnational affiliations and to drive globalism. Marx predicted revolutions against capitalist governments, but did not anticipate the most successful communist revolutions would take place in agricultural rather than industrial nations. Marx's call for leftist and labor activism inspired movements that forced capitalists into co-optive positions improving the lot of laborers (and indirectly, the longevity of capital). Accommodation led to large social-welfare and regulatory bureaucracies that effectively softened economic crises and the need for revolutionary response. Emergence of information technologies extended the middle-range between capital and labor.⁴¹

A subject in which Marx and Engels have proven increasingly visionary over time is their environmental analysis: "Natural elements entering as agents into production, and which cost nothing, no matter what role they play in production, do not enter as components of capital, but as a free gift of Nature to capital, that is, as a free gift of Nature's productive power to labour, which, however, appears as the productiveness of capital, as all other productivity under the capitalist mode of production."⁴² Without question, capitalism has ignored base-level costs that have not been factored in to costs: first, natural resources and ecosystem services; and second, domestic labor. Concerning the extraction, exploitation and

non-valuation of natural resources, change is just beginning; the Kyoto treaty capping carbon emissions is one of several new strategies of Green Capitalism or Natural Capitalism. Such policy proposals attempt to force the economic system to factor into account the actual costs of natural resources. The hitch here is that what Marx charged of capitalism could be said to apply to any form of intensive and hierarchically organized production, e.g., of the mode of production as metaproduction. Historically, however, capitalism has been the dominant force in the intensification of the mode of production, therefore it is difficult and unnecessary to separate out capitalism from the current mode of global production and trade.

As to the exploitation and non-valuation of domestic resources, such as homemaking, childbearing, childcare, education, and other aspects of life derived from the mode of reproduction, policies and norms are more complex but fall far short of effective intervention(s). Increases in the rationalization and technologization of housework, public expenditures for early childhood, primary, and secondary education, health and welfare expenditures, increasing male participation in the domestic sphere (in westernized nations), and even a developing market for childbearing services, are each areas in which political economies have bowed to the irrevocable significance of biological and social reproduction. These capitulations have been piece-meal, underfunded, and lacking in anything approximating comprehensive or transnational policy. It is still the case throughout the world that individual women bear ultimate responsibility for the destiny of children. Given this, the systematic abuse of children within families and societies is not surprising. Malnutrition, inadequate health and education, physical and emotional abuse, and infanticide

are rife in many countries. These provide dramatic evidence of the need for a systematic model reproduction to guide public policy, social, and familial norms. Thus, in pointing out the absence of the domestic sphere from the mode of production, Marx and Engels again showed great vision.⁴³

A good theoretical complex such as Marxism claims high-efficacy for a period in historical transformation. Whether all or part of it endures over time depends on the flexibility, adaptability, and modularity of both its components *and its proponents*. As a theory of proletarian revolution to a utopian society, Marxism expired. Followers of Marx who, in the late 20th century continued to endorse rigidly this idea, denied the evidence of history and became ideologues. Aspects of Marxism remain quite relevant though, especially the visionary analyses by Marx and Engels on the relation of capital to nature⁴⁴, and to domestic production. Though the predictive prowess of Marxism was limited, the ideas of Marx and Engels remain powerful.

Science is a subset of theory production including built-in features for testing and verification. Ideally, the work of science involves carefully formulated hypotheses and a set of methodologies to ensure objective observation (empiricism), even to incorporate prediction. The scientist forms a research hypothesis, meaning a theory that might be proven but must be able to be disproven,⁴⁵ then tests the hypothesis under controlled conditions. Results must be reported, as well as conditions that were not controlled. The experiment is described with sufficient accuracy and detail so that others can replicate the test.⁴⁶

It would be propitious if all scientists stood beyond the pale of ideology, but

unfortunately this is not the case. The most inhumane notions about races, sexes, and species have been justified by highly respected scientists, who have claimed such ideas are based on scientific observation.⁴⁷ No matter how empirical a scientist attempts to be, science is embedded in a social matrix and vulnerable to factors beyond the control or the conscious attention of its practitioners. In *The Structure of Scientific Revolutions*, Thomas Kuhn describes the vulnerabilities of day-to-day science and the resistance to changes in scientific paradigms even in the face of contradictory evidence. Only when a new paradigm emerges will the older recede. Thus, despite its weaknesses, scientific methodology eventually self-corrects.⁴⁸

Ideally then, all theorists will preoccupy themselves with some facet of pure scientific inquiry. In fact, the luxury of such preoccupations belongs to the few who are fortunate to find no reason to have to deal with the messy ways of the world. René Descartes was such a man, whose purified destiny enabled him to pursue reason wherever it led him; for example, it led him to assert that "animals are without feeling or awareness of any kind."⁴⁹

Testified to by the fate of Galileo, even such "pure" sciences like physics, astronomy, or chemistry have produced amazingly different worldviews resistant to change. False theories of the universe, the planet, and certainly, of human and biological existence have held sway for centuries before they finally yield to disproof or simply to a changing normative order. The history of consciousness traces such theories.

Highly nonlinear systems, such as interacting social elements or the unfolding of

history, do not lend themselves readily to requirements of the scientific method. Thinkers, like Marx, Simone de Beauvoir, Emile Durkheim, and many others by necessity of character are compelled to tackle real-world impediments based in twists in history or conditions-in-place, such as nationality, gender, wealth inequality, variations in religious, racial or ethnic status, etc.. To make sense of this muddled and tangled world requires devising and testing theories on a riskier plane. The study of history, society and culture (the social sciences) and of biology (evolutionary biology, paleontology, etc.) is an unfolding process of speculation, confirmation, refutation, and revision.

Human evolutionary science⁵⁰ presents a particular problem in the history of consciousness. Like psychology and even more so, evolutionary psychology and related fields speak to what it means to be human, since they purport to root such ideas in "natural" rather than "cultural" laws. Speculations about "human nature" are easy to articulate and as difficult to disprove. Eventually, the juggernaut of empirical science digests and regurgitates what is disproven and not provable, but these misrepresentations have often already sunk into popular consciousness, where they are hard to dislodge. They become culturally "naturalized" .

For example, the reconstruction of human prehistory popularized in the 1960s by Robert Ardrey and others, held that increased brain size was brought about due to the development of hunting skills. "Man" distinguished himself from other higher primates by adapting to the ways of the carnivore. The development of hunting weaponry and strategy provided the impetus for unique development of the human brain. The idea of "man the

hunter" and "the killer ape" fit well into the notion that human nature is by nature predatory and violent, feeding models of militarism and expansionism. "Human war has been the most successful of our cultural traditions," bragged Ardrey, asserting further that, "Aggressiveness is the principal guarantor of survival."⁵¹

But decades of research failed to confirm the "killer ape" theory of brain development. In fact, recent evidence points to a new model of the "scavenger hominid"; in the manner of meat procurement, evolving homosapien behavior shared as much with hyenas as with cheetahs. Recent paleontology is thick with evidence that plants, not meat, were the mainstay of the hominid diet.⁵²

Such misinformation so widely publicized and replicated normalized the idea that hunting was the primary thrust behind human evolution. The "killer ape" theory was immortalized in the first scene of Stanley Kubrick's *2001: A Space Odyssey*, when the low-brow "cave man" picks up a club and his subsequent murderous battering ushers in a new era in which even the exploration of space is open to "man". Museums of natural history still uniformly and prominently feature images of low-brow, primitive male hunters, even though these are images of outdated science. As I will later discuss, further research indicates that innovations in social communication and social structure were of most likely of greater significance to human evolution.

"Man the hunter" has always been depicted as that: a male. Yet it is spurious to presume that only males were hunters in human prehistory, as such stereotypes are contradicted by evidence. Huntresses are often most skilled among carnivorous mammals.

Paleontology finds no evidence linking hunting solely to hominid males rather than to both sexes. Hunting females are known among many indigenous peoples, such as the Asche of Eastern Paraguay.⁵³ Archaeological evidence at sites such as the famous rock overhang in France. Cap Blanc, dated 1300 BC, indicate existence of woman hunters and warriors in prehistory. The Cap Blanc site features a single skeleton of a woman of around 19 years old buried in rich regalia with reindeer teeth, flint tools, and a spear laid across her.⁵⁴ The only observation on record of a chimp that used tools in hunting is of an adolescent female.⁵⁵ Even the often derided contention of Heroditus of the existence of Scythian woman hunters and warriors, whom he called Amazons, has received support from archaeological evidence. In 1977, the grave of a woman hunter and warrior was unearthed in Muldavia in the Eurasian steppes, dated seven centuries ago, a time and place that would suggest she was a member of the Scythian people.⁵⁶

Certainly, with increasing division of labor, hunting became an activity engaged in mostly but not exclusively by men. While advances in hunting techniques had little impact on human brain development, such advances on the part of already large-brained humans no doubt affected both evolution and culture. During late Paleolithic and early Neolithic times, increased hunting enhanced available protein, facilitated and co-evolved with male bonding, and enabled shorter periods of time between infant births, posing issues for female homo sapiens that were unknown to her closest relatives, the great apes. These features combined to increase population and to put into place the foundations of patriarchal evolution.

This is one among many narratives from natural history revealing that ideas about

human nature are as potent as they are speculative. "Man the hunter" as theory of hominid evolution is dead but is alive in public consciousness. "Man the hunter" as one element in a theory of patriarchy is an untested but promising hypothesis. Theory is confirmed in historic unfolding of reality, thus it is never tidily confirmed. Social and political theories that show endurance over time and flexibly adapt to new circumstances are not ideologies. Thus, liberal and conservative political traditions are not ideologies but theories of social history. At times, each of the theories can become bogged down in rigidity, thus wedded to ideology, though apparently conservatism is most vulnerable in this respect.⁵⁷

Forerunners in Reproductive Theory

Firestone's reproductive focus was submerged, but has continued in several strains of feminist analysis, especially ecofeminism, and the analysis of reproductive technologies. Ecofeminism began with the "essentialist" perspective of Francoise D'Eaubonne.⁵⁸ In *Ecological Revolutions*, Carolyn Merchant delineated firm foundations for an analytic theory, describing reproduction within the context of ecology. She proposed that the ecological breakdown can be understood in terms of tensions and contradictions between the means of reproduction and the means of production.⁵⁹ Espousing an anti-essentialist but materialist argument, Carolyn Merchant provides a bridge between gender theory and evolutionary feminist theory. Alongside her social analysis, Merchant developed an ethic of male-female and human-nature partnership.⁶⁰ Even prior to Merchant's ecofeminist analysis

of production and reproduction, Canadian anthropologist Richard Borshay Lee, discussed the interaction of production and reproduction in his instructive investigation of gender and work among !Kung peoples.⁶¹

From the evolutionary side of reproductive theory, the theory of sexual selection, initially formulated by Charles Darwin⁶²—based in his earlier work on the theory of natural selection, *The Origin of the Species*⁶³—affords compelling evidence that sexual competition⁶⁴ is a powerful factor of selection. Darwin believed that such competition existing only between males, neglecting female-female competition and male-female competition. However, founded on his theory of sexual selection, a new understanding of sexual competition and cooperation has emerged.

Kinship theory, developed in the early 1960s by the brilliant humanist scientist, William Hamilton⁶⁵, provides an understanding of how a prosocial behavior such as altruism can be genetically inherited and spread through a population, even though the behavior may be disadvantageous to the individual fitness of the altruist. Hamilton's principles of the heritability of prosocial behavior apply to all genetically hardwired behavior. It is also clear that the more dynamic and genetically remote are the relationship in a population, the less effectively can a prosocial (or any) gene spread through the population. To the extent that a population is large, unstable, fragmented, and unrelated, inherited tendencies are not subject to the mediating power of Hamilton's kinship selection rule, which in a small, interrelated and relatively stable population would tend to reward prosocial traits so long as they are compatible with genetic vitality and group defense. Thus, inherited traits facilitating

aggression and violence meet with greater genetic rewards in such populations (since they might be facilitate military and caste dominance), rather than with the extinction of the trait, as is the case in small, close-knit breeding groups. The "anti-Hamiltonian effect" has operated in highly urbanized, mass populations beginning in the Neolithic era. This issue will be treated further in a more thorough exploration of Hamilton's kinship theory.

Formulas of parental investment created by Robert Trivers⁶⁶ greatly extended the analytic power of sexual selection. Trivers' evolutionary parental investment theory is also an enormous asset to feminist reproductive analysis. In highlighting the differential interests in evolutionary fitness held by mothers and fathers, parents and children, and among siblings, Trivers sets the stage for a feminist political analysis.

In E. O. Wilson's book, *Sociobiology*,⁶⁷ E. O. Wilson proposed investigating the full range of human behavior in terms of evolutionary biology. "Sociobiology" transitioned into "evolutionary psychology," though I prefer to call this emerging field (incorporating portions of many disciplines) human evolutionary theory. Human evolutionary theory combines evolutionary biology with social research across disciplines and on a variety of fronts.

Feminist perspectives and evolutionary science converged in the work of evolutionary feminists like Sarah Hrdy⁶⁸ and Patricia Adair Gowaty.⁶⁹ Evolutionary science includes several other important avenues of theory and research appropriate to reproductive analysis. Study of the origins of sexual reproduction has long been a topic in evolutionary science. Other topics related to reproduction comprise important components of

evolutionary theory, for example, Darwin's theory of sexual selection,⁷⁰ and research on factors affecting fitness (which is, by definition, reproductive fitness), principles of genetic inheritance and sexual recombination, differential birth rates, etc. Evolutionary feminism is the missing link in reproductive theory, providing the evidence from evolutionary biology that has the potential to ground social and political analysis in the natural sciences.

In an effort to unify the work of these and other authors and researchers, I am guided by the belief that reproduction is the matrix of human society uniting the biological and the social. The old controversy of "nature versus nurture" is now rephrased as "nature through nurture." Neurophilosophy conceptualizes the mind as emergent in the brain.⁷¹ In the same sense, human civilization is emergent within nature. People who are abhorred at the downside of civilization (myself included), find this a scary proposition. An even scarier scenario is now played out: of a species, exercising extraordinary powers over of nature without a clear understanding of how it is are part of the whole. Human nature is limited or emancipated by the evolutionary processes that produced our species.

In examining the coevolution of genes and culture, we confront a dynamic process. If it is determined that a trait or behavior is "biological" this does not mean it is an unalterable fact. As Sarah Hrdy succinctly puts it, "No adaptation continues to be selected for outside the circumstances that happen to favor it."

From the incipience of patriarchal social and political hegemony, tension between the modes of production and reproduction began. Such tensions have been treated in the feminist analysis of patriarchy and, as we suggest below, in class analysis. It is time to

examine the history of gender relations in terms of reproductive analysis, including the ideas and tactics that have formed struggles to control power, both between and within the sexes. As I intend to show, both intrasexual and intersexual competition over the means of reproduction, have been regulated by patriarchy. A focus on reproduction transforms feminist into humanist analysis, for reproduction is an inescapable condition of life, even among asexual species and certainly among all plants and animals. Among most mammals and all primates, raising offspring requires social as well as biological reproductive practices, and cooperative breeding. Thus, human reproduction forms the basis of core human social structures of family, group, and community.

It is true that mass social institutions, mathematics, art, science, philosophy, and political economy profoundly influence the course of human existence, and the synergistic surge during the past several centuries of technology and media greatly affects both humans and nonhuman nature, promising even more profound effects in a telescopic future.

Feminism and Evolutionary Biology

Reproductive has been a constant concern of feminists, but prior to the mid-20th century, these issues were addressed as discrete. A unitary reproductive analysis emerged within the radical feminist movement, which peaked approximately between 1965 and 1974.

In 1970, in *The Dialectics of Sex*, Shulamith Firestone traced women's subordinate status to conditions arising from reproductive biology.⁷² Firestone proposed that sexual inequality is rooted in the conditions of reproduction. Firestone integrated theories of Hegel,⁷³ Karl Marx,⁷⁴ and Sigmund Freud. Putting a brilliant spin on Freud's concept that "anatomy is destiny,"⁷⁵ she argued that over the course of civilization, reproductive anatomy and roles led inevitably to the oppression of women, and further, that changing conditions of reproduction would lead inevitably to sexual revolution. Confident that an adjustment in sexual relations was historically mandated, she charted the course of a female struggle to (re)gain power over the conditions of reproduction. Firestone boldly stated to women, "*To grant that the sexual imbalance of power is biologically based is not to lose our case.*"⁷⁶

Despite the social transformation initiated and inspired by Firestone and other radical feminists, women of the political and intellectual elite, who took charge of newly enfranchised women's studies, moved swiftly to put the "excesses" of radical feminism behind them. These feminist scholars were mindful that misogyny has traditionally been justified through biologizing the sexes. Identifying Firestone's biologically based theory as "essentialist" — meaning a form of reductionism in which biological sexual categories were mistakenly conflated with social role and status.

Scholarly feminists conceptualized the term “gender” as preferable to "sex," defining gender to include the full spectrum of factors appropriate to feminist analysis. Gender theory initiated multifaceted, detailed, pragmatic, and co-sexual approaches that focused on consolidating the gains of the women’s liberation movement. From the late 1970s to the present, gender theory has dominated feminist scholarship, with its emphasis on a multifactorial social science perspective.

Gender theory has produced excellent insights and gains in women's status. Reproductive rights is viewed as one among many issues in the feminist agenda.⁷⁷

Those feminists who did continue in an "essentialist" vein moved away from theoretical research and analysis toward lifestyle approaches. Remnants of separatism continue in women's land cooperatives.

Aside from political theory based in gender analysis, post-radical feminist culture flourished. In an effort to seize symbolic strength, many feminists focused on and became submerged into a reinstitution of a prehistoric female symbolism, which seemed to express a more gynocentric culture.

Sociobiology and the Challenge to Feminism

Those who have an interest in sexual equality need to be aware that progress in the status of women has been reversed in many cultures and times.⁷⁸ Younger women of the early 21st century uphold identities of freedom and equality attained through the gains of the second

wave, yet recently these have receded, especially in jurisprudence, an arena of such power that it cannot be underestimated.

Evolutionary science includes several important avenues of theory and research appropriate to reproductive analysis. Study of the origins and expressions of sexual reproduction has long preoccupied evolutionary science. In *Sociobiology*, E. O. Wilson proposed investigating the full range of human behavior in terms of evolutionary biology.⁷⁹ "Sociobiology" transitioned into "evolutionary psychology," though I prefer to call this emerging field (incorporating portions of many disciplines) human evolutionary theory. Human evolutionary theory combines evolutionary biology with social research across disciplines and on a variety of fronts.

Evolutionary science can inform reproductive theory, and woman-oriented perspectives can inform human evolutionary research. It is time to reembody feminist theory, reincorporate radical feminist "essentialism" and honor the visionary political theory of radical theorists like Firestone, while forgiving their excesses of sexual anger and separatist tactics necessitated by conditions leading to the second wave.

Sociobiology incorporates some male-oriented viewpoints. Men have a right, however, to see the world through their own eyes. Casting stones from the sidelines is a cowardly intellectual act. It is time for women to counterbalance such viewpoints by their own work and commitment, and indeed this is already being accomplished by a small number of Darwinian feminists. Some women fear that evolutionary biology will confirm their own feelings of inferiority. Such feelings are implanted and maintained by many

cultural artifacts of misogyny. Women on the defense, who seek assurance of sexual equality or even superiority, will find as much evidence in the study of human evolutionary biology to garner to their side as those who have sought with a similar male bias.

A simplistic version of evolutionary adaptationism, more fully described below, assumes that if a trait of behavior exists then it was selected for and is genetically "hardwired"; we are stuck with it so we might as well learn to like it. Recent research has eroded the assumptions of strong adaptationists. In a recent analysis of genomic evolution, Michael Lynch notes that, "an uncritical reliance on adaptive Darwinian mechanisms to explain all aspects of organismal diversity is not greatly different than invoking an intelligent designer."⁸⁰

Women seeking assurance of sexual equality or even superiority will find as much evidence to garner to their side as those with a male bias. Gathering such ammunition for chauvinism is a waste of time given the far more compelling issues and questions that face evolutionary feminists. When the onus of sexual politics is viewed from the wider perspective of human evolution, the question is not what data proves superiority, but what knowledge informs strategies of equality and social progress.

Some feminist bristle at findings of "gender" differences in mate selection, e.g., that females in primitive or modern environments might value resources on the part of potential mates while males are more preoccupied with gross physical indications of fertility). Such defensive posturing is unnecessary. Women's sexual strategies, if intelligent will relate to their existential situation.⁸¹ As coevolution theory suggests, culture and genes interact.

Feminists who fear that examining biological evolution of the sexes will in some way support traditional patriarchal notions, can well dispel such timidity. Because a fact is biological does not mean it is an inescapable law of nature. The laws of life are dynamic; the course of evolution is dialectical. Power within culture (and certainly over culture) can translate into evolutionary changes, both genotypic and phenotypic. The contemporary surge in biotechnology reveals that human society now has the power to time-compress such changes. What we learn about biological sex and sexuality is not what *is fixed* but what *can be fixed* (for better or for worse).

The ostrich approach is no longer viable. Contemporary sexual selection theory shows that the battle of the sexes is real, that it is dynamic, and that it must be fought. Offspring can benefit from a creative dual of the sexes over reproductive power.

The Concept of Evolutionary Strategy

In current evolutionary discourse, the term "evolutionary strategy" defines a genetic trait or predisposition of an organism that is found to be adaptive, or is believed to have been adaptive at some point in its biological history. The concept of evolutionary strategy is a metaphor rather than a scientific principle. It is, to use another Richard Dawkins term, a "meme." Dawkins' idea of a meme, is itself, a metaphor, in that it defines a unit of "social replication" that behaves (or is touted to behave) like a gene (a unit of genetic replication). Sociobiologists use this metaphor to attribute intent to random evolutionary processes, as a

kind of imaginative "shorthand." The idea of the genetic "strategy" was most vividly (though not necessarily correctly) expressed by Richard Dawkins, who traces through reverse evolutionary history the progress of the "selfish gene."⁸² Some biologists prefer to think of genes as collective bodies rather than atomistic units, for example, Egbert Leigh referred to the genome as "the parliament of genes."⁸³ David Haig justifies the use of metaphors like "evolutionary strategy" and "self gene" by pointing out that, "Natural selection is a purposeless process with purposeful products."⁸⁴ The assumption of evolutionarily stable, "optimal" strategies tends to ignore or obscure the influence of other important evolutionary explanations. I intend to explore this issue more fully in the following chapter on evolutionary theory.

People often use the term "strategy" in feminist analysis, but nearly always describe in social terms feminist or patriarchal ploys and counterploys. Beginning with the work of Robert Trivers and David Haig, evolutionary scientists have begun to unravel evolutionary "strategies" in the reproductive realm from the genomic level up to the level of family dynamics.

Primates as Cognitive Strategists

Research on primate groups, whether isolated or not, requires a social perspective in that regardless of genetics, primates utilize higher mental faculties to produce a diversity of culture. Primate researchers found that looking at a societal group over time yielded

important information that could not be derived (but was confirmed) by sociobiological research.

The Kyoto school of primatology emphasizes "strategic anthropomorphism," a structural view of primate societies emphasizing long-term fieldwork.⁸⁵ Long-term observations of Japanese macaque populations concluded that these societies were based on female genealogical relationships. Prior conceptions constructed primate society around dominant males, using male dominance interactions as independent variables.⁸⁶ Studies by K. Imanishi, N. Koyama, and others in Japan found that as impressive as were the displays and tactics of males, long-term genetic and social reproduction centered around the more subtle status competition and social mutuality of matriline.⁸⁷ In a behaviorally-based study of African chimpanzees by Robert Wrangham and Barbara Smuts, confirmed the Japanese data on female bonding in their work with chimpanzees, known to be mostly patrilocal.⁸⁸ Wrangham's behavioral ecology studies subsequently used female foraging and social strategies as independent variables.⁸⁹

Donna Haraway comments that as of the 1990s, for primatologists, "...human and nonhuman primates alike appear to be flexible strategists, with multifactorial cost-benefit analyses guiding the order's behavioral and evolutionary investments."⁹⁰ Primate and primitive society is the reproductive mode of sociality. Reproductive strategy is a major component of evolutionary strategy.

Collective Strategies

The reproductive realm is a major arena of evolutionary strategy. Evolutionary strategy has not been applied at the level of the group (the societal or social level), but at the level of the level of the individual organism, or even to genes and gene complexes. The idea of "group selection" has been rejected in evolutionary biology, not because group selective factors do not exist, but because population factors such as immigration and outmigration make it difficult if not impossible to measure selective factors. William Hamilton's formulas of kinship provide a way of mathematizing and extending genetic relationships,⁹¹ yet the complex history of even small and fairly isolated societies renders Hamiltonian analysis difficult, especially when relatedness must be measured both horizontally (in the present) and vertically (over generations). The term "deme" is used to refer to an isolated sub-population where selection of the unit, as the aggregate of individual, can be measured. Sarah Hrdy uses the term, "breeding group" a social group consisting of closely, if loosely, related individuals.

Among primates and humans, the tasks of reproduction as well as other evolutionary strategies are conducted by members of a group in which social strategies are not solely instinctual, but socially adaptive. In *Primate Encounters*, Shirley Strum and Linda Fedigan note that "sociobiologists demonstrated that conditions for group selection were limited and focused questions about adaptation on the individual rather than the group of species;"⁹² by they assert the existence of social complexity in primates to the extent that, "individuals use cognitive abilities regardless of the efficacy of gene strategies."⁹³ Further, they note that,

"the diversity of species, social organizations, and social relationships suggest that regardless of the basic nature of mammalian males and females relationships between them could be exploitative cooperative complementary or some combination of all three." We can no longer talk about "primate society," but instead a balanced interlinking individual and group strategies that constitute primate society.

It has been well established that among primates and humans, intrasexual group strategies can affect reproductive fitness. For example, all male raids of neighboring tribes commonly kill off men and male children while raping or kidnapping females.⁹⁴ Female collective strategies, such as primate female philopatry serve reproductive goals through matrilineal support and status structures.⁹⁵

The actions of an individual or aggregate of individuals can affect the genotype (the inherited, genetic make-up, that either determine or predispose certain consisting of traits and behaviors), or the phenotype (the real-life actualization of genetic potential, that is not passed down genetically). I will attempt to analyze collective strategies in primate and human social behavior as evolutionary strategies, e.g. as having the capacity to enact genotypic effects. An evolutionary strategy can be described not only in sociobiology but in other forms of research, such as ecology and social ecology, that reveal motivated behavior that impacts on reproductive fitness.

The mode of reproduction is intersects all levels of action, whether by genes or "parliaments of genes" (genomes), by genotypes (organismic "blueprints") or by phenotypes, ("real-time" living organisms). The aggregate of these actions by collectivities of individuals

constitutes the mode of reproduction, and these phenomena both affect and are affected by the conditions of reproduction.

An evolutionary strategy need not be intentional and often is not; instead, it describes metaphorically and in shorthand the reverse history of a heritable trait of the genotype or a trait or behavior of the phenotype that affects/affected evolutionary fitness. The reproductive realm is a major arena of evolutionary strategy. Reproductive strategies, whether consciously or unconsciously manifest, concern the capacity of males and females to control the means of reproduction.

Evolutionary Processes

In 1859, Charles Darwin published his theory of natural selection, *The Origin of the Species*,¹¹⁵ settling finally a lively controversy within biological science between those who believed each species was created intact from the beginning (creationists), and those who believed that through as yet undefined natural laws, the species changed over time.¹¹⁶

Charles Darwin believed that individuals inherited a “blend” of characteristics from both parents but was unsure of the means (and mistaken about the “blended” character) of the transmission of inherited traits.

In 1865, the Augustinian monk, Gregor Mendel in studying peas described the inheritance of traits in living beings, which he published in a monograph, *Experiments with Plant Hybrids*.¹¹⁷ He discovered that in garden peas that inheritance comes in unitary

packages (later called genes), that hereditary units could be dominant or recessive, and could be passed down in an unblended, undiluted form, enabling genetic stability as well as genetic change.

These two major strains of evolutionary research were initiated within a mere 6 years or one another, though apparently neither of these monumental scientists knew of the other's work.

Evolution occurs over vast reaches of time through multitudes of organisms and species. Approximately a minimum of a hundred generations is generally required for an evolutionary trait to manifest within a species or subspecies. This implies that up to 70 cycles of genomic change (at 2,000 years per cycle) could have evolved in the past 140,000 to 195,000 years since the incipience of the human species, and up to 3.5 cycles of evolutionary change could have taken place since the "dawn" of historically accessible civilization, which we estimate to be around 7,000 before the present (BP). The speed of evolution is greater when a population rapidly fills a new ecological niche, and is slower where a population attains equilibrium within a comparatively stable habitat.

The original idea of evolution that Darwin addressed related to the origin of species, but there are several levels or "basic units" of evolution. Some place the primary focus of selection at the level of the organism. This makes sense, since the organism lives and interacts with the world, reproduces (or not) and dies. Thus, the destiny of genes is inextricably tied to the fate of the organism in which they reside. Despite this principle, there is evidence that changes occur at the genetic level that can, in retrospect, be viewed as a sort

evolutionary competition between such changes seem to reflect a fate of genes and gene complexes themselves. that impact upon the organism. The original idea of evolution that Darwin addressed related to the origin of species. To incorporate all evolutionary processes, then, requires an analysis of assumption that evolution occurring at the genetic level, the level of organisms, and of species.

Evolutionary processes are summarized in a Appendix A of this Chapter.

Adaptionism

The role of adaptation has been embellished in the work of a currently influential group within evolutionary psychology. A neo-Darwinian research agenda, adaptionism, especially in its "strong" version, emphasizes genetic selection over other all other evolutionary considerations. Adaptionists make the assumption that existing traits and behaviors, especially those known to be expressed cross-culturally, must have been adaptive at some point and is probably genetically hardwired. This leaves to the researcher the task of showing that a trait is universal or nearly universal, then providing a model of the trait's evolutionary function that fits with the evidence.

Tenets of adaptionism include a) assumption of evolutionarily stable "optimal" strategies, meaning that any trait or behavior that currently exists is presumed to have been adaptive ; b) a belief that much behavior is hardwired and that the brain consists of modules each having evolved to serve an evolutionary function ; c) a fondness for metaphorically

attributing evolutionary intent to a gene or an organism (for example, Richard Dawkins' conceptualizes the "selfish gene" in order trace evolution backwards); and finally, a reductionist and deterministic view of genetic inheritance.

The assumption of evolutionarily stable "optimal" strategies tends to ignore or obscure the influence of other evolutionary explanations, such as genetic drift, founder effects, phenotypic variation, "spandrels" or expressions, which are by-products or adaptive traits.

Adaptionism also ignores the effects of large-scale events, which have impacted the history and prehistory of many peoples. If a volcano destroys a village, it takes with it the "strong" as well as the "weak" of all ages and both sexes. The same might situation might occur from earthquake, extreme and long-term drought, hurricanes and other climate phenomena. When an alien plant or animal species is introduced into a new habitat (as many have been through human migration), this invasive species might destroy or greatly reduce the indigenous population within a generation or a few generations, striking down the healthiest as well as the least vigorous natives. Modern environmental crises involving endangered species are often a good example of the reduction or "bottlenecking" of a population, with little or no regard to individual fitness.

In addition to habitat-related disasters, human social disasters such as war, exile, epidemics, impoverishment, and other factors can be quite unselective and even counter-selective (in the case of major wars accompanied by military draft) in regard to genotypic fitness. The assumption of evolutionarily stable "optimal" strategies does not consider

potential effects of such forces, and instead proceeds as though the individuals who survived did so because they were the "fittest," rather a simplification of Darwinian theory.

Beyond the Selfish Gene

In contrast to the adaptionist conception of modularity (which assumes most thought and behavior are be traced directly to genetically coded brain hardware), many neuroscientists believe that most thought processes and complex behaviors, and especially, consciousness, are characterized by integral, emergent properties and by global processes that transect various loci of the brain. Adaptionists sometimes lose sight that they metaphorical ploy comes from poetry, not science, and proceed as though it is real that genes consciously fight and conquer one another in order to "build" machine-like organisms, or that organisms intentionally develop traits or behaviors in order to outlive or out-reproduce others of their group. Even in the case of a known conscious creature, the human being, motivations seldom consciously match adaptive functions. For example, a teenager does not play basketball because he or she thinks it will be good training in later competition for a mate, nor does a couple go on a honeymoon in Hawaii because they feel it will increase their survival and reproductive fitness.

A mechanized view of genes and genetics has thoroughly seeped into popular consciousness, even though this view is seriously challenged by findings in the harder biological sciences. Molecular biologists, Klaus Scherrer and Jürgen Jost state that the term

“‘gene’ has become a vague and ill-defined concept" and conclude that, "in the world of biology and genetics there is no longer a straightforward answer to the question, ‘What is a gene?’” Michael Snyder and Mark Gerstein assert, “Even with the availability of the genome sequences of many different organisms, we are still left wondering about the definition of a true gene.”

The origin of the gene, itself is a question still shrouded in uncertainty, James Lake notes, adding that, Dr. James adds that, "The availability of a broad range of whole genome sequences could provide the information needed to unravel these complex connections." Dr. Lynch's on genetic drift work, cited above, also notes that phenotypic mutation appears to take place and the genetic level, calling to question conceptions of genetic determinism common to strong adaptionists.”

Biological and genetic architecture comprises a convoluted series of phylogenetic features ranging from the deepest to the most recent past. Adaptionists tend to focus solely on recent opportunistic adjustments, with the tendency to favor hardwired vs. softwired causality. It is possible to take a larger view of human "nature", focusing on enduring features of genetic and biological architecture as well as on more recent and perhaps even ephemeral adaptations, with respect for a range of phenotypic adjustments as well as the dynamical aspects of cultural influences on both phenotype and genotype.

Memes

An interesting though perhaps overrated idea to arise from adaptionist thinking is the

"meme." According to Richard Dawkins, memes are self-replicating ideas similar to genes except that they propagate socially. Though self-attributed, his idea bears an amazing similarity to that of a biologist of half a century earlier. The notion of a unit of social evolution, defined as an "mneme" (from the Greek goddess "Mneme" symbolizing memory), was conceived by Richard Semon in 1904. In 1921, Semond wrote a book with that title (*The Mneme*). Dawkins notes: "Cultural transmission is not unique to man. The best non-human example that I know has recently been described by P.F. Jenkins in the song of a bird called the saddleback, which lives on islands off New Zealand. On the island where he worked there was a total repertoire of about nine distinct songs. Any given male sang only one or a few of these songs. The males could be classified into dialect groups. For example, one group of eight males with neighboring territories sang a particular song called the CC song. Other dialect groups sang different songs. Sometimes the members of a dialect group shared more than one distinct song. By comparing the songs of fathers and sons, Jenkins showed that song patterns were not inherited genetically. Each young male was likely to adopt songs from his territorial neighbours by imitation, in an analogous way to human language. During most of the time Jenkins was there, there was a fixed number of songs on the island, a kind of 'song pool' from which each young male drew his own small repertoire. But occasionally Jenkins was privileged to witness the 'invention' of a new song, which occurred by a mistake in the imitation of an old one."

To Dawkins, "memes are tunes, ideas, catch-phrases, clothes fashions, ways of making pots or of building arches. Just as genes propagate themselves in the gene pool by

leaping from body to body via sperms or eggs, so memes propagate themselves in the meme pool by leaping from brain to brain via a process that, in the broad sense, can be called imitation. If a scientist hears, or reads about, a good idea, he passed it on to his colleagues and students. He mentions it in his articles and his lectures. If the idea catches on, it can be said to propagate itself, spreading from brain to brain."

The meme is mostly a trope and an example of adaptationist craving for metaphor as a substitute for more rigorous constructs. At its best, the meme mimes postmodern trends toward particularism in the construction and deconstruction of subject matter, a trend that has already altered and raised the standard of analysis in the social sciences and philosophy. Jacques Derrida introduced the notion of the historicity of ideas and the need to deconstruct broad and sweeping interpretations of history. "Must not structure have a genesis," he asks, "and must not the origin, the point of genesis, be already structured, in order to be the genesis of something?"

In order actually to function as a tool for analyzing social forms, the meme would require decoupling from its roots in biological evolutionary theory. Genes undergo random mutation due to natural influences and the sheer mass of their numbers. Ideas are not random but are consciously conceived, and they are consciously mutated. As Nick Rose points out, Dawkins description of memes are based in simplistic ideas about genetics. Meme theory has not structured adequate parallels to many aspects of genetics such as developmental effects, phenotypic adjustments, habitat influences, epigenesis, genetic drift, and impacts of invasive or extinct elements. Expressions of consciousness and will in social

and cultural production bear little resemblance to the more random expressions and variations of nature.

The strength of the meme is that it encourages constructing reductionist definitions and careful tracking processes of ideas and social forms. For example, the term patriarchy does not qualify very well as a meme. Patriarchy is a system of interacting sets of institutions and ideologies that functions as the core organizing power principle of human society, that orders (or disorders) society based on principles of hierarchy and male-male competition), ensuring the dominance of some males and a smaller number of male-linked females over all children, almost all women, and a of majority of men. A successful analysis of patriarchy will break down the system into several components, defining each with sufficient accuracy to track its course through history and to the extent it exists, biology. The interactions of these various components must then be examined, as well as the valences and intensities with which each has been historically expressed.

Yet neither a factor nor mimetic analysis is sufficient when examining a complex social institution such as patriarchy. Michel Foucault's concept of genealogy locates a topic or idea within various discourses, and requires tracing its components through history and across institutions. Of particular need of investigation are matters that "we tend to feel [are] without history" and the unraveling of influences of power on "truths."

The Mode of Reproduction: An Overview

Sexual-Selection Theory

A focus on male-male dominance and competition used to dominate Darwinian sexual-selection theory, but this is changing. Recent advances by both men and women theorists have changed this course, with the result that sexual-selection theory recognizes the importance of female-female competition and provides the basis for an examination of strategies of conflict and cooperation between the sexes. A new perspective on the history of women, children, and men begins to emerge.

Evolutionary fitness involves two factors: survival and reproduction. Survival is implicit in reproduction (survival of the offspring and of the parent(s) to the extent necessary for the offspring to survive). Strategies to alter social aspects of the mode of reproduction have an impact on reproductive fitness, and therefore on evolutionary fitness. This reality underlies an integral historic linkage that began in the mid-to late 20th century, between feminist and evolutionary theory, a linkage seldom considered.

Sexual-selection theory is ground zero in any investigation of human reproduction. Evolutionary feminists are just beginning to traverse the vast information and potential research presented by this important strain of evolutionary theory.

Reproduction works through a multiplicity of means in nature, sex and sexuality being one among many of nature's methods. Even among human beings, one percent of live births are born with discernable hermaphroditic traits in the genitalia. These physical distinctions, often "corrected" surgically, are just the most visible expressions of extensive

physiological, hormonal, and neurological variations in sex and sexuality.

Despite that categories of sex and sexuality are by no means as distinct or as universal as patriarchal dogma defines them, the facts remain that human society organizes around both the ideology and the enforcement of male-female sexual polarity; and that only biological females can give birth,¹³² incurring the benefits and burdens of this capability. The actual location of human beings along the reproductive spectrum, including of women, children, men, hermaphrodites, transsexuals, sexual orientations, and of all variations in sex and gender, we must begin with selection-selection theory.

Modern sexual-selection theory began with Darwin's theory of sexual selection proposed in 1871. In 1930, Ronald A. Fisher constructed the first major enhancement in sexual-selection theory. He set forth the foundations of population genetics, and most importantly in terms of sexual-selection theory, he showed that males and females exist in approximately equal numbers in most species with separate sexes, regardless of the mechanism of sex determination; and that among humans there is an inverse relationship between fertility and social class.

During the postwar period (1948), A. J. Bateman posed a principle since both confirmed and challenged. After an extensive study of *Drosophila* (fruit flies), he concluded that the investment of the sexes is unequal, even if only in the production of gametes, in that, energy-wise, sperm are cheaper than eggs. Bateman's principle of differential investment includes several components: (1) that females generally have a larger investment in producing each offspring; (2) that a male is capable of fathering more offspring than any one

female can bear; (3) that a male's reproductive success increases with each female he mates with; (4) that due to her greater energy investment in the offspring, a female's reproductive success is not significantly increased by mating with more males; (5) and finally, that this results in greater male-to-male competition (thus more uneven reproductive success among males) and greater selectivity on the part of females.

Sexual selection can favor production of extravagant secondary sexual characteristics, mostly in males, such as ornamentation (colored plumage) and weapons of intrasexual competition (antlers, etc.), in the contest for access to the opposite sex. Secondary sexual characteristics include reproductive costs as well as benefits to the individuals possessing them. Their formation expends organismic energy. In addition, these characteristics can render the organism more vulnerable to predators. Finally, their existence can tend to encourage an "arms race" within members of the sex in genetic development of these characteristics (e.g., the "costs of weapon production also may drive patterns of weapon evolution"), increasing danger while not necessarily increasing reproductive benefit.¹³³ An example of the latter problem is the "Irish Elk" (*Megaloceros*), which is believed to have gone extinct due to the overbearing weight of the males' antlers, which spanned up to 12 feet.¹³⁴

From the standpoint of human evolutionary theory, the great breakthroughs in Darwinian sexual-selection theory occurred the 1960s and 1970s. In "The Genetical Evolution of Human Behavior" (1963), the brilliant geneticist and evolutionary biologist, William D. Hamilton, showed how a genetic trait could be passed down to future

generations, even if the individual who expresses this predisposition does not reproduce. Hamilton's Rule showed how a predisposition to a socially beneficial behavior, such as altruism, could spread in a population of genetically related individuals similar to the small extended-kin groups constituting many mammalian, primate, and hominid social groups. His elegant theory of "kinship selection" provided a "missing link" in exploring evolutionary studies of behavior.

In 1971, E. O. Wilson published, *Insect Societies*, a systematic study of the biological basis of social behavior in insects. His investigation of ants showed how their form of sexual reproduction, haplodiploidy, provided a high degree of genetic relatedness among females. This close female kinship formed the basis of a complex gynarchical society. Wilson showed, then, that social system could be constructed out of the genetic relationships of the participation organisms and their reproductive system. This was the seminal work of sociobiology and its successor, evolutionary psychology.

In "Parental Investment and Sexual Selection" (1972) and in "Parent-Offspring Conflict" (1974), the evolutionary biologist, Robert L. Trivers, further refined Hamilton's rule and Bateman's principle with a sophisticated analysis of reproductive conflict and cooperation between mates based on differing parental "investment" in the offspring. Parental investment is based on the amount biological and "life" energy an organism uses in producing an offspring. Trivers postulated that to the extent that an individual of a given sex (usually the male father) was less biologically invested in the offspring, that individual would be in greater competition for access to the more investing parent (usually the female

mother). Trivers produced formulae of parental investment and sexual competition strategies of males and females based on reproductive investment. Trivers' work and that of other researchers showed how genetic investment could affect relations between all family members including parents and children. David Haig found evidence of competition between mates and between parents and children even at the level of genes and gene complexes.

While male-male competition and female selectivity is a prominent feature of sexual selection, sexual selection also includes male selection upon females, female-to-female competition, and other combinations sexual division and coalition. Accompanying each of these scenarios is a history of strategic interactions to attain control of the means of reproduction.

Biological Reproduction

The history of reproduction is the history of life. An effort to describe fully human reproduction must begin with life, itself. The OED defines reproduction as “the action or process of forming, creating, or bringing into existence, again.”¹³⁵ Some contemporary observers believe that humans have ushered in an "Anthropocene Era," in which cultural and technological of our species will have a determining role in the future of earth. On a temporal scale, however, the productive mode of our species is a brief player compared to the drama of 4.6 to 5 billion years of planetary life.

Richard Forty provides an authoritative vision of the creation of life on earth.¹³⁶ The earliest creature was a hyperthermophile, a creature lacking oxygen (anaerobic) and thriving on heat. Forty and other scientists speculate the first cell came into being near the mouth of a hot seep hole in the primordial ocean, through which mineral rich emanations from the interior of the Earth erupted. The dawn of life on Earth was a nearly endless morning. The first living cell came into being perhaps 3,500 million years ago. By 1,000 million years ago, life reached the stage of a simple, large, but complex cell. Over the 2,500 million years between the tiny, primordial photosynthesizers breathed their vast exhalation of oxygen into what was to become the Earth's atmosphere. The genesis of life was not a simple feat (simple feats arise multiply and contemporaneously), but instead an immensely improbable casting of the dice, like winning the lottery but multiplied perhaps a few trillion times. The totality of processes of even the simplest cell is too complex for mathematical modeling, though it is possible to describe the essential structural features of cells in terms of dissipative structures.¹³⁷

This genesis inculcates a sense of fate and the fragility of life. In the face of so much probability that it would never exist, life came into existence. "Much of the order we see in organisms may be the direct result not of natural selection but of the natural order selection was privileged to act on," observes the systems biologist, Stuart Kaufman.¹³⁸ In systems biology, life constitutes a system with an inherent capacity to (re)create through novel processes of disequilibrium and equilibrium, a capacity referred to as *autopoiesis*. The Greek term, *organon*, means tool, that which makes or is used to make something.¹³⁹ What

the organism makes is itself. Here nature departs from both mechanism and metaphysics. Immanuel Kant described an organism as “a natural product... in which every part is reciprocally both end and means.”¹⁴⁰ The internal dynamics of fabrication and reciprocation, the incorporation of external energy, and the interdependence of all aspects of the organism, enable it to grow and to reproduce. Open-endedness of the organism and the synergistic relation of its parts to the whole; are invariably found together in the organism, are codetermining features of self-organization.¹⁴¹

The work of early creation was parthenogenic, revealing no mothering or fathering. Even in the context of sexual reproduction, evolutionary research constantly documents efforts to enact self-birth against great odds.¹⁴² This struggle and pure luck in the face of overwhelming odds is exquisitely expressed by human spermatozoa, which by the millions, hurl themselves at the gate of existence. Only a paltry few enter the womb, far fewer enter ovum in conception. Even the sought-out queen of sexual reproduction, the ova, faces daunting odds ever to come into realization. Sarah Hrdy notes that, "By six month's gestation, even while an embryo, each future [human] mother has within her fresh-minted ovaries complements of oocytes, some seven million—fourteen thousand times more than will ever ripen into ovulation."¹⁴³ These five or more million eggs dwindle down to a mere 300,000 by the time a girl reaches puberty, to actualize into approximately five human beings.¹⁴⁴

The first self-replicating world was probably an RNA world. A common thread of ribosomal RNA courses from the simplest to the most complex of biological organisms; it is

improbable that such genetic similarities arose by chance. An asexual Archaeobacterium most likely set life into motion; the evidence of DNA points toward genesis from this single ancestor.¹⁴⁵ The most primitive living replicators, Prokaryotes, are minute, consisting of a single cell without a nucleus. Bacteria usually lack chlorophyll, though there is an important class of exceptions (described below).

The work of early creation then, is parthenogenic, revealing no mothering or fathering qualities of Nature or God. Even in the context of sexual reproduction, evolutionary research constantly documents amazing efforts to enact self-birth against great odds within the context of random chaos.

Replicating by division, Bacteria are capable of reproducing at an enormous rate. Bacteria proximate to one another are capable of a high degree of DNA recombination, a process by which bits of genetic material are routinely and rapidly transferred from one individual to another. This greatly increases the adaptive potential of the bacterial kingdom, in that it provides a potentially huge population access to a very broad gene pool.¹⁴⁶ Oxygen (an ingredient in the atomic structure of DNA) was not favored by many species of Archaeobacteria but a few rare creatures launched great evolutionary advance of photosynthesis, which Dr. Forty describes as, “the motor that powers all green plants,” , becoming the champions of future evolution.¹⁴⁷ Cyanobacteria (the blue green bacteria that can still be seen around dripping sinks), represented another revolutionary advance by becoming oxygen breathers. Ancient practitioners of photosynthesis and oxygen exploitation created the atmosphere of earth over a period of 3,500 million years.

The first known biological structures were stromatolites comprising a community of microbes surrounded by a sort of skin, comprised of interweaving photosynthesizing threads.¹⁴⁸ "By cooperating and continually trading genetic information the microorganisms [had begun to regulate conditions for life on the entire planet, as they still do today." From these organizations of discrete simple cells [Prokaryotes], complex cells emerged around 1,000 million years ago. They may have arisen by one bacterium embracing another in a new relationship: symbiosis, a process of organic existence dependent upon co-existence with other organisms. The energy of symbiosis eventually enables the nucleation of the cell. Eukaryotes, formed from nucleated cells, developed organelles like mitochondria—tiny, membrane bound bodies that perform different functions, such as enzyme production. These organisms begat the last three kingdoms of life: Algae, Plants and Animals.¹⁴⁹ Until recently, it was thought that animals, plants, fungi and protists (the eukaryotes) were descended from archaeobacteria — extremophile prokaryotes distinct from "true" bacteria (eubacteria). A 2007 study suggests that these advanced forms of life emerged from "a strange cocktail of genes from various prokaryote sources for the eukaryotes."

The Coevolution of Genes and Culture

As discussed earlier, the complex of features involved in the capacity to write are preexisting rather than novel adaptations. , and perhaps for symbolic thought is considered a by-product of existing human faculties writing, a trait-complex derived from architectural

"side-effects" of the human genome, continues to be performed on a large-scale over long periods of time, and if it accrue social and technological (therefore, indirectly, reproductive) advantages for those who possess it, then the trait-complex(es) associated with writing will be selected on. Eventually, due to the selective advantage of writing will to write will be "written" into the genotype of Homo sapiens.

Other architecturally/structurally-determined genotypic traits associated with symbolic media also might be selected upon, or have already been selected upon, thus, culture and genetic capacities interact, especially among human beings.

Traits and behaviors associated with reproduction have co-evolved will continue to evolve within the context of human culture. The vast phylogeny inherited by our species includes a repertoire of propensities that can be called upon to resonate with or to change social and cultural structures, and of course, the reverse is true. The marriage of genes and culture exists, for better or for worse.

In exploring human reproductive relations, the concept of coevolution as a key analytic tool. Coevolution, a strain of evolutionary theory and research, identifies mutual evolutionary influences between species. These include cooperative arrangements of reproduction and subsistence (like that of the flower and the hummingbird) and parasitic arrangements that may be mutually beneficial (like that between cleaner and cleanee fishes) or pathogenic (like the HIV virus and the human bloodstream).

William H. Durham's extensive work on the coevolution of genes and culture relates the evidence for genetic cultural interactions related to incest taboos, marriage systems,

nonadaptive and maladaptive cultural norms, and the dynamics of cultural/"group" vs. individual fitness.

Traditionally, quantitative approaches to evolutionary biology consider evolutionary change in isolation from an important pressure in natural selection: the demography of coevolving populations. Fabio Dercole and Sergio Rinaldi have recently developed Adaptive Dynamics (AD), a quantitative modeling approach that explicitly links evolutionary changes to demographic ones.

Coevolutionary theory also analyzes the interaction of culture and genes within the human species. Evolution did not end when culture began, rather, the coevolution of genes and culture is a dialectical process with capacity to be consciously shaped (socially engineered). Coevolution is a factor in understanding the human impact on nature, for example, ecology studies the ways in which exploding populations (reproductive rates) of species expanding into new niches affect the reproductive rates (subsistence and survival) of indigenous species. I propose that reproductive strategies also result in the coevolution of sexes over generations, by which intrasexual and intersexual strategies exert an evolutionary influence within.

Great apes hominids began to frame questions of reproduction within a specifically cultural context, adding a new layer of complexity between the mode and the means of reproduction. Matters social organization increasingly loomed within the mode of reproduction. As culture produced language and civilization, human beings continued to ask and to answer reproductive questions, throughout history.

The issue of individual vs. collective fitness is a source of incessant tension within the reproductive mode. Intrasexual conflict and competition has been a major subject addressed in the evolutionary theory of sexual selection. Intersexual conflict has been the subject of feminist analysis. Each of these emphases, and the research questions arising from them, can benefit from a cross-disciplinary approach based on reproductive analysis. Feminists have attempted to trace the development of sexual oppression (patriarchy), but have not focused on the dynamic nature of biological competition at the root of sexual asymmetry. Evolutionary science (prior to the emergence of evolutionary feminism) tended to ignore dominance patterns between the sexes, viewing them as "givens", while focusing on intrasexual competition, especially between males. For human beings, selective factors include sociocultural exigencies and political control. The mode of reproduction has not been uniform through human history and prehistory. Expressions of sexual struggle over the means of reproduction occur even within minute biological processes of reproduction. The normative sexual conduct of many species hints of dialectical "battles of the sexes" that once took place, preconditioning "instinctual behavior."¹⁵⁰

Human reproductive theory studies human reproductive arrangements over time and place. How have these means varied and what, if anything, does not vary? What have been the evolutionary as well as the social impacts of these arrangements? The basis of reproductive theory is a bold one: an examination of human biological and social evolution will dispel fears that the facts will buttress or justify chauvinistic notions. The laws of nature are dialectical; the course of evolution can be dynamic; the facts are not static but in process.

Reproductive theory approaches human behavior not as "what is fixed" but as "what can be fixed."

Human Reproduction as Biosocial

Among humans as well as in our close primate relations, certainly the chimpanzee and bonobo, the reproductive mode is biosocial, transecting biology and social structures and processes. My analysis of reproduction, correspondingly, is "biosocial," focusing on dialectical interactions between human history (including social, cultural, and political aspects) with natural biological influences. Sociobiology is a particular strain of evolutionary science tending to emphasize biological determinism. My perspective is neither determinist nor nondeterministic; it is a *strategic* perspective, taking into consideration obstacles and opportunities emergent in biology and society. Both obstacles (the given) and opportunities to address or reverse these obstacles (strategic action), are biological and societal. I approach the principles and the course of reproduction as resulting not only from "distal" causes but also from reproductive decisions made *de facto* in real-time existence.

The Mammalian Family

Group membership at some state of life is a necessary condition for the survival, subsistence and reproduction of almost any animal and definitely for a human being. The mode of reproduction must foster fertility among a sufficient number of members to ensure biodiversity and sufficient potential for offspring vitality. It must structure and implement

social norms of sufficient strength to foster the work of its members in bringing to life, nourishing, nurturing, protecting, and training the new generation.

The basic unit of mammalian reproduction is the mother-dyad. The great anthropologist, Robin Fox, argues that in mammalian mating systems, if the mother-child unit can survive without the support of a male then it will do so, but this dyad, itself, is a social unit. Among primates and humans, Fox stipulates the requirement of a support system involving at least one male. "Whatever else happens, any society needs to protect and provision its mother-child units." ¹⁵¹

The human kinship system according to Fox consists of the mother-child dyad and a kinship structure including at least one male, who acts as the *genitor* (biological father), *pater* (social father), or both. The model human kinship system traditionally includes the components of 1) mother child dyad; 2) extended kin, and; 3) a social father (whether or not biological). Both historic and current conditions have produced exceptions to Fox's kinship principles, in the form of single-mother families and even single-father families; those composed only of siblings, ¹⁵² or of a grandmother-child unit; or in collective child-raising structures such as the kibbutz (that (largely but never wholly) supplant the family unit of child-rearing). I intend to revisit human family forms and the family interactions of our closest relations, chimpanzees and bonobos, in an effort to structure an offspring-centered model in an effort to resolve the origin of variety of old and new family forms.

Sexuality

The relationship of and differences between the sexes, and the nature of their biological and social bonds, are founded in reproductive arrangements, which both express and influence power asymmetries around the mode of reproduction. Effort to attain reproductive success as well as to control the mode of reproduction result in competition and cooperation both within (intrasexually) and between the sexes (intersexually). As Patricia Gowaty points out, these strategies converge into other, even more complex strategies.¹⁵³ Reproduction is the basis of social organization thus, even non-reproductive self-interests, as well as the interests of non-fertile family members both influence and are influenced by the arena of social reproduction. Investigating of sexuality requires examining its forbear, asexual reproduction, the origin of sexual reproduction, sex determination, biological sex-differences, and the range of sexuality. Asexuality, multisexuality, hermaphroditism, and transsexuality are rife in nature. The notion that male/female polarity is the law of nature reflects a myopic and ill-informed view of biological reproduction, not to mention primate behavior.

Sexual reproduction as a life strategy began about a billion years ago. Two organisms with a separate heritage of DNA engage in a joint process of co-creation, generating a new and unique organism.¹⁵⁴ In this genetic process of *meiosis*, the number of chromosomes in the nucleus is divided by half, creating a specialized egg and sperm cells. These cells are then fused in act of fertilization, in which the normal number of cells is restored and a new cell, the fertilized egg, is created. The egg then divides repeatedly in the

growth and development of a new organism. This innovation exploded the energy available to species replication. The effects of mutation and ecological impacts provide further dynamic conditions for reproduction. As I discuss in greater depth in the chapter on sex and sexuality, *meiosis* and the process of genetic inheritance are nowhere near as simple as this.

Sexual reproduction at the mammalian level involves sex and sexuality, mating, meiosis and fertilization¹⁵⁵, gestation (including "maternal effects" that can alter the offspring during fertilization and pregnancy), birth, lactation and nursing, maternal nurturing, protection, and training, and the support of the maternal function through individual and collective male behavior, fatherhood and collective behaviors in the breeding community. The means of reproduction consist of the energy, resources, behaviors, and relationships that function to foster a new generation of offspring, a generation that must be able to survive and to renew the cycle of reproduction.

Reproduction is an arena of both conflict and cooperation. Strategies of conflict and cooperation are enacted within and between the sexes, and between family members. The outcome of this conflict and cooperation determines the genetic representation in future generations, as well as the environment that determines opportunities for expression of the phenotype in both sexes. Reproductive arrangements determine who expends energy on what and how much energy is expended by each and all involved. Some aspects or reproductive arrangements are "hardwired", e.g., the existence of sexual desire, while other aspects are soft (how sexual desire is directed). It is impossible to speak intelligently about reproduction without comprehending basic process of evolution.

Not every individual in a society must reproduce numerous or even a single offspring. For those who do, further questions converge on physical, environmental, and social capacities to locate a mate, to have sex, to give birth, to form bonds with the offspring, to form bonds with kin and others that enable the feeding, nurturing, protection and training of the offspring; these issues must be addressed alongside of self-survival and subsistence. Given such daunting challenges, it is a wonder that reproduction takes place at all. Yet among wild mammals and primates, an overwhelming number of females and a lesser proportion of males, reproduce.

Implicit in sexuality is sexual selection. Sexual selection at times converges and at times contradicts the forces and outcome of natural selection. I will explore instances of both interactions in future chapters. The simplest message of sexual selection is that genotypically, speaking each sex has been created by the other. The extent a male or female (as a mean representative of her or his sex) is empowered in this act of creation is reversely correlated with the success of that sex in dominating strategies of intersexual conflict and cooperation within the mode of reproduction. Maternal investment in the reproductive mode is always greater, even in the egalitarian of species, such as Emperor penguins, callitrichids, gibbons, and pygmy chimpanzees (bonobos). Therefore, females tend to have a greater sway in creating male traits and behaviors through sexual selection. In male dominated societies, however, males might possess formidable powers of sexual selection upon females. Male dominance characterizes most primates and has characterized *Homo sapiens* at least since the beginning of the Neolithic era. Male dominance of the mode of reproduction does not by

any means ensure paternity to all males, but for those who attain biological fatherhood, male dominance over the mode of reproduction most likely translates into individual father-dominance over the conditions of reproduction at the family level. The structures and prevalence of human family forms is, despite claims on many sides, still a wide open question that evolutionary feminists have just begun to answer. In chapters on patriarchy and female empowerment, I will explore the possibilities presented by existing evidence integrated with a set formulas based in principles of parental investment conceived by Robert Trivers.¹⁵⁶

Reproduction as an Existential Act

In order to ask the question, How can I procreate?—an individual must first ask: How can I survive? How can I subsist? Integral to the sphere of reproduction are behavioral strategies and mental faculties including both artifacts and inventions of consciousness. For all creatures, interdependence on other life forms is a mandate of evolutionary survival, thus the reproductive mode involves existential interaction with other creatures and with the habitat and climate.

Mechanistically speaking, reproduction is the replication of an organism either asexual mitosis or sexual meiosis and fertilization. Self-replicating genes incur mutations and in sexual reproduction are subject to recombination. Rarely, but sometimes a mutant gene finds its way into the future genetic pool. The potentialities of genes become expressed

or repressed within the prenatal environment, developmental stages of the organism, and the organism's encounter with its environment, creating a phenotype (the living and acting organism). This unique individual is different from others with similar or even the same genotype.

The basic existential questions of reproduction center on survival, subsistence, mate selection, birth, survival of offspring, nurturing and training of offspring, (individual and generational) so that the round of reproduction (species survival) will continue. The energy of reproduction consumes the lifetimes of most creatures. Survival of both parents is required to produce an offspring up to the point of fertilization. Survival and well-being of the mother prior to and through the period of offspring dependence is required if the offspring is to attain viability. Among primates, the survival of the father (*genitor*), or an unrelated guardian (*pater*), during the period of dependence, is important or critical to offspring survival and fitness.

Maternal/Paternal Investment and Offspring Activism

Throughout the animal world, the reproductive mode is expressed through structures of family, kinship or breeding group, the troop or herd, and at the macro-level, the subspecies or species, for some primates, ordered societies, and for humans beings nations or societies. Biological reproduction cannot take place in the absence of certain reproductive roles. These roles are often undertaken within the context of a "group," defined classically

by Georg Simmel as the, "coming into existence of essential socialization out of three [or more] elements..."¹⁵⁷

The reproductive mode of a society includes all functions and structures, from the microbiological to the macrosocial, that foster successful or favored reproductive strategies. Thus, to study reproduction is to examine basic prosocial interactions and group dynamics. It is to explore the evolution of the family, or language, art, tools, and culture, and in addition, the emergence and current formation of human social structures and power relations. It is also to explore microbiological to the macrosocial factors that inhibit or counteract nurturance. It is to study dialectical relationships that occur when self-interest, or even reproductive interest, of natural and social actors conflict with nurturance.

Hardwired traits of nurturance and fitness discrimination related to maternity form the bedrock of altruism in the evolution of mammals and primates.

Bonds and behaviors between mother and offspring can be broken down into two categories: conflict and nurturance. Nurturing bonds instigate all actions related to the reproductive fitness of an offspring. Maternal/parental-offspring conflict has been well described in the theories of Robert Trivers¹⁵⁸ and the eloquent work of Sarah Hrdy¹⁵⁹. I prefer to use the term "maternal/parental," since throughout the primate world most organismic interaction between parent and child is maternal, however, it is important to include exceptions in which the biological/social mother is absent from the nurturing relationship and substituted for (as with adoptive or male-only parents).

Maternal/parental conflict is well represented in the literature of human evolutionary

theory, however, very little is said about the other, far more universally expressed aspect of maternal/parental relationship with offspring, that of nurturance. "Altruism" is often spoken of as a prosocial trait or complex of traits in evolutionary discourse; nurturance is mentioned (if at all) as a subcategory of altruism. Nurturance is a prosocial trait complex emerging within a specifically sex-based trajectory in biological evolution.

The basic unit of nurturance is the maternal/parental-child dyad. This dyad is usually supported by additional biosocial elements and in the case of higher primates, is always contextual. Nurturance is probably the most important of prosocial traits and it is of particular importance to the survival and reproduction of mammals. Many neurophysiologic and hormonal adaptations produced the trait complexes collectively comprising nurturance. These adaptations center on maternity but they can involve fathers, offspring, kin, and others. The structures and prevalence of human family forms is, despite claims on many sides, still a wide open question that evolutionary feminists have just begun to answer.

Sex-based characteristics like nurturance and aggression are more diffusely shared in a population than sex stereotypes or categories take into account.

Heroic facets of maternal/parental nurturance are documented in the behavior of many animal mothers who put themselves at great risk to protect their offspring, whose very bodies are given over (willingly or unwillingly) to the nourishment of fetal offspring, and who typically engage in multiple endeavors of personal survival, group membership tasks, and the often onerous tasks of maternity. Hardwired traits of nurturance and fitness discrimination related to maternity form the bedrock of altruism in the evolution of

mammals and primates.

Reproduction requires that a new organism is born. The newborn organism is not fully developed yet normally possesses the capacity to develop as a typical member of its species and the capacity to reproduce offspring. The birth occurs independently of the body of the progenitor(s) in exonatal species, and by emerging from within the body of the (maternal) progenitor in endonatal species.

Despite the huge contribution of time, energy and personal characterological investment of the mammalian mother and—in some species, including the human species—of the father, the urge to self-creation adheres to mammalian offspring, defying views of the infant as wholly passive and dependant. John Bowlby,¹⁶⁰ David Haig,¹⁶¹ Sarah Hrdy¹⁶² and others offer eloquent testimony to the tenacity of the offspring (especially among primates and humans) to ensure their existence, subsistence, and care. The infant's reproductive interests include being brought into life, more than adequately fed and nurtured, and favorably attended to in comparison to its siblings. These interests and the accompanying "strategies" of the infant can contradict the mother's interests, first, in her own survival, health, and status, and second, in her capacity to produce the optimal number (generally a very small number) or offspring that she can successfully bear, birth, nurse, feed, protect, train, and otherwise bring into a condition of reproductive fitness. The interests of an infant with siblings is out of synch with his or her mother's overall reproductive interests. Any hungry infant might be out of synch with a mother intent upon gathering sufficient food to ensure her own health and to provide for this offspring or for additional

offspring. In a patrilineal setting, the demands of the offspring for resources might conflict with the interests of the father in providing for all of his children equally, or for other offspring preferentially. I will further survey potential maternal/parental/offspring conflicts, including potential horrendous impacts on the offspring, including neglect, infanticide, and other nightmarish outcomes, as well as the conditions necessary for adequate nurturance of infants and children. Differential parental investments in the offspring can lead to similar destructive outcomes for one parent or another, generally for the female, whose investment in reproduction is greater.

I cite Wade Mackey asserts that among primates, only in *Homo sapiens* has the male expressed a high degree of personal parental investment,¹⁶³ a fact accounting for many of the best and some of worst aspects of human society. In Part 2 I intend to examine the various roles of males in human the mode of reproduction, and contradictions of being male (as well as being female) within patriarchal systems.

The Means of Reproduction

The human mode of reproduction is a societal complex that determines how individuals interact around mating, the creation and maintenance of family forms, and of primary social structures facilitating survival and subsistence. The mode of reproduction is social (existing between and beyond individuals). It is emergent in the means of reproduction, which can be defined in a more reductionist manner as particular biological, behavioral, sensory, and

cognitive capacities and constraints and life-cycle factors. The means develop because they are or have been effective in some period to ensure the viability of offspring and the capacity of the species to create new generations.

These means designed by evolution change over time in response to selective factors. Changes in reproductive means have occurred throughout sexually reproducing species. Functional alterations in reproduction take place during periods of "punctuated equilibrium" (when a confluence of evolutionary factors results in genetic changes occurring relatively swiftly to produce new species or subspecies)¹⁶⁴.

Though reproductive behaviors reach equilibrium in many species, they are by definition dynamic. Nature is both preset and dialectical and so is human society; inflexibility over long periods yields to flexibility.

Even under conditions of relative stability in the means of reproduction, an individual can be creative in altering aspects and outcomes of reproduction. "Maternal effects" are modulated changes occurring to an offspring between fertilization and birth, and in some cases extend into postnatal conditions. They may be purely physical or involve some action or judgment on the part of the mother. Among insects, mice, fish, and mammals, parturient mothers regulate the sex ratio of females and males depending on habitat pressures. A mother fig wasp manipulates her progeny in ways that suit her long-term reproductive interests. As the female lays each egg, she either fertilizes it or not, determining the exact configuration of daughters and sons, which you can translate into the greatest number of grand offspring.¹⁶⁵

We often view the mode of reproduction as fixed and instinctual. Yet the history of life is not quantitatively different from the history of civilization. The discrete actions of an individual, a small group, collectives, or massive populations, each shape future events. The black widow consumes her mate post-copulation. We think of this as "instinct" and indeed, it is, in that the behavior is programmed genetically. We accept the behavior as fixed because we dare not speculate what conflicts between females and males of ancestral spiders might have taken place over vast periods, and/or what punctuated event in geologic or genetic history, might have launched and advanced this murderous behavior.

Short of and including murder, many other such means are employed in the arena of sexual competition, both within and between the sexes of all sexually reproducing species including humans. These means address the issues: Who gets to be fertile? Who gets to choose their mate? Who gets to control how much of themselves the offspring inherits? Who expends energy giving birth? Who determines what happens to an offspring before birth? Who gets to control the rearing and training of the offspring? What sex is the offspring to be? Who must provide resources to the dependent offspring? Who must protect the offspring?

In the language of sexuality, creatures have posed and answered manifold questions like this, since the dawn of reproduction. Plants of all species have addressed these issues even though their immobility calls often for solutions necessitating the involvement of members of other species. Reptiles, amphibians, fish, birds, marsupials, and rodents have resolved the issues of reproduction through the employment of multiple, fantastic means.

Among mammals, such questions revolve preponderantly around of the survival of the maternal-offspring dyad. The ways in which these questions are answered and the resulting normative behaviors resulting constitute the means of reproduction.

Individual shifting of reproductive modalities, such as sex changes, seems to occur as a form of individual opportunism in the presence of hierarchical norms, in which sexual dominance plays determining role in reproductive success. Among coral reef fish, females change to males when the relative numbers of larger and smaller members of the species change within her home range.¹⁶⁶ In *Lythrypnus dalli*, the blue-banded goby, reproductive success is primarily determined by functional sex, and functional sex is determined largely by rank in the dominance hierarchy, led by one "male" and a number of ranked females. When the male exits the group, a female ascends to the top of the hierarchy and becomes a male.¹⁶⁷ Among orangutans in the wild, a subdominant male remaining with the troop keeps a juvenile appearance even into adulthood. The "Peter Pan" remains forever young until (perhaps) the dominant male disappears. In this case, Peter Pan undergoes a transformation, accumulating bulk and hair, to take on the role of the dominant male. In their cross-species comparative studies across sex-changing animals, Andy Gardner and colleagues found that an amazing consistency in developmental readiness for transsexuality: "91%–97% of the variation in size at sex change across species can be explained by the simple rule that individuals change sex when they reach 72% of their maximum body size."¹⁶⁸

Contradictions Between Reproduction and Production

In *Ecological Revolutions*, Carolyn Merchant delineated firm foundations for an analytic theory, describing reproduction within the context of ecology. She proposed that ecological breakdown resulted from tensions and contradictions between the means of reproduction and the means of production.¹⁶⁹ Alongside her social analysis, Merchant developed an ethic of male-female and human-nature partnership.¹⁷⁰ Merchant's consciously articulated ecofeminist analysis of production and reproduction was preceded by anthropological research.¹⁷¹

In complex human societies, as Merchant noted, the mode of reproduction interacts with the mode production.¹⁷² The status of women is determined by and in turn affects the mode of reproduction. Initially, production served the reproductive mode, as with early female-oriented technologies for water and food carrying, infant and child transportation, housing, gathering and horticulture. Male-oriented tools for hunting and defense also functioned primarily to support the breeding group. Oral history and magical innovations by both or either sexes supported the fertility and survival of the breeding group. When populations amassed, production developed more and more as a separate realm from reproduction.

As mentioned above, Merchant places within the realm of reproduction subsistence, daily life and household maintenance, socialization (family, church, community), and symbolic complex, which she assembles under the term "social reproduction."¹⁷³ Prior to acquisition of language, the reproductive mode expressed embodied primary consciousness

linked to evolutionarily adaptive archetypal imagery, and to behavioral patterns of ancestral origin. Language and cultural technologies linked the mode of reproduction with social production. The intensification of technology through mass organization, written language and symbolic practicum such as mathematics, linked social reproduction with the productive mode. In terms of this work, social reproduction involves the family, cultural and societal institutions transmitting cultural attributes and skills, gender, and the exploitation of animal and plant fertility through horticulture, agriculture, and animal husbandry. The productive mode is inclusive of all else. All aspects of bioengineering, biotechnology, and reproductive medicine, including bioethics

The coevolution of biology and culture is a dynamic, unfolding process. To understand the relationship between biological and social reproduction, and between human biosocial reproduction and human production, require traversing several media revolutions.

The human social order increasingly determines the evolution of the human species. The primary role of the mammalian mother in reproduction has for centuries eroded through the gradual transfer of power within the mode of reproduction from women to men. In an analysis of patriarchy below, I will attempt to trace this trajectory and the possible impacts on the human genotype and phenotype. Alongside this biosocial shift, the productive mode has undergone its own transformations, which are certainly beyond the scope of the present work. The outcome of these changes produces the contemporary condition, in which global capitalist civilization now possesses the technology to embark on a greatly expanded and more efficient control of the means of human and nonhuman reproduction.

Production became increasingly hierarchical and wealth stratified. Productive goals such as imperial warfare, amassing and concentrating wealth, hierarchical governance and the production of scientific and metaphysical thought increasingly contradicted the more basis goals of human and social reproduction: the interactive work of women and men toward producing viable small ecosystems for the care, feeding, and education of children became increasingly controlled and fragmented. Over time, the human reproductive sphere has become chattel to the productive sphere, disempowered, fragmented, and dependent on production for sustenance.

Contradictions Within the Reproductive Mode

The issue of individual vs. collective fitness is a source of incessant tension within the reproductive mode. In complex societies both human and nonhuman, contradictions exist within the mode of reproduction pertaining to the goals of the individual and the "breeding group." Evolutionary scientists sometimes define reproductive fitness for an individual as the ability to produce two additional generations: offspring and the offspring's offspring. To a breeding group, reproduction means producing a generational lineage that is sustainable over time. In the close-knit breeding groups exist among most mammals and early humans (thought to have numbered around a hundred individuals), the contradiction between individual and group fitness is mediated by a somewhat homogeneous gene pool produced by shared kinship. In cases of very close breeding over time (sustained incest), both positive

and negative heritable traits are likely to be passed down. In cases of exogamous populations, where two groups typically interbreed or intermarry, hybrid breeding acts as a stimulus to sustain genetic vitality, but the envelope of kinship is still such that any mutations in behavior or character that subsequently are hardwired would to some extent be shared across the population. It is in such a reproductive mode that Hamilton's kinship theory equations for the development of altruism and other prosocial traits would have flourished. Antisocial traits might have assisted the dominance of one group over another, unrelated group, but might well have fallen into genetic disrepute within the breeding population itself.

In a larger group characterized by intense population growth, the contradictions between individual and group fitness become increasingly significant. If for example, Mister A is a mean, bullying fellow with no compassion and a high greed coefficient, the failsafe mechanisms of a small breeding population might serve to keep him in line. Franz deWaal notes that among the higher primates, social dominance is not only an issue of strength and ferocity but also involves bonding, alliance, and negotiation. Female chimps in captivity will act as a group to attack abusive males.¹⁷⁴ In the wild, the alpha female chimp coalesces with males and with other females to contain, punish, or even unseat a bully, thus reducing his reproductive fitness.¹⁷⁵

In conflicts between unrelated males, ferocious and unmerciful behavior is likely to enhance the possibility of victory and therefore of reproductive fitness. "Raiding" is a common tactic by which higher primate males attain genetic vitality. The raiding troop

attacks, kills many of the indigenous males and infants, and rapes or abducts the females. As populations amass (or habitat dwindles), these conflicts between mostly unrelated peoples increasingly foster asocial traits within the gene pool.

Over time, the human reproductive sphere has become chattel to the productive sphere, disempowered, fragmented, and dependent on production for sustenance. Success in the reproductive mode of a society implies support for the maternal/parental function, strong prosocial traditions such as shared history and ritual, and the development of language, culture and life-affirming technology, in addition to beneficial forces of habitat. The criteria of reproductive fitness for women and children are closely associated with the fitness criteria of a small, stable breeding group. This can be true even when the group is male-led and patrilocal, but individual-social reproductive interests are more closely linked to the extent that the maternal function is well served by providing access of females to close-knit, closely-related sociality and/or by close male-female parental bonds. Reproductive fitness of individual or very small parties (for example, of a cluster of related males of around 5-10) might be a very different matter, in that such an individual or group can attain power through aggression and thus greater access to mates, creating very high male-offspring ratios, probably at the expense of reproductively disenfranchising other males.

"Sexual Politics"

Reproductive strategy is the sum total of traits and behaviors along an axis of cooperation

→confrontation¹⁷⁶ by which an individual ensures that her or his genes are replicated in successive generations. In sexually reproducing species, a parent must settle for only half of his or her genes represented in an offspring. Thus, in order to replicate her or his genotype, the parent must produce two reproductively fit offspring. Enhancing the survival of kin who reproduce is an indirect strategy of reproduction. At each lateral step of kinship (sister, cousin, etc.), genetic replication is cut by half. Reproductive strategies may evolve in the offspring as well, put there by either the mother or father, or as the result of successfully ensuring that they receive adequate nurturing to attain their own reproductive fitness.

The biological relationship of the sexes has resulted in victories as well as defeats for each sex, in periods of truce, even during periods long-lasting peace and stability. Both male and female strategies are "intended" to ensure that replication of the parent's in a viable and reproductively fit offspring. Keep in mind, however, that such a "selfish" goal may produce a good offspring for one parent at the risk of the life or reproductive fitness of the other. For example, a male might be interested in procreating an offspring that has a larger head or body of value in future reproductive competition, thus more offspring's offspring. Such a strategy might be encoded in the male's Y-chromosome. Giving birth to such an unusually large-headed or large-bodied offspring would pose a danger to the mother's reproductive organs or even her life, preventing her from having future offspring by some other male partner(s). To give an opposite sex example, a female who is mated to a male of somewhat low quality genotype who is assisting her fulfill her maternal responsibilities, might breed covertly with a male she considers of higher quality, leaving the male to expend energy on

helping her raise the offspring, when that energy would be better spent on an offspring carrying his genes. Over such issues, the sexes have tweaked and re-tweaked conflicting reproductive strategies.

The phrase, “battle of the sexes” seems arcane today, as Westernized women and men uphold an ideal of equal partnership in the projects of creating family and society. Yet around a half-century ago in Western nations, the sexes engaged in a clash of historic proportions. Conflict and conquest exist throughout the natural world and so are cooperation and coalition.¹⁷⁷ are found throughout the natural world, as well conflict and conquest; this is as true—or even more true—in the realm of sexual reproduction than other arenas of life. Evidence of the ancient wars of reproduction are imprinted in our bodies and our minds: the battles, the truces, the creative alliances engaged in by a vast succession of plant and animal genealogies. In fact, as I will later discuss the human placenta is itself a zone of war and peace, of truce, of beneficence, resistance, and ruthless exploitation.

Crises in the Mode of Reproduction

The extinction of a species is an irresolvable crisis in the mode of reproduction. Conditions of habitat that impact adversely on reproduction for a breeding population. Ecologists are consistently engaged in the daunting task of understanding the non-linear complexity of habitat changes and the endurance and survival of species.

Any human society must of necessity be a very loosely defined breeding group, due

to factors of high mobility and extensive "out-breeding." Though the evolutionary impact of collective crises and adaptations is difficult or even impossible to determine within existing scientific processes, social theory can and must consider the potential coevolutionary affects of human conditions and behaviors.

Distinct from but closely related to habitat conditions (in the case of human beings, the conditions of production), the mode of reproduction, itself, can undergo novel stresses and extreme variations with the capacity to initiate a reproductive crisis.

Both prehistory and history hint of a series of crises in the reproductive mode. The inability of women to control numerous pregnancies does not reflect a natural state experienced by women of the Pleistocene or the Paleolithic, or even by other higher primate females.¹⁷⁸ Several factors placed boundaries on the fecundity of higher primates and primordial and primitive women. Concealed ovulation empowered women with a degree of choice over the time, place, and partner of a sexual tryst. Maturation factors related to nutrition created a situation in which a typical woman did not bear a full-term child until the age of nineteen or her early twenties. Constant lactation through the nursing of infants for periods of up to five or six years (a practice providing a monumental portion offspring nutrition), had the effect of discouraging postnatal pregnancy for long periods. Social norms in some societies prohibited men from engaging sexual relations with postnatal women for periods extending into years, and other societies even mandated or permitted infanticide of infants born of nursing mothers. About a third of offspring might have died in infancy. As the result of this confluence of factors, childbirth and childrearing were spaced and the

average woman mothered only three to five children into maturity.

These limitations, providing women with some control over their reproductive lives, collapsed with the invention of agriculture, when the procreation and sustenance of multiple offspring became both possible and necessary. Patriarchal social institutions, as well as the agricultural economy, fostered obligatory motherhood of a large brood of children. The march of industrialization over several centuries increasingly produced a crisis in reproduction. Social, biologic, and economic barriers to women's control of reproduction had been removed, yet childbearing was dangerous (becoming more so with urbanization and an increase in infectious agents). Most mothers were unable to provide for children outside of a mated relationship with a male. Crises in the mode of reproduction brought about the *pater familias* of Rome and earlier models of the patriarchal family of Greece and Egypt; the mass exodus of medieval people into monasteries and convents, the Inquisition (which directly addressed undesired practices of infertility and the fertility of undesired populations; and the massive relinquishment of infants surrounding the emergence of the industrial revolution, which can itself be viewed as a crisis both of production and reproduction. Serious reproductive analysis of all of these crises is seldom undertaken because the tools of such analysis have been inadequate.

Reproductive crises occur when macro-interactions between mode of production and the mode of reproduction result in the dysfunction of both. Never is only one but not the other adversely affected, for the balance between production and reproduction (including social reproduction) is fine-tuned. This is why polities have always attempted to direct

reproduction, often expressed in simplistic and gross governance actions to increase or decrease fertility. The affect of reproduction on production is more subtle and only when the reproductive mode holds relative power can it exercise control over the productive mode. Analytical tools are now developing. I attempt on the following pages to elucidate the interaction of production and reproduction, focusing on aspects of feminist thought and activism.

A Test Case: Reproductive Crisis and Feminist Strategy

The Second Wave of Feminism

In an effort to integrate feminist reproductive with evolutionary theory, I focus on a period of feminist thought and action that is known as the "second wave." The second wave is distinguished an earlier historical movement, the first wave.¹⁷⁹ Viewed through a the lens of this dialectic, a compelling narrative emerges of the about the surfacing of the second wave and its course, involving an initial phase of specifically female radicalism¹⁸⁰ followed by a shift in content from the conflict-agenda of radical-feminism to the more impersonal, cooperative and egalitarian approach of gender-based feminism.

“Feminism” describes complex of political theories advancing sexual equality and freedom, and historical movements acting to advance the status of women. Though poststructuralists are fond are using the term “feminisms,” I believe it is possible to treat the term “feminism” holistically. For the present purpose, I define feminism in detail as a tradition of thought incorporating cultural, scientific and metaphysical ideas into an actionable ethic of sexual egalitarianism that promotes the rights and perspectives of human females. While women more than men are likely to embrace and advance the feminist agenda, profeminist beliefs correlate with political liberalism across gender, and some important feminist thinkers have been men.

As a prototype of reproductive analysis, I intend to examine the feminist movement during the latter half of the twentieth century. By the mid-twentieth century, patriarchal institutions in the West failed to serve the needs not only of young and adult women but also

of young men. Tensions and contradictions in the reproductive mode generated a "sexual revolution" participated in by both sexes but in many ways serving the purposes primarily of men. This revolution segued into a highly motivated and articulate feminist revolt responding both to the larger patriarchal order and to the sexual revolution itself.

The conflict-approach of early second-wave feminists forged a collective strategy to effect transformation of the sexual-reproductive mode. Among the primary social and physiological correlates of this "strategy" were a collectively expressed and well articulated anger toward men; a intense motivation to forge female bonds toward common purposes; and the willingness of at least a minority of women to take risks in terms of individual reproductive fitness. While historical and certainly mythical and fictional precedents existed for radical feminist behavior, the early second wave was the first time in history that women launched a collective strategy to place their own individual reproductive fitness at risk, in order to challenge male hegemony over the mode of reproduction. The risks taken included leaving and rejecting marriages, the threat of withholding sex (celibacy), and a popular upsurge of lesbianism.¹⁸¹

The emergence of gender theory constituted an effort to consolidate the gains of radical feminism by shifting reproductive arrangements toward greater intersexual cooperation. Borrowing a metaphor from evolutionary analysis,¹⁸² I define both phases of the second wave as "strategic." I do not mean to imply conscious or disingenuous thought or action on the part of feminist thinkers and leaders, who acted with integrity in both phases of the second wave.

The conflict-approach of early second-wave feminists forged a collective strategy to effect transformation of the sexual-reproductive mode. Reproductive analysis actually emerged in the political theories of radical feminists of the early second wave, reaching peak development between 1965 and 1972. To a remarkable extent, these early feminists articulated a biological model of women's "oppression," a model enabling them to launch a campaign that was not only social but was *sexual*.

In her 1970 book, *The Dialectics of Sex*, Shulamith Firestone traced women's subordinate status to conditions arising from sexual reproductive biology.¹⁸³ Firestone proposed that sexuality expresses the conditions and relations of reproduction and that sexual asymmetry is rooted in reproductive arrangements. Firestone integrated theories of Hegel,¹⁸⁴ Karl Marx,¹⁸⁵ and Sigmund Freud. Putting a brilliant spin on Freud's concept that "anatomy is destiny,"¹⁸⁶ Firestone argued that in the course of human civilization, the destiny of anatomy led inevitably to sexual revolution. She proposed that an adjustment in sexual relations was historically mandated, and charted the course of a female struggle to (re)gain power over the conditions of reproduction.

Firestone boldly states to women, "To grant that the sexual imbalance of power is biologically based is not to lose our case."¹⁸⁷ Many feminists were not so sure of that. Their memory was not distant from the era when monolithic misogyny reigned, a misogyny justified by biologizing the sexes. Radical feminism tore apart the seams of patriarchy but did not provide for a cooperative strategy of progress. Thus, despite the social transformation initiated and inspired by radical feminists, newly enfranchised women of the

political and intellectual elite moved away from Firestone's reproductive analysis, which they defined as "essentialist".¹⁸⁸ Emerging women's studies developed and refined gender theory and a softer, co-sexual agenda, focusing on consolidating the gains of the women's liberation movement. Within the larger culture, separatism and feminist culture flourished.¹⁸⁹ In an effort to seize symbolic strength, many feminists focused on reinstituting of prehistoric female symbolism, introduced in the work of Elizabeth Page Gould¹⁹⁰ and best exemplified in the work of Marija Gimbutas.¹⁹¹ Firestone's reproductive focus became submerged.

Feminism: A Brief History

No fully feminist society is known to exist but within some patriarchal societies a number of more advanced patriarchal societies, major feminist gains have been instituted and many feminist ideas are part of popular consciousness. In recent centuries, feminism has become increasingly specified and organized, not only absorbing other domains of knowledge, but also interacting with and influencing these domains and worldviews. In continually proposing the egalitarian agenda, feminists must diligently mine all viable sources of knowledge, and attempt to uncover the full story of human existence from our origins to the present. Feminists must question not only the text but also the subtext of the theories we produce. The viability of feminism relies on its capacity to extract new and authentic knowledge from the sciences and history, to contribute to such knowledge, and to shun

intellectual rigidity.

Even in classical times, feminist ideas were advanced.¹⁹² Aristophanes' satiric play, *Lysistrata*, envisioned a women's "strike" successfully utilizing a strategy of celibacy to gain peace in Hellenic Greece. In Greece and Rome, a small number of elite women gained prestige in the arts, in religious rites, and even in academic institutions.¹⁹³ During late medieval times and the Renaissance, women's status was extremely uneven.

Women are more likely than men to embrace and advance a feminist agenda, however, profeminist beliefs correlate with political liberalism almost as positively as with gender. Therefore, a large minority of men are profeminist. Women are integral to society and to the family, thus women's welfare directly or indirectly impacts that of children and men, thus, feminism is part of a larger humanist agenda. The relationship between the status of women and the status of men is not inverse, in fact, they often correlate within a society. A high status of women has been associated with more advanced cultures in which one might assume that the lives of all members are improved. Simplistic interpretations of sexual dominance need to be replaced by careful analysis of interaction of between sexual status (both intersexual and intrasexual) with various modes of reproduction.

Feminism as a philosophy and movement in the modern sense may be usefully dated to The Enlightenment with such thinkers as Lady Mary Wortley Montagu and the Marquis de Condorcet championing women's education. The first scientific society for women was founded in Middelburg, a city in the south of the Dutch republic, in 1785.

After the landmark publication by Mary Wollstonecraft of *Vindication of the Rights*

of *Women* in 1972, Charles Fourier coined the term “feminisme” and declared that women's rights were essential to society.¹⁹⁴ From that time forward, the status of women was a topic of discourse debate in Western European thought. Social theorists tended to be far more progressive than biologists, whose unsophisticated observations of natural history fed existing notions of male superiority.

The First Wave of Feminism

By the mid-19th century, the condition of women's reproductive lives was dire. Large families were common and the mothers of these families, even in the middle-classes, worked very long hours producing domestic subsistence. The opportunity for women to earn income was limited at all class levels but especially impacted middle and upper-middle class women.

The basic assumption of contemporary feminism is that gender equality desirable and has focused on how to attain it. Earlier feminists, humbled by centuries of misogyny, took nothing for granted and expended much energy arguing eloquently why sexual equality was desirable.

The first wave of feminism constituted the first modern movement when women as a sex rose up in coalition. Several earlier movements have been documented. Female primates have no problem coalescing, as we will learn in a later analysis of primate behavior. Historically, the commitments of women to their families and communities have

tended to isolate them from other women. Thus, few mass movements by and for women have taken place. The first wave was mostly participated in by elite women is entirely understandable, as they were the only women who had the capacity to form such coalition.

The first wave of political feminism began in England, becoming a powerful movement throughout the United States and Western Europe.¹⁹⁵ In the U.S., the movement was spurred by the participation of women in the campaign for the abolition of slavery. The work of first wave feminists found its opportunity for expression in the "rights" discourse of Jeffersonian democratic principles and abolitionist politics. Beneath these principles of justice, however, these women showed an understanding of the impact of reproduction on the lives of women and families.

Defining women's rights in terms of reproduction was a nebulous project for first wavers. For one thing, sex itself was a taboo topic and even a reference to childbirth was considered obscene in normal conversation. With the exception of only a very few women like Susan B. Anthony, first wave feminists were married women and mothers. Elizabeth Cady Stanton embodies an understanding that the first wave was not simply a struggle of "suffragettes" or even "suffragists," but also a struggle to alter conditions reproduction. Stanton managed to become the leading feminist philosopher of the first generation of women's rights activists despite raising a family of seven children. Though she co-published a newspaper entitled, "The Revolution," Stanton resisted active engagements during periods when nursing her children. Her rhetoric was inspirational and in the tradition of advancing democratization: "Nature never repeats herself, and the possibilities of one human soul will

never be found in another. No one has ever found two blades of ribbon grass alike, and no one will ever find two human beings alike. Seeing, then, what must be the infinite diversity in human character, we can in a measure appreciate the loss to a nation when any large class of the people uneducated and unrepresented in the government. We ask for the complete development of every individual, first, for his own benefit and happiness."¹⁹⁶

Inherent to Stanton's eloquence were the insights gained from her own maternal experience and her understanding of how issues of equality relate to women's reproductive lives. Original proposing women's suffrage at Seneca Falls in the face of shocked approbation, even from other women attending the conference,¹⁹⁷ her actions throughout her life made it clear that the right to vote was essential to women gaining power over their reproductive lives. Stanton fought to secure secular recognition of marriage as a contract, divorce reform, custody rights for mothers. Along with Susan B. Anthony, Stanton launched a campaign to expand the New York State Married Women's Property Law.

First-Wave Feminists and the Theory of Evolution

The first French translator of *Origin of the Species*, Clémence Royer, believed Darwin's theories could be applied to society to attain humanitarian progress. An anthropologist, natural philosopher, and encyclopedist, she was a feminist. and a social Darwinist.¹⁹⁸

Penelope Deutscher provides an insightful examination of first wave feminists who focused on the biological nature of the sexes. To the feminist social evolutionist, Charlotte

Perkins Gilman, the theory of evolution was the most important for feminism that “has ever come into the world.” Like other social Darwinists, she interpreted evolution as a narrative or progress that applied to humanity as well as other creatures. A male feminist social evolutionist, Lester Ward, proposed a “gyanaecentric” vision of women’s “biological superiority” based on the reproductive role.

First wave feminists took Darwin to task for remarks in his text that disparaged women and struggled to contain and dispute mythologies of women’s inferiority buttressed by his work. In *The Evolution of Woman*, Eliza Burt Gamble asserts that ‘his ability to ignore certain facts which he himself adduced...is truly remarkable.’ Darwin was no more sexist and somewhat less racist nor sexist than the typical British middle to upper class male, whose views in both respects were abominable by today's standards. He accepted without question the predominant belief of his time that women were the inferior sex.

More notably, Darwin's conclusions regarding male and female traits derived from his own unsophisticated view of sexual selection. Since he invented the theory, it would be foolhardy to blame him for not being privy to future elaborations. He attributed positive attributes to women based on the maternal function, and also believed that epigamic selection (the "principle of female choice") was a factor responsible for much that is positive in humans (and males). He guessed that even in the "higher" species, hermaphroditism might underlie sexually expressed traits.

Antoinette Blackwell posed the possibility if not the necessity of a feminist analysis based in evolutionary science. Blackwell held that Darwin’s theory cleared the slate for an

inventive naturalistic reassessment of the sexes. “It is to the most rigid scientific methods of investigation that we must undoubtedly look for a final and authoritative decision as to woman’s legitimate nature and functions. Whether we approve or disapprove; we must be content, on this basis, to settle all questions of fact pertaining to the feminine economy.”

Margaret Sanger, the early twentieth century advocate of birth control technologies, was also a Darwinian and a eugenicist.¹⁹⁹ Unlike many other eugenicists, Sanger's views were democratic rather than autocratic. From 1916 onward, she disseminated information on birth control and advocated for the development of safe, scientific methods. Millions of women wrote her requesting information on birth control, which she disseminated both in lectures and written handouts, and for these efforts, she was jailed on “obscenity” charges. She believed that the democratization of birth control technologies and rights would, without any fiat from above, result in enhancing the human species. In this belief, she distinguished herself from Darwin and other evolutionists, who worried that lowering fertility rates would result in the decline of the species. Sanger founded the organization that was to become Planned Parenthood. As a nurse, she learned first-hand of the health and social problems of women who faced one pregnancy after another under circumstances where they and their children were often wholly dependent on a man for livelihood. Margaret Sanger spent time in jail to fight for sex education, and for distributing contraceptive information and contraceptives.

The beleaguered leaders of the feminist first wave took on a daunting task of confronting a monolith of misogyny during the 19th and early 20th centuries. With great

energy and brilliance, these women laid the foundation for a strategy of sexual egalitarianism. Their radical ideas gradually submerged into mainstream suffragism, which dissipated when women obtained the right to vote. The reforms in marriage, divorce, custody law, and birth control were major legacies of the first wave, legacies as important as the vote.

Another class of women, female factory workers of New York and other big cities, expended Herculean energy as mothers raising children in crowded and unsanitary urban neighborhoods and who, themselves worked under harsh conditions and long hours. These women were bold activists and leaders, whose contributions to the union movement around the turn of the century were legendary.²⁰⁰

The Mid-20th Century Crisis in the Mode of Reproduction

By the close of World War I, organized feminism was in decline. Reforms in marriage, divorce, custody law, and birth control were major legacies of the first wave, legacies as important as the vote. The focus of the movement, finally, on attaining the vote, led to its demise once the vote was attained. Like the second wave that followed, the first wave of feminism was annihilated by its success.

Despite the dwindling of organized feminism, a new sense of modernity excited and inspired women. Many embraced the egalitarian views of suffragists, and the optimism to believe that they could unite maternity with interests previously thought to be the purview of

men, such as art, philosophy, and work outside the home. Leftist political thought incorporated some feminist ideas though the cause(s) of the male worker took clear priority. A tiny minority of elite women began to achieve high education and to excel in the professions. Women's expectations, especially the expectations of educated women, had been raised, and did not fade over the next decades.

During World War II, economic necessities thrust women from the domestic sphere into the sphere of production, a task the sex commenced with great ability. Fabled hardhats like "Rosy the Riveter" were seized on by the government to promote the idea of such work for women. But with the return of men from Europe at the close of the War, women were not simply asked but were unceremoniously dumped from their autonomous work lives, and indeed some fled the jobs to begin creating families that had been delayed. "Protective laws" were instigated to ensure that postwar females no longer risk their delicate sensibilities by moving machines, carrying tools, etc.

Marriage and divorce and custody laws, initiated by and for women, soon operated for the benefit of men as well, with the result of greater numbers of broken marriages and female-headed families. Many men returning from the War suffered substance abuse problems, further increasing the plight of women who had returned to the home to raise young infants. The demands of late-industrialization were such that work became the main measure of life.

By the late 1950's, infrastructural shifts are well documented showing increasing wealth stratification, suburbanization and increasing distance from home to work sites,

increasing divorces, These shifts occurred primarily in the very broad and populous "middle" class (meaning the working class to upper-middle class but not the poor and the wealthy), which in no way erases their historic importance.

Seldom noted is the fact that leading up to the feminist second wave, members of both sexes challenged the existing patriarchal order in different ways and for different reasons. Postwar male-female relations and sexual institutions were the cauldron from which the second the women's movement.

Freudianism²⁰², which reached the height of popular saturation in the 1950s, defined women as bound by their anatomy to inferior sexual and emotional status.²⁰³ Women's participation in the labor force steadily increased, though social norms continued to deify the male-supported nuclear family, with the result that both working women and men whose wives worked experienced alienation from the dominant model of the family.

The popular perception that safe birth control technologies were accessible launched a dramatic change in attitudes toward sex and marriage. Among the middle classes, suburbanization increased the isolation of women, the separation of the sexes, and the increasing alienation of both sexes regarding their lives.

Sexual disequilibrium was one of several major consequences of the post-war baby boom. With increased population came increased demands on natural resources, social capital, and human capital. The baby boom matched with increasing longevity brought home to roost the impact of rapid increase in population. With the devaluation of persons, reproduction was devalued along with of those whose primary role was defined as

reproduction: women. Excessive competition for resources with others of the same boomer generation accompanied women's increasing entrance into the job market.

The initial response of baby-boomers to these competitive pressure was anti-competitiveness, as expressed in mass collective movements ("everybody get together, try to love one another right now!").

Young men rebelled against traditional patriarchal notions of the male reproductive role and many withdrew from participation in it. The rebellion of young-Turks like Allen Ginsberg and Jack Kerouac created a splint in the otherwise rigid, somber, and monolithic patriarchy of American in the 1950s. "Beatniks" challenged the straight male stereotype. "Hippies" followed on the heels of beatniks during the sixties, and the gay male movement took fire in the late sixties. Males committed to non-reproductive goals and lifestyles increasingly dominated the youth culture. In many times and places, hordes of "bare branches" have fueled the needs of the military, of militia or even organized criminal activities. These are men unable or unwilling to make reproductive commitments due to over-competition in mating, often due to shortage of women.²⁰⁴ Young American males of the mid-century were not, technically speaking, bare branches, but did defer reproductive competition as well as in some cases, economic, competition (which is linked). The reasons for this are not entirely clear. I speculate that population pressures of these "baby-boomers" coming of age, combined with the increasingly unclear benefits of the established patriarchal role combined to result in a turn away from reproduction. These youth questioned the role of the straight-shirted monogamous male breadwinner. Unlike male "hordes" of prior history,

these new congregations of youth rejected the call of militarism.

The explosion in popular music was replete with male rebellion against their given gender role in lines of varying playfulness or seriousness. In the musical comedy, *Hair*, when a character is asked about his long locks and decorative appearance, he sings, "That is the way it is in other species!" Bob Dylan's classic verses in "It Ain't Me, Babe" spoke eloquently against the role young men were expected to play with women.²⁰⁵

A less thoughtful expression of the rebellion of young men against the traditional patriarchal role was the "Playboy philosophy" that emerged in late 1950s and reached articulate expression in *Playboy Magazine*. Playboys rejected the role of the monogamous male breadwinner as limiting both their income and their sex lives. Accordingly, it became popular among young men to scoff at norms promoting respect for "chastity" in women, and to opt into the view of women as sexual playthings. New challenges to the dogma of women's inferiority threatened some men, whose identity depended upon being superior to females.²⁰⁶ These attitudes lent impulse to a trend toward greater sexual aggression among sectors of young men.²⁰⁷

The pressures felt by young men, and freely expressed from a position of comparative gender entitlement, bore down even more heavily on women. A rapid increase in postwar population affecting urban and rural sectors was accompanied by a surge in technological capital, generally devaluing reproduction and those whose role was defined as belonging to the reproductive sphere. Young women endorsed freer sexuality as well but without real access to tools of reproductive control, which included not only (a lack of)

ready access to safe birth control and abortion technologies, but also a lack of knowledge about their own bodies and sexuality. In the decade before *Roe v. Wade*, a dramatic and unprecedented increase occurred in pregnancies of and numbers of children born to unmarried women. Between 1960 and 1970, the illegitimacy rate in the U.S., doubled, from 5.3% to 10.7% of all births, with a corresponding rise in relinquished children.²⁰⁸

Married women faced higher risk marriages combined with lower income potential. Divorces increased year by year and formal techniques of collecting court-ordered child support were non-existent. In the U.S., by the mid-to-late 1950s, the standard sexual norms of the male-led and male-supported nuclear family were no longer a credible guide for either sex, yet new norms were yet in a formative phase.

Male-female arrangements were never ideal under human patriarchy, but in the Western post-war generation, the unwritten rules of patriarchy were flagrantly and consistently violated. For women, these normative expectations included male resource mobilization to provide adequate support for women as homemakers and mothers, and for their children. For men this meant certainty of superior, having the full pie of economic earning power to compete with other males for; and being able to count on female chastity and fidelity. The drift from the norm in each of these aspects was slight but enough to destabilize the institutions of patriarchy. The “sexual revolution” was in full sway when it came to sex but in terms of male-female interaction, it was an anomic (normless) revolution, without clear benefits or conscious direction, characterized by miscommunication between the sexes and especially penalizing young women.²⁰⁹

Mid-20th Century Feminists

Feminist theory has focused precisely upon intersexual asymmetry, though reproductive theory as a conscious formulation began with the second wave of feminism. Beginning as the “women’s liberation movement,” the second wave emerged in the mid-1960s as the visible eruption and hallmark of a longer, more intense and conflicted period of transformation in gender relations. The radical feminism movement of the mid-1960s through early 1970s forged a dialectical political theory based in sexual reproductive roles. Radical feminists engaged in a militant confrontation with society and with individual men as well as social and behavioral norms.²¹⁰ In Westernized countries, this confrontation ended in a structural shift in gender relations.

As the mid-20th century crisis in the mode of reproduction, progressed, feminist intellectuals, like other women, endured the fulcrum of these structural pressures on youth and the family. These women were also exposed, however, to an expanding volume of information about the female sex that empowered their sense of identity. They were energized by news from the sciences and social sciences lending credence to an ideology of sexual egalitarianism. This information included increasing knowledge of the biological basis for determining the sex of offspring²¹¹ and the process of fertilization and birth, itself,²¹² increasing knowledge associating health and endurance factors with female biology,²¹³ and the uncovering of archaeological sites such as Knossos in Crete and Chatal Huyuk in Southeastern Europe, which provided evidence of matriocentric power and relative sexual equality in early societies.²¹⁴ Societies valuing women need not have been

"matriarchal", matrilocal or matrilineal. For example, bonobo females leave their natal home to mate with males, but females enjoy high status among bonobos. On the other hand, patrilocality combined with patrilineage and wealth stratification would suggest a devalued role for women.

By the time Simone de Beauvoir's *The Second Sex*²¹⁵ reached an American audience in the 1950s, academic women and men, authors like Anna L. Rose Hawkes, Jessica Barnard, and the pro-woman anthropologist, Ashley Montague,²¹⁶ had begun to seriously observe and study the changing lives of women and to ponder the call for an adjustment long overdue in the status of women. These intellectuals began to popularize new perspectives from science and social science that woman was not the faulty, inferior sex constructed and popularized under patriarchy. In 1962, Betty Friedan's widely read book, *The Feminine Mystique*, placed feminism into firmly into public discourse.

The Women's Liberation Movement (1965 - 1974)

A recent article in the New Yorker claimed that Betty Friedan "launched a revolution"²¹⁷ In fact, Betty Friedan was one among many late-fifties/early-sixties intellectuals, both women and men, who articulated the increasingly visible problems of sexual arrangements, but were forbears rather bearers of revolution. In 1966, Friedan began with others a liberal reform organization, the National Organization for Women.

During that same year (1966), Juliette Mitchell wrote "The Longest Revolution," the

first manifesto of leftist women. A year earlier, the French author, Monique Wittig, published a remarkable novel, *Les Guérillères*, about a militia of self-sustaining women engaged in world sexual warfare with men.²¹⁹ The endangered state of new womanhood was given archetypal expression by the poet, Sylvia Plath. In 1965, after her death, Plath's *Ariel* was published and massively read. While not a political feminist, Plath gave voice to the rage and internalized misogyny of women. Her expressed anger, "pure as a gold baby", and a self-hatred that took ownership of its own misfortune ("every woman loves a fascist").²²⁰ Suicide and warrior resurrection was the horrific solution the poet proposed (and carried out) to redress her abuse as a woman artist ("Out of the ash/I rise with my red hair/And I eat men like air"). Her life, death, and work of inflamed feminist sensibility.

These three works, coming from disparate locations, were among the first of many theoretical (and heretical) writings by women that mushroomed across America and Europe.²²¹ Marxist-feminist tracts populated the pages of left wing journals. Most significantly, a new breed of woman-oriented thinkers emerged. Academics and office-workers, housewives, "spinsters" and lesbians poured from their various isolated and internal spaces (homes, campus and office buildings) into meeting rooms and onto the streets.

Early second wave feminists did their homework, earnestly poring over the ideas, successes, and failures of the first wave. They concluded that first wave feminists had asked both eloquently and elegantly for an equal place, but never attained it. The rhetoric of asking was over; it was time to formulate strategies of demand. Political thoughts swept like rumors

across this "strange new vine",²²² by word-of-mouth, mimeographed papers, or journals forged by novice publishing collectives.

The new women's movement was "at heart, a massive complaint,"²²³ but it was also a massive political strategy, led by a decentralized, dynamic, and hybrid core of women who lived and breathed sexual revolution, including Katie Sarachild,²²⁴ Dana Densmore, The Redstockings Collective,²²⁵ the W.I.T.C.H. Collective, The Chicago Women's Liberation Movement, the Boston Women's Collective, Kate Millett, Robin Morgan,²²⁶ Pat Mainardi, and Valerie Solanis.

Shulamith Firestone

The overriding theorist of the second wave was Shulamith Firestone. Firestone's first principle was: "The freeing of women from the tyranny of their biology by any means available, and the diffusion of the childbearing and childrearing role to the society as a whole, to men and other children as well as women." She claimed that: "Feminists have to question, not just all of Western culture, but the organization of culture itself and further, even the very organization of nature."²²⁹ She goes on to say, "...biological contingencies of the human family cannot be covered over with anthropological sophistries."

Sexual interaction, based in biological reproductive roles, formed the core of male-female relations. "Sex class is so deep as to be invisible," she writes in the opening line of *Dialectics*. She goes on to assert, "Until a certain level of evolution had been reached and

technology had achieved its present sophistication, to question fundamental biological conditions was insanity..." Proposing a new feminist dialectic, Firestone noted, "That so profound a change cannot be easily fitted into traditional categories of thought... is not because these categories do not apply but because they are not big enough: radical feminism bursts through them." Firestone was also a humanist understanding that both sexes suffered in the last stage of patriarchy, industrial capitalism. She idealistically proposed the feminist revolution was part of a larger shift toward "cybernetic socialism," prefiguring later feminist analysis of technocracy.²³⁰

Firestone called for "an analysis of the dynamics of sex war"... "For we are dealing with a larger problem, with an oppression that goes back beyond recorded history to the animal kingdom itself." (The Dialectics of Sex, 1970).

Shulamith Firestone broke ranks with feminist apologism and forged a theory of biological sexual oppression. Walking in the footsteps of Antoinette Blackwell,²³¹ Firestone was not at all interested in weighing the relative superiority of maleness and femaleness. Indeed, her perception of the oppression of female biology was profoundly demeaned and exaggerated. She placed heavy emphasis upon the utilization of technology to remove the biological impediments in woman's path. Yet her analysis was dynamic and dialectical, charting a modern female strategy of seizing control of the factors of reproduction in order to forge sexual equality. She argued that during human prehistory, the biological demands of female reproduction and maternity were the impetus for in the intensification of human culture and technology. This she classified as the "matriarchal" phase. Yet this very progress

in human civilization placed women at an increasing disadvantage. Saddled with the immense role of primary reproducer of the species, women were limited in participating and controlling the course of civilization. Men, who were less personally bound to the biological requisites of reproducing the species, gained sociocultural and technical prowess, and consolidated these gains through the advance of patriarchal institutions. As civilization evolved, women's greater energy and time commitment to reproduction of the species put the female at an ever-increasing disadvantage in face of the acquisition of human cultural, social, and economic development. This burden on women was not offset by the contributions of males, who used their relatively greater freedom men to develop technology, control wealth and build increasingly complex institutions, through which they eventually developed a systematic process of sexual domination, a successful male strategy to control the means of reproduction. According to Firestone, human patriarchy not only subordinated women's reproductive power and human cultural potential but also reversed of the parent-child commitment in nature, compelling children to become the servants of their parents. Even monogamy was a trade-off within the patriarchal system between high-status and lower status males. No matter how bad off a man might be under patriarchy, he could take comfort in being the "master" in his own home.

Firestone's theory was, consciously or unconsciously Darwinian. She conceptualized humanity within the realm of the natural and animal world and envisioned a dialectical process of sexual relations around reproduction. Firestone called for "an analysis of the dynamics of sex war"... "For we are dealing with a larger problem, with an oppression that

goes back beyond recorded history to the animal kingdom itself.” Rather than seeing science and technology simply as male weapons of control, she saw human technocracy as a tool that could and must be seized by women on behalf of their own sex. She focused extensively upon the condition of children under patriarchy, emphasizing the biological connection between women and children, especially in the mammalian world, and foresaw an activist role for children in opposing their subordinate status. She conceived of the war of the sexes as dialectical, concluding that anatomy, while a factor of the greatest importance, was not destiny. Finally, she charted a plan of victory whereby women could take charge of their lives and become the sexual equals of men. Irrespective of the efficaciousness of any aspect of the plan, a strategy emerged, like that of Karl Marx, inevitably and irrevocably from the analysis itself.

Lysistrata, Performed in Real Time

Firestone was not alone among radical feminists in casting the sexes as antagonists, in casting men as the personal exploiters in dominion over women and children. *Sexual Politics*, the title of a work of the same period by Kate Millett, became an iconic expression of the women’s liberation movement. “Sexism” “male chauvinism”, and “patriarchy” and other terms either invented or popularized illustrated new tools of analysis in place of what had been merely inchoate perceptions.

Second wave feminists blamed sex and sexuality, and proposed specifically sexual strategies. In a book containing a series of diagrammatic proposals for change-oriented activism,²³² and through widely attended lectures on college campuses across the country, Ti Grace Atkinson proposed that all women commit to celibacy and political lesbianism until equality was achieved.

Anne Koedt²³³ cited *The Masters and Johnson Report*, stressing findings that the pleasureable experiences of the female orgasm were localized in the clitoris with only secondary vaginal responses. Since women's orgasmic pleasure was greater in activities other than vaginal penetration (a finding of the *Report*), heterosexual intercourse was an

demand, a rejection of marriage, the requirement of self-sufficiency for women, the valorization and legitimization of single motherhood, a rejection of terms such as "illegitimacy" and "Mrs." that indicated male-centrality of the family, a rejection of the traditional notion of a male God and maintaining phallic dominance, and an adherence to a common bond of womanhood (sisterhood).

However, one feels about the extreme positioning of radical feminist, few can deny the power of radical feminist theory and activism, based in a vision of dialectical struggle of the biological sexes. Radical feminism mobilized women (and sympathetic men) to seize the agenda of the power elite. The movement coerced men into an apologetic stance and enabled nonpoliticized women to negotiate a stronger position around the conditions of sexual and reproductive relationships. A perceived imbalance moved toward equilibrium in gains in sexual equality. Even in highly patriarchal nations, ideas of the second wave influenced women's organizations and governmental policy.

In summary, second wave radical feminists focused on sexual biology and reproductive norms, proposing specifically sexual strategies. They defined the relationship of the sexes as a personal-political relationship in which males had secured an unfair imbalance. In an historic eruption of organized anger, they aggressively denied males access to the sexual act and domination of the conditions of reproduction. Their numbers were small but sufficient. Popular culture adopted the neo-feminist vocabulary, many of its ideas, and a large portion of its agenda. Despite the power of the counter-wave, the

Leviathan of westernized culture has shifted to new waters and the second wave washed ashore.²³⁵

The Effect of Long Term Population Trends

Underlying the temporal crisis of reproduction were long-term more foundational trends, without which the gains of feminists would have been difficult if not impossible. The most important underlying trend was the demographic transition (discussed above), that brought socioeconomic pressures on industrial and post industrial nations to limit fertility. The limitation of fertility and the status of women often coincide,²³⁶ as in the mid-to-late 20th century when postwar population growth had reached the limits of the capacity for political economy to accommodate. A focus on restraining births combined with westernized practices of relative democracy, combined to increase reproductive technologies. To the extent that access to reproductive control was (and is) available to women (due to the need to limit population), paradoxically, on a personalized basis, the value of human life increases, and therefore the status of women (as bearers of life), within the family and personal relationships. From an evolutionary perspective, the paradox arises from the contradiction between individual vs. collective fitness goals. The valuation of women and children as a correlate of reproductive choice makes perfect sense. In the face of constraints upon multiple births, the innate desire for reproductive fitness in males (as well as females) encourages a focus on maternal and child vigor (women's rights and human capital

investment). This is why, during the sixties and seventies, the increasingly massive involvement of fathers as participants in childbirth and in early infant care, corresponded in time with the emergence and availability of abortion rights.

The Shift in Strategy from Sex to Gender

The turning point of the second wave from attack mode to consolidation mode is difficult to date precisely; it began in the early 1970s among academic feminists and took some time to become the predominant way of thinking in popular consciousness. Scholarly feminists believed that radical feminism were able to tear apart the seams of patriarchy but not to provide for a practical or cooperative strategy to consolidate its gains. Cultural feminism was introduced in the work of Elizabeth Page Gould,²³⁷ and best exemplified by UCLA anthropologist, Marija Gimbutas.²³⁸ A librarian, Gould romped encyclopedically through a massive amount of material, flattening out prior considerations of validity, which she believed were based on biased patriarchal attitudes. Her book was not only influential, but her process of assembling information heralded mass-information techniques utilized today on the Internet. The renewed interest in myths and antiquities suggesting a primordial "Great Mother," inspired the creation of a separatist women's culture, and a new scholarship ranging in quality from high scholarship to popular derivative works.²³⁹ Cultural feminism has since integrated into mainstream culture, producing lasting effects in gender attitudes, traditions of women's health, women's music, etc. The diffusion of cultural feminism

mystified the period of the seventies by giving symbolic voice to the formative energy of radical feminism while shedding its rational, analytical and politically transformative power.

On the scholarly front, Sherry Ortner and others disparaged Firestone's ideas as essentialist.²⁴⁰ Essentialism was defined as a tendency to categorize the sexes through biological polarities, in which "woman" as a biological category was burdened with the trappings of both patriarchy and modernism. Other writers forging the victory of anti-essentialism in feminist scholarship included Judith Butler, Marilyn Fry, Diana Fuss, Elizabeth V. Spelman. These postmodern theorists pointed out that essentialism resonated with rigid patriarchal ideas of opposition of the sexes within nature, and the resulting preoccupation with dominance and subordination. Even the inspiring novelist, Monique Wittig, who had earlier envisioned a culture of female separatism, seemed to turn against essentialism.²⁴¹

Anti-essentialist revisionism did not deny women's embodiment; instead, sexual and physical qualities must be factored into a broad perspective on a sophisticated and multilevered human experience in which social, cultural, and political norms presided over biology. "Bodily experiences may seem self-evident and immediate but they are always socially mediated."²⁴²

Gender denoted the totality of socially recognized male and female traits and behaviors, attributed to social roles. In gender theory, biology can influence social roles but gender is never described as a biological phenomenon but instead as a phenomenon emerging in role relations. The term "gender" originally defined a feature of grammar

common to Indo-European languages in which nouns were modified by feminine, masculine, and neutral adjectives (such as "la," "el," and "das". The reasons for specific and even general use of these definers are unknown though it is possible that ancient speakers personified objects in the landscape and made judgments as to their sex. Eventually, someone's perspective won out, so that a tree came to be understood (and spoken) as a male and an ocean came to be understood (and was spoken) as female. Even now, French rivers are commonly referred to not as "objects" but as though they are persons with titles, e.g., "La Riviere Dordogne."²⁴³

Feminist use of the term was popularized in the early seventies. Ann Oakley entitled a feminist anthology, "Sex, Gender, and Society."²⁴⁴ The philosophical work of Simone de'Beauvoir preceded gender theory in that de'Beauvoir asserted, "woman was made, not born."²⁴⁵ Gender was initially (and perhaps best) defined as "the cultural transformation of biological sex differences into stereotyped and dichotomized expectations of the attributes of women and men."²⁴⁶ Studies of gender became increasingly multifactorial, understandably, but the term, gender, has correspondingly become "unstable" and "unsituated."²⁴⁷

Gender-based theory enabled women to consolidate the second-wave by smoothing out ruffled feelings of men (and of women who had not been onboard with radical feminist notions of conflict); by creating new and wider venues for cooperation between the sexes; and by minimizing lingering attitudes that polarized the sexes and demeaned women.

Gender theory resonates with some aspects of evolutionary theory. "Experience is not merely constructed but also is itself constructing."²⁴⁸ Evolution results from the

phenotype's interaction with the environment. The phenotype (the living organism) is faced with myriad, complex and often unique situations. The genesis of the future is determined not by the heritable traits of the genotype but by the many projects of the organism facing daily exigencies of living, reproducing, and enhancing the chances of its kin. Life experiences, both reactive and proactive, of the phenotype, combined with random chromosomal variation, determine the future genetic future. Newtonian principles dissolve in a roiling pot of grits to be articulated in a new and altered context.²⁴⁹ In the same sense, biological determinism reaches its limits in the chaos of existence.

As a sexual strategy, the radical second wave may have altered phenotypic expression of male and female in the westernized world. If egalitarian relations between the sexes continue over multiple centuries, a change in genotype will be forged as well. Effective as a consolidation strategy, gender theory became part of many institutions and played a leading role in the proliferation of general social science theory and research. While the approach did not discount the role of biological factors, gender studies gradually moved further away from the biological sciences and more firmly into role theory and preoccupation with multiple, statistical factors affecting sexual role and status.

The commitment to gender theory increased feminist skepticism of biological accounts of human behavior. This resistance is beginning to change. Sociobiology has been largely male-oriented, but casting stones from the sidelines is a cowardly intellectual act. Men have a right to see the world through their own eyes. In their 1997 article, "The Mask of Theory and the Face of Nature," M.F. Lawton, J.C. Hanks, and W.R. Garstka show how

good field research requires the eyes of both men and women. Men, as sexual reproducing primates and members of the animal kingdom, should be expected to look after their own interests, certainly including reproductive interests. Women's perspectives on the biological substrate of human behavior and society come to the fore when women in large number pursue thoughtfully and creatively the questions posed by evolutionary biology. Despite the existence of dangerously presumptuous pop-evolutionist works, a good deal of research in evolutionary psychology and related fields is thorough and empirical, and challenges traditional social science theory as the "final solution" to all social ills.

As an early second wave activist, I see on the contemporary horizon a very mixed pastiche of feminist gains and losses. Reproductive rights, never as far-reaching as sought by radical feminists, are dissembling piece by piece, and suffered a severe blow in the recent decision of the U.S. Supreme Court. No matter how sincere and industrious have been the efforts of current feminist leadership, we are losing the struggle for reproductive rights. The "Mommy Track" (or simply "Parenting Track") is mostly a lexical exercise. Sex stereotypes are commodified into Barbie Dolls and faceless armed and armored monsters gifted respectively to little girls and boys. Female soldiers and national guardsmen are taken from nursing infants to fight a war on the other side of the world. The consolidated gains of gender theory are now eroding.

Currently, gender theorists are preoccupied with juggling multiple, statistical factors affecting sexual role and status, even as the gains of the second wave diminish. Neofeminist scholars have embraced postmodern theories of social construction, in which ascribed

identity plays a more powerful role than biology in affecting the lives of women. In denying the necessity of rooting gender in sexual differences, gender theorists cast out the positive with the negative and the baby with the bathwater. As taught in many women's studies departments today, *gender has no sex*.

Reproductive behavior is rooted in sex and sexual interactions. Traits, behaviors, and events related to sexual reproduction form the core of many issues faced by women, children, and men. Despite its softening and collaborative attributes, the "gender studies" strategy followed for the past three decades requires serious rethinking. A more nuanced analysis of "gendersex" must be formulated.

The Contemporary Generational Divide

Younger women currently tend to identify as feminists and with basic feminist issues, such as equal employment and reproductive "choice." More young men than ever before share this

"profeminist" posture/ However, there is an important generation gap among young and older feminists. For young women and especially young men, gender is simply not "where it's at" in terms of their lives and priorities. Several factors contribute to this. Consumer society has encouraged gender stereotyping as well as other ideational division and fragmentation. Older women who over several decades dominated the institutional remnants of the second wave have finally begun to move aside. The tenacity with which a few second

wave feminists continued to cling to leadership of institutions like NARAL²⁵¹ Such clinging to power and "bragging rights" understandably caused resentment among younger women, who began to identify on a more generational than gendered basis.

Many younger women simply no longer understand what second wavers of the 1960s and 1970s were fighting about. As the beneficiaries of second wave achievements, younger women did not see the world with the sexually charged ideological "spectacles" of their mothers, aunts and (in some cases) grandmothers. Gender inequality was by no means solved, they recognized, but its more jagged edges were smoothed, making positive relationships between and within the sex far easier.

The abstract, academic direction of gender theory (a direction that is currently reversing) told a new and drabber narrative of the feminist battle, lifting it out of the streets, living rooms and basements of common women into rarified scholarly homilies on postmodernism, the dangers of "essentialism," and "point-of-view" philosophy.

A study of the confluence of these and other factors remains to be done. Contemporary feminism enjoys wide acceptance, decreasing efficacy, and little depth. Reproductive rights are in a shambles. Teenage girls contract unprecedented rates of venereal disease. Second-wave leadership is seriously eroded. Without making a judgment on the relative merits of the candidates in the 2008 Democratic Primary or their campaigns, it is clear to me larger social elements underpin the unraveling of events. Media bias against presidential candidate, Hilary Clinton, has been pervasive and unapologetic. While older women support her, droves of younger women prefer her youthful male rival, accepting the

gratuitous label of "Barackazon(s)." This gap in political preferences of older and younger women, reinforces my view that feminism is experiencing an important and widening age fissure, similar to the discontinuity in beliefs and lifestyles of younger and older women during the 1960s and 1970s, and the during late 1920s and 1930s.

A new convergence of feminist ideas and strategy is overdue. The generation gap will probably get worse before it closes. An in-depth focus on reproductive theory is the path to a new synthesis.

As in the early formation of the second wave, new directions must be forged by scholarly feminists. Radical ideas and strategies will form through new communication/activist enclaves of women similar to the "consciousness-raising groups" of early second-wave united community and scholarly feminists. Technological communication must fill in for social disintegration, to produce an Internet/real-life enclaves eventually bringing about massive social enactments. I am tempted to dub such a strategy "grounded networking." Grounded networking of a different sort is precisely the strategy that, as I will explore further, is often used by female primates (and male affiliates of females) to assist in maternal reproductive fitness: performing intricate affectional and communicative bonds necessary for primate society; maternal assistance and co-nurturing assistance by younger, older, and related females; and ganging up against abuse, bullying, and infanticide. These group tactics have not always been successful. Plus, expressions of mate and status competition, fighting and occasional brutality among female primates are facts ensuring that no one retains a utopian view of female bonding among primates or primordial humans. Like all bonds

among animals and humans, the bonds of females are fraught with contradictions between individual and collective survival and fitness.

Grounded networking has the potential to generate new and creative confrontational strategies forged by an effective minority of women and men through a cosexual new wave. If this movement is to attain success, its goal will be to wrest reproductive control (from birth control through bioengineering) from the hegemonic global order, and into the individual-collective hands of transnational civil society. Spurring the reproductive revolution will be humanist and ecological principles, including not only ending reproductive coercion but also expanding reproductive access and fitness to ensure greater human diversity and to protect the diversity of plant and animal life.

The Evolution of Evolutionary Feminism

As documented above, during the mid-to late 1960s, radical feminists forged an analysis having the capacity to incorporate evolutionary theory. In the early 1970s, feminist intellectuals defined radical feminist theory as "essentialist" shifting the focus of feminist analysis from sex to gender. In continually proposing and arguing the egalitarian, feminists must diligently mine all viable sources of knowledge, and this includes a serious effort to uncover the full story of human existence, from our origins to the present. Those who wish to combat the pernicious staying power of human patriarchy need to reassess feminist theory.

In *The Death of Nature*, Carolyn Merchant tracks resonances over the course of the Enlightenment between scientific and cultural ideas, showing how cultural ideas both enabled and justified the scientific-industrial revolution.²⁵² She concludes that ideas and processes take on power (are “invented”) when required by changes in the socioeconomic substructure. The confluence in timing of second-wave feminist theory and the theories of Trivers and Hamilton may be an example of such a synchronous response to underlying conditions,²⁵³ in which tensions in the means of reproduction resulted in an historic transformation in gender.

Contemporary sexual-selection theory shows that cooperation of the sexes is based in biology and evolution, moreover, that the battle of the sexes is real, that it is dynamic, and that it must be addressed in a realistic assessment of gender relations. Offspring can benefit from cooperation of parents of both sexes, as well as from a creative dual of the sexes over reproductive power, so long as the politics of reproduction are not based in rigid social structures of exploitation and subjugation. A committed investigation by feminists of sexual selection and parental investment theory could have led the way toward a reproductive theory of intersexual conflict and cooperation. Firestone's reproductive analysis was prophetic but only a careful study of reproductive relations within evolutionary science will enable humanist-feminism to "seize the means of reproduction." Over three decades later, Patricia Adair formulated a theory of "sexual dialectics" based in Trivers' formulas of parental investment. Power conflicts between the sexes lead inevitably to the selection of strategies to control the reproductive environment, e.g., the mode of reproduction.

This brief intersection of political and scientific in the late 60's and early 70's highlighted a missed opportunity. Trivers' work in evolutionary science might have been extremely useful to feminist reproductive theory in providing further evidence and direction to Firestone's ideas. The mainstream-feminist turn away from biology was understandable in view of the way biological categories were misused in an overly dualistic manner to "prove" the "inferiority" of women. A greater feminist presence in social biology and natural history, however, might have modulated male-orientated speculations rampant in these fields, in which gender-blindness led to misleading science.

We have already described "the killer ape" theory as an example of how male-oriented thought has dominated natural history discourse. Feminists must redefine the dominant discourse in evolutionary psychology and related fields. About the conditions of reproduction, which are most relevant to feminist analysis, evolutionary theory provides not only answers, but questions. Evolutionary research reveals examples of intersexual conflict and competition, even at the genomic level,²⁵⁸ however, has not effectively dotted the lines between reproductive investment and sexual politics. Intersexual politics and power asymmetry becomes more highlighted (and diverse) among primates, and must be fully explored. Yet, for its own part, post-essentialist feminist scholarship became increasingly disembodied, desexualized, and uninformed by research in evolutionary science. Almost thirty years passed after publication of *The Dialectics of Sex* before evolutionary analyses of sexual politics were undertaken feminists like Sarah Hrdy and Patricia Adair Gowaty.

Firestone's baton was seized once again by Gowaty in her essay, "Sexual Dialectics,

Sexual Selection, and Variation in Reproductive Behavior”, in which she attempts a new model of Trivers' formulas to analyze male-female relations around reproductive investment.²⁵⁹ Gowaty specifically entitles her model of intersexual conflict as "sexual dialectic," though she does not cite the work of Firestone. It is possible that Gowaty never read Firestone, or that she read her when younger and subsequently remembered the phrase. It is also possible that she believed in crossing from feminist theory into science, attributing Firestone's ideas was unnecessary and incurred the risk of seeming unscientific. Finally, Gowaty reinvented the phrase through her own ruminations on the subject. In any event, Gowaty's work, itself, is a remarkable tribute to Firestone's visionary ideas.

In *Mother Nature*, Hrdy amasses an array of evidence on primate, hominid, and human maternity (which in prehistory was the yoke of nearly all mature females). In a foray into evolutionary sexual politics, Hrdy challenges the existing male-orientation of primatology and human evolutionary research in "Raising Darwin's Consciousness" with her own evolutionary-based theories of the prehistoric rise of patriarchy:

"I argue here that female solicitation of multiple males (either simultaneously or sequentially, depending on the breeding system) characterized prehomimid females; this prehomimid legacy of cyclical sexual assertiveness, itself possibly a female counter-strategy to male efforts to control the timing of female reproduction through infanticide, generated further male counter-strategies. This dialectic had important implications for emerging hominid mating systems, human evolution, and the development of patriarchal arrangements in some human societies. For hominid males who will invest in offspring, there would be

powerful selection for emotions, behaviors, and customs that ensure them certainty of paternity."²⁶⁰

Both feminists and evolutionary biologists have tended to overlook the pivotal creativity of a feminist evolutionary perspective. The work of ovular scientists like Sarah Hrdy and Patricia Gowaty has yielded new ideas in emerging fields of human evolutionary theory. These scientists are joined by an increasing number of women and men, yet their endeavors are still obscure to the public and even within academic institutions. For reasons both viable and erroneous, feminist scholars often reject insights gained in such fields as evolutionary anthropology and evolutionary psychology. Yet the cross-fertilization of feminism with evolutionary theory progresses, and must progress.

In summary, imprinted in our bodies and our minds is evidence of ancient wars of reproduction, of battles, of truces, and of enormously creative alliances engaged in by a multitude of hermaphrodites, females, and males in a vast succession of plant and animal genealogies. These biosocial realities led, in our own case, to complex, emergent social properties expressed by primates and humans. Sexual dominance and power struggles both within and between the sexes, is a fact of nature, but so is collaboration. The broad task of evolutionary feminism is to integrate current knowledge of sexual selection, kinship theory, parental investment, genetic and chromosomal research, feminist social and political theory, and other aspects of biological and social science, toward a fully articulated vision of human reproduction and sexuality. Reproductive theory goes farther on this path by analyzing the

interaction of modes of reproduction with production and political economy, social-political structures, and history of consciousness.

Peer reviews of this article are welcome. Email: evolutionaryfeminism@yahoo.com

Appendix A.

Evolutionary Processes: A Summary and a few Points of View

Genetics and Replication

The science of genetics involves continual revelations, mysteries, and debates. The term “*gene*” coined in 1909, defined a unit of genetic information, clarified further to mean the part of the *chromosome* that carries the plan for development of a protein molecule. The chromosome is the self-duplicating structural unit of the cell nucleus only during *mitosis* (asexual nuclear division in which an identical new cell is created) and *meiosis* (sexual reduction division involving two successive nuclear divisions creating a new cell from two chromosomal parents). ant from one another.²⁶¹

The reproduction of species occurs through the replication of an ever-transforming template of DNA crossover and sequencing, with minimal variations, upon a foundation of a limited number of chemicals.

In 1901 the U.S. zoologist, Clarence E. McClung, hypothesized the existence of a sex-determining chromosome by which a definable set of hereditary traits is passed on. During the teens and twenties of the 19th century Thomas Hunt Morgan worked to link Gregor Mendel's laws of heredity to microscopic knowledge, a chromosomal theory of heredity.

The structure of the genetic code was deciphered by James Watson, Francis Crick, and Rosalind Franklin, and Maurice Wilkins, in the early 1950s. Since then, enormous

strides have been made by mechanistic science in understanding and isolating genes and gene complexes, and since then a new world of knowledge exists on the process of heredity through sexual reproduction (and, for that matter, non-sexual reproduction). Most of the DNA in the human species is packaged within the "nuclear genome" consisting of 23 pairs of genes in the nucleus, measuring in total about 3 billion base pairs in length.

In 1966, George C. Williams proposed a gene-centered view of evolution. Genetics is a new science still fraught with mystery. Genome rearrangements that lead to human disorders are typically thought to be caused by mistakes that occur during recombination.²⁶²

Many behaviors, imprints, and physiological aspects of reproduction have been put in place by prior evolution, of evolutionary forces leaving affects deep within the phylogeny, as well as recent adaptations. Evolution occurs when traits existing within the genotype(s) and are passed on through inheritance. It is increasingly clear, however, that even at the level of the gene, real-time changes are enacted in through non-deterministic factors. To say that a gene determines a specific trait is simplistic, as there are cases of multiple genes involved in the production of specific traits, for example, at least six genes take part in producing various types of hemoglobin. James Bailey notes that, "in many cases either single genes do not affect phenotype (meaning the physical expression of a trait in a creature), or... their influence on phenotype does not arise in a simple, obvious fashion."²⁶³

Circular patterns of cause and effect can be the result of more than a dozen enzymes located along various chromosomes both contingent and dist

Epigenetic events not determined by genetics occur even at the level of cellular

development, environmental conditions can trigger physiological responses in pregnant mothers. These nongenetically determined maternal effects can take place in utero and even in prior to fertilization. Phenotypic plasticity is the capacity of the developing organism to express aspects of genetic heritage while suppressing other aspects. Phenotypic plasticity is a powerful, "existential" force that not only falsifies purist notions of genetic determinism, but can actually affect the genetic pool of a population.

Evelyn Fox Keller calls into question the very conception of "gene" as an abstraction. In this sense, genetics began with a conceptual plan similar to that of atomism, which in physics has since relented to far more complex and process-oriented conceptualization. Keller would prefer rethinking genetics in terms of a "more dynamic concept of a distributed [genetic] program in which all the various DNA, RNA, and protein components function alternatively as instructions and as data."²⁶⁴

DNA is a double-stranded molecule—parallel strands (or "backbones") coil around each other in a spiral helix. Within and between the two exterior strands are pairs of submolecules ("bases") located across from each other. These are always coupled in pairs: adenine↔thiamine (A↔T), and cytosine↔guanine(C↔G), which are chemical complements separated by a hydrogen bond.²⁶⁵ These "bases" link chemically to one another and division occurs all along the scores of sequences, building the required protein called for by its recipe, in order to duplicate itself, forming a new identical "base" carrying all the genetic information of the parent. Prior to the division of each cell, hundreds of millions of bases must be duplicated. The two new cells continue on the same spiral form, in effect,

doubling the double spiral.²⁶⁶ The DNA patterns are unique for each individual creature, and broader patterns are unique to each species, thus, DNA profiles can be constructed to show identities and relationships.

RNA plays a critical role in forming the complementary copy of the genetic material. RNA is similar to DNA but is a single, short, untwisted strand. As Richard Fortey noted, first self-replicating world might have been an RNA world that preceded the DNA world in which protein synthesis became central.²⁶⁷

Natural Selection and Adaptation

"That many and grave objections may be advanced against the theory of descent with modification through natural selection, I do not deny. I have endeavored to give to them their full force. Nothing at first can appear more difficult to believe than that the more complex organs and instincts should have been perfected not by means superior to, though analogous with, human reason, but by the accumulation of innumerable slight variations, each good for the individual possessor. Nevertheless, this difficulty, though appearing to our imagination insuperably great, cannot be considered real if we admit the following propositions, namely, — that gradations in the perfection of any organ or instinct, which we may consider, either do now exist or could have existed, each good of its kind, — that all organs and instincts are, in ever so slight a degree, variable, — and, lastly, that there is a struggle for existence leading to the preservation of each profitable deviation of structure or

instinct. The truth of these propositions cannot, I think, be disputed."

With these words, Charles Darwin began the final chapter of *Origin of the Species*. Natural selection is based in evidence from numerous observations in many fields of biology, that interaction of living beings with the larger environment and in doing so, some live and reproduce while others die and/or do not reproduce. Natural selection occurs when these differences in survival and reproduction reflect, at least in a given locale over a period of more than one generation, an enhanced capability.

Natural selection occurs when a heritable gene or gene complex in a population survives due to an adaptive advantage, whereas while another trait becomes less common or extinct because it is disadvantageous in adapting. Organisms with "adaptive" traits pass on more copies of these traits, and so on over many generation(s), the traits become represented in the gene pool of the species or subspecies. This is a process of natural selection called adaptation, a major force of evolution. It is important to remember that it is the living organism (phenotype) and not its genes (genotype) that adapts to the environment and habitat alterations. Even though the phenotype is the adaptive actor, through reproduction, only the genotype is passed on, posing an interesting conundrum of evolutionary research that requires analytical complexity and discourages simplistic determinism.

Recognizing the force of natural selection and adaptation is at the core of evolutionary theory, however, in discussing the factors, the question of the unit of selection becomes primary. Darwin spoke of selection at the level of the species or subspecies. The question of what a species is opens up a whole new can of worms (who apparently constitute many

species); but a good on-the-ground definition that covers most cases is that consists of members who are able to (co)reproduce. Ernst Mayr later defined the basic unit of selection as the organism, which can be defined as an organization of cells, which interacts with the habitat (non-organism) in order to process energy. In "Adaptation and Natural Selection," George Williams argued for defining the gene as the unit of selection,²⁶⁸ and many have followed him, as the gene, as the so-called basis unit of heredity, appeals to reductionist sentiments. As we will see in a discussion of genetics, however, the issue of what a gene actually is has not been wholly resolved. In his theory of phylogenetic systematics, Willi Hennig conceptualized a meta-category of the clade, a cluster of species branching out from a single ancestor. Stephen J. Gould advocated the importance of multi-level selection, including selection amongst genes, cell lineages, organisms, demes, species, and clades. The concept of group selection (which would be helpful to social theories) was roundly condemned by Williams and others to follow. As I pointed out earlier, however, the real problem with group selection is how to measure it, given that dynamic processes of natural selection do not readily allow on to isolate a particular group in time or space.

Genetic Drift

New physical traits and behavioral predispositions can evolve from the transfer of genes between individuals or populations through migration or a founder effect. The evolutionary process of genetic drift occurs when chance alone determines which heritable traits spread

through a population through reproduction. The molecular biologist, Michael Lynch, suggests a greater role and power than previously conceived of genetic drift in genomic evolution, especially in advanced multicellular organism, and affirms the importance of population factors to genetic evolution.

Genotype and Phenotype

Every organism is both a genotype and a phenotype. As I mentioned above, the genotype is the sum of inherited and heritable genetic traits. The phenotype is the living individual that expresses its genotype within a range of possibilities, in existential confrontation with the world. It would be nice if behaviors and traits learned by the organism (phenotype) could be inherited by its offspring. Unfortunately, it is false that what a parent does or learns can be genetically inherited by their offspring. However, the range of phenotypic expression of a genotype is quite elastic, thus, through culture and nurture, humans and some animals can pass on learned information and cultural habits to offspring. Contemporary gene theory finds that the genotype-phenotype relationship is more expansive and flexible than has been previously thought, a topic I will return to below.

R-Selected and K-Selected Species

R-selected reproduction in species is characterized by: breeding at a young age; producing many offspring quickly; small offspring relative to adult size; brief maturation periods; a short lifespan and high mortality rates; high mortality rates; and little direct parental

investment in the offspring. The overall expenditure of life energy can be huge. For example, the parent(s) may expend a tremendous amount of energy returning to breeding ground or destination to depositing eggs, but once the fertilized egg is deposited, the offspring are pretty much on their own. Examples of r-selected species include many species of insects, fish and reptiles.

K-selected species focus on producing fewer offspring and investing more energy in care of the living offspring. K-selected species usually live near the carrying capacity of their habitat, where living requires more specialized skills and habitat knowledge). Available resources control population size. K-species reproduction involves breeding relatively later in life; a longer lifespan; producing relatively few offspring; large newborn offspring; far lower mortality rates of the young than in R-selected species; long periods of offspring maturation; and extensive parental care. Examples of K-selected species are most bird species, mammals, and among mammals, primates, and Homo-sapiens.

In human evolution and the human species, the reproductive investment of the female must be considered a primary factor. Maternal investment is an enduring feature and one that increases among mammals and primates. Feminists can take heart, however, from evidence of the gradual trend among mammals and primates toward the far edges of the K species adaptation, that is, limitation of offspring with increasing emphasis on offspring fitness. As I will later discuss, females, even among primates and women, when left to their own devices, are practitioners extraordinaire in K-species adaptation, while males of all species are a bit more disposed to fathering more numerous offspring, thus, there is a K-R

gender split. We will later turn to further the implications of the "K-word" as applied to human population growth and in discussions of patriarchy.

The recent term "human capital" can be translated in the evolutionary context as a social extension of Triver's theory of "parental investment." Human capital resonates with the evolutionary K-species trend of increasing investment of parents in the procreation, nurturance, and training of fewer offspring, involving limitation of family-size. An emphasis on offspring investment ensures that parental and social nurturance serves to extend the highest phenotypic development of the genotype, even at the risk of reducing the total genetic pool of inheritance.

Biological Architecture

Existing features both limit and enable evolutionary adaptations. Bilateral or spherical symmetry, inheritance of eye placement either to the front or side, the type of digestive system of a species, and other architectural features constrain the form of adaptations.

"By-products" of earlier adaptive or architectural features might already exist in an organism that have not been used or developed because, the need for utilization has never before occurred. Habitat or other changes create the conditions in which such pre-existing features are used. This occurrence leads some evolutionists to emphasize the scenario in which natural selection works on extant features, rather than solely by "opportunistic adaption occurring through innovative and competitive uses of random mutations.

The architectural term, spandrel, describes a triangular space enclosed by the curves of two adjacent arches or a space enclosed by an arch and an enclosing right angle. The insignificant spandrel of gothic arches became over time a feature for artistic focus in cathedrals, thus, as a by-product of the arch, the spandrel opened up possibilities for other uses. Stephen J. Gould calls this type of natural selection exaptive rather than adaptive.

A spandrel exists as part of the preexisting structure of an organism or species, belonging to the deep history of the species. Structural constraints in evolution are common. For example, both flies and eagles have vision (trait that evolution at some point seems to demand), but the eyes of eagles face forward, while those of flies look to each side. This is because these species evolved along two different paths of bilateralism.

Stephen J. Gould and Richard Lewontin, propose that natural selection can proceed in a more “fuzzy” manner than is ordinarily attributed to adaptation (e.g., selection of a random genetic mutation).²⁶⁹ A genetic trait or behavioral predisposition might be selected that is not “built” by natural selection but is a consequence of other feature or features already in place. Thus, belonging to a larger evolved structure of itself, becomes, but was not itself created through the process of natural selection,” in the final analysis. Yet, If a structural capacity (rather than a random new trait) expresses phenotypically over time, then genotypic foundations and refinements of the capacity might be selected for, and it thus becomes a criterion of selection. The adaptationist might respond that the idea of spandrel is unnecessary, since originally it was genetically imprinted (even as a by-product) and, in the final analysis, the trait or trait complex survives because it is adaptive. Yet spandrels

embody the power of structure, placing in perspective the evolutionary history of the species and clade, rather than yielding to an opportunistic and atomized analysis of evolution.

The concept of the spandrel is a subject of debate, yet it seems self-explanatory and is notably applicable to an analysis of human evolution. Human culture and technology has greatly extended the human genotype toward the farthest manifestations of phenotypic expression. Consider the fact that the speed of a contemporary female Olympic runner exceeds that of a male Olympic runner in classical Greece. This could be a purely phenotypical manifestation, since the species-genotypic anatomy of the female pelvis is wider to accommodate childbirth, and is assumed to be less efficient for the mechanistic aspects of running than the narrower pelvis of the male.

Gould and Lewontin cite the human capacity to write as an example of a spandrel. Oral speech did arise as a biological and evolutionarily adaptive trait complex. What did not evolve as a genetic adaptation was the comprehension and expression symbolic media, such as petroglyphs, television, or calculus equations. These capacities expressed phenotypically. Gould and Lewontin cite the human capacity to write as an example of such a structurally-determined adaptation. Oral speech did arise as a biologically/ evolutionarily adaptive trait complex. But, as far as we know, writing as a genetic predisposition did not evolve as a (hardwired) adaptation. The capacity to write and to commit to external media symbolic forms, such as petroglyphs, television, or calculus equations, arose as a “side effect” of other evolved adaptations in the homo-sapiens genotype. Yet this evolutionary "spandrel" forms one of the core factors of human civilization. According to Gould, “the term spandrel

[means] "'spaces left over'... Evolutionary biology needs such an explicit term for features arising as byproducts, rather than adaptations, whatever their subsequent exaptive utility."

MtDNA and Y-Chromosomal Dating Techniques

In addition to the X and Y chromosomes, the human genome contains another, more ancient form of inheritance, mitochondrial DNA. Mitochondria of the organelles responsible for the cell's energy metabolism. The "mitochondrial genome" consists of a circular molecule of DNA 16,569 base pairs long.²⁷⁰ Each contains 13 protein coding genes as well as RNA. MtDNA is inherited only from the mother but exists in the cells of both females and males. MtDNA mutates more rapidly than DNA, the rate of mtDNA mutation has not been adequately determined. Similarity of mtDNA for any two humans provides a rough estimate of how closely they are related to their maternal ancestors. mitochondrial genes did not provide a pure picture of phylogeny but rather one mediated through what had happened demographically to a population whether it had grown a remain stable.

Studies tracing Y-chromosome markers in a population can construct an accurate phylogeny based on male inheritance. Excellent chronological results have been obtained. Recently, a worldwide "phylogeography" for the human X chromosome constructed by an international team of immunologists found that research with X and Y chromosome markers produce similar figures for the founding of the human species. These dates are... compatible with the current widely accepted scenario of the origin of modern mankind in Africa within

the last 195,000 years and migration out-of-Africa circa 55,000–65,000 years ago"²⁷¹

MtDNA tracing gives an excellent picture of the total relatedness of one population to another. Research has shown that, "the amount of variation in mtDNA types in the modern human populations throughout the world is surprisingly low just 1/10 of that known among chimpanzees. One explanation is that modern humans evolve very recently that the Wallace and Wilson hypothesis. calculation based on the rate of accumulation of mutations of mitochondrial DNA gave the time of origin of 140,000 to 280,000 years ago. An alternative explanation holds that modern humans pass through a population bottleneck recently, which reduced genetic variation. The mitochondrial model showed that the genetics of living human populations could be a powerful tool in reconstructing evolutionary history, although the analytical difficulties could be formidable."²⁷² MtDNA is passed matrilineally but all human cells possess MtDNA.

The relatedness of various peoples can be fairly accurately determined by using MtDNA and Y-chromosome markers. This line of research is important not only in determining human migration(s) but also for engaging in (what at this point is highly speculative) research patterns of primordial mating and family location. Recently, researchers have utilized X and Y chromosomal tracking to an attempt to answer questions of primordial family form. The complexity of determining family form from genealogical data is formidable; a broad and precise classification system must be considered. Interpretations favoring a patrilocal bias have been effectively challenged. For example, the fact that the Y-chromosome variants tend to be more localized geographically than MtDNA

variants is usually taken to indicate patrilocality. But the chronological evidence is flimsy and the farther back in human lineage, the less conclusive are genealogical findings, much less their interpretations. Though it is widely known that some males leave many offspring while others do not reproduce (whereas historically and prehistorically, many more females reproduce), the effects of male reproductive asymmetry are not factored in when interpreting "localization" of Y-chromosome variants.

A new approach of X-chromosome-based phylogeography is now part of the repertory of tracing human prehistoric lineage. A study by R. Spencer Wells and colleagues, found the nonrecombining portion of the human Y chromosome to be, "a valuable tool for the study of population history." The team studied the frequencies of 23 Y-chromosome "polymorphism haplotypes" in 1,935 men from 49 Eurasian populations. "These haplotypes reveal traces of historical migrations, and provide an insight into the earliest patterns of settlement of anatomically modern humans on the Eurasian continent. Central Asia is revealed to be an important reservoir of genetic diversity, and the source of at least three major waves of migration leading into Europe, the Americas, and India."²⁷³

X-chromosomal studies begin to yield information inaccessible through work with MtDNA or Y-chromosomes. Comparing a sample of DNA sequence data set from a diverse Old World humans and primates, Eugene Harris and Jody Hey found that human X-linked PDHA1 expresses in highly diverse in African and non-African populations, suggesting that, "age of onset of population subdivision appears to be about 180 thousand years ago... Most of this range of dates is older than the estimated ages of the first modern human fossils. If

the morphological transition to modern humans occurred more recently than the origin of population structure, it necessarily follows that genes associated with the transformation to modern humans spread via gene flow between populations." Thus, "cross-breeding" with other species, such as homo erectus, might have taken place.²⁷⁴

NOTES

- 1 See especially Salleh, Ariel Kay (1984). "Deeper than Deep Ecology: The Eco-Feminist Connection," *Environmental Ethics*: 6.
- 2 Crutzen, Paul Jozef and Eugene F. Stoermer (2000). *International Geosphere-Biosphere Programme: 41*.
- 3 Pfeffer, Naomi [1993]. *The Stork and the Syringe: Political History of Reproductive Medicine*. Wiley Publishers: London.
- 4 Major existentialists include Søren Kierkegaard, Jean Paul Sartre, Simone de Beauvoir, Karl Jaspers, Albert Camus, and Martin Heidegger.
- 5 See Ehrlich, P. and A. Erhlich (1990). *The Population Explosion*. New York: Simon and Schuster. The demographic transition is exemplified by comparative statistics in industrialized vs. preindustrial nations, for example, in 1998, the birth rate in the US is 14 births per 1000 people while in Kenya it is 32 per 1000.
- 6 For thorough data on women's reproductive lives in medieval and renaissance times, see Davis, Natalie Zeon, Ed. *A History of Women In the West* (3 volumes). Harvard University Press: Cambridge. For lives of women of ancient times, see Lefkowitz, Mary and Maureen Fant (1982). *Women's Life in Greece and Rome*, Johns Hopkins University Press, Washington, D.C.
- 7 Williams, Brian; Stacey C. Sawyer, and Carl M. Wahlstrom (2005). *Marriages, Families & Intimate Relationships*. Pearson: Boston.)
- 8 Foley, Robert (1998). "The Context of Human Genetic Evolution," *Genome Research*, 8 (4):

9 *Genesis 1: 22, Holy Bible*, version from Dickson Publishing, Chicago. Current evidence indicates the Hebrews were among the first peoples to practice agriculture. Neither the capacity nor the mandate to produce a spiraling population existed prior to the invention of agriculture.

10 Dalai Lama (1979), responding to a question on birth control after a lecture before a Canadian audience.

11 The deeds and facts of biological reproduction incessantly repeat. Human puberty and menarche relentlessly lead people toward enactments(s) (though extraordinarily various) of our own species' version of the "birds and bees": the quest for a mate, love, and sexual gratification, the "same old story" told in countless songs. On rare occasions, sexual acts are fertile resulting in pregnancy, childbirth, nursing, the long phase dependency and parenting, generation after generation.

12 The alchemists failed in their search for gold. As Buckminster Fuller said, "nature abhors perfection". In a sense, though, the magic of reproduction has worked in that each sexually reproduced is unique.

13 Writing in the early 20th century, Ferdinand Julius Tönnies described village society (*gemeinschaft*) as community based in kinship or and other common bonds and as rooted in place. Such communities are uncommon. Today, the ideal village-type community is small, with a degree of neighborly contact and organization, diversity of income, and characterized by small business, such as independent bakers, butchers, hardware stores and cafés. The village atmosphere is enhanced by an urban-rural connection, such as city dweller memberships in coops obtaining food grown by nearby small farmers.

14 As co-editor from 1970-1974) of the New Orleans-based *DISTAFF: The Southern Women's Journal*, I contributed essays, articles, and poems. Later, I taught a course on the history of the second wave at the Harvey Milk Institute (1995-1997), and at City College of San Francisco (1997-1999).

15 Firestone, Shulamith (1970) *The Dialectic of Sex: The Case for Feminist Revolution*. Morrow: New York.

16 Merchant, Carolyn (1990). *Ecological Revolutions*, North Carolina Press, Chapel Hill. Her structure of ecological revolutions is based in dynamic interactions between the natural environment, reproduction, production, and consciousness. Carolyn Merchant teaches environmental history and is the author of numerous works on history of science and environment including the ground-breaking (1980), *Death of Nature: Women, Ecology and the Scientific Revolution*. Harper Collins: New York. Merchant's thoughts on the reproductive mode and on the human-nature connection serve well as a foundation for further articulation of reproductive theory. After taking Dr. Merchant's class in environmental philosophy at the University of California, Berkeley, I composed indexes to seven of her eight books, gaining an intimate knowledge of her ideas.

17 Merchant, Carolyn (1990). *Ecological Revolutions*. See esp. Figure 11.

18 Correa, Gena (1985). *The Mother Machine*. New York: Harper and Row. See also Corea, G. (1987), and Corea, G. et. al. (1987). *Man-Made Women: How New Reproductive Technologies Affect Women*. Indiana University Press. Corea served as Director of MIT's Institute on Women and Technology. Her home page online is at: <http://www.geryunant.com/Gena.htm> .

19 Newbrough, Celeste (1997). "Bah, Bah, Black Sheep: Cloning, Reproductive Rights and the Gender Revolution." *International Archives of the Second Wave of Feminism*; online at <http://www.home.att.net/~celesten/clone.html> Berkeley; also Newbrough, Celeste (2000) "Cloning." *Routledge International Encyclopedia of Women: v. I*. Routledge, Taylor and Francis Group, New York, NY; and Newbrough, Celeste (1987). "Adoption, Surrogate Motherhood and Reproductive Exploitation". *MATRIX*, Santa Cruz.

20 Frank Sulloway is an evolutionary researcher and visiting professor at University of California, Berkeley. Previously at Harvard University, Dr. Sulloway authored two best selling books and numerous articles in psychology and evolutionary science. A selected list of his work can be found online at: <http://www.sulloway.org/pubs.html>.

21 s a graduate student at Tulane University in 1971.

22 Merchant, Carolyn (1990). *Ecological Revolutions* North Carolina Press, Chapel Hill.; and Carolyn (1994). *Ecology: Key Concepts in Critical Theory*. Humanity Books, Prometheus, Amherst. (Second Edition, 2008).

23 Hrdy, Sarah (1999), *Mother Nature: Maternal Instincts and How They Shape the Human Species*. Random House, New York.

24 Samuel D. Gosling and Oliver P. John (1999). "Personality Dimensions in Nonhuman Animals: A Cross-Species Review," *Current Directions In Psychological Science*, 8 (3).

25 Nothing has been more humbling in this respect than remarkable discovers of the science of genetics, revealing that somewhere around 96% of human genes are shared with chimpanzees, as Stefan Lovgren reports in an August 2005 article for *National Geographic News*.

26 Toolmaking species include Caledonian crows, orangutans, and chimpanzees. According to Jane Goodall, "Chimpanzees use more objects as tools for a greater variety of purposes than any creature except us and each population has its own tool-using cultures." Goodall, Jane (1993). "Chimpanzees - Bridging the Gap." In Paola Cavalieri & Peter Singer. Eds. *The Great Ape Project*. New York: St. Martin's Griffin.

27 McDougall, I., Brown, F. H., and Fleagle, J. G. (2005). "Stratigraphic placement and age of modern humans from Kibish, Ethiopia." *Nature* 433.

28 Foley, Robet (1998). "The Context of Human Genetic Evolution," *Genome Research*, 8 (4): "Compared with chimpanzees and other apes, the human population is relatively lacking in genetic diversity (Ruvolo et al. 1993); such genetic variation as does exist occurs primarily within populations rather than between (Relethford and Harpending 1994); African populations are more diverse genetically than those found anywhere else in the world (Vigilant et al. 1991; Cavalli-Sforza et al. 1994; Watson et al. 1997); and for the most part, non-African patterns of genetic variation can be treated as a subset of African ones. The chronological and demographic context of the processes

of diversification has been strongly disputed, but several genetic systems indicate that living populations derive from a relatively small population (effective population size between 5000 and 50,000 individuals) (Rogers and Harpending 1992; Harpending et al. 1993; Nei and Takahata 1993; Harpending 1994). That size represents a bottleneck in the hominid lineage dating back no more than 200,000 years (Cann et al. 1987; Stoneking et al. 1992), with evidence of demographic expansion occurring in the last 70,000 years (Rogers 1995)."

29 In fact, the genetic diversity of original Africans is much greater than that of the human population as a whole. See Seielstad, Mark, Endashaw Bekele, Muntaser Ibrahim, Amadou Touré, and Mamadou Traoré (1999). "A View of Modern Human Origins from Y Chromosome Microsatellite Variation," *Genome Research*, 9 (6).

30 Neumann, Erich (1949). *The Origins and History of Consciousness*, trans. by R.F.C. Hull, 1954, Bollinger Series: Princeton. p. 6.

31 Hrdy, Sarah (1999). *Mother Nature: Maternal Instincts and How They Shape the Human Species*. Random House: New York.

3232 For an excellent article addressing the subject of evolution and creationism, see Sulloway, Frank J. (2006). "Why Darwin Rejected Intelligent Design." In *Intelligent Thought: Science versus the Intelligent Design Movement*, ed. by John Brockman. Vintage: New York. Also online at: [http://www.sulloway.org/Why%20Darwin%20Rejected%20Intelligent%20Design%20\(2006\).pdf](http://www.sulloway.org/Why%20Darwin%20Rejected%20Intelligent%20Design%20(2006).pdf).

33 Other migrations might have occurred by small boat or even foot from the Northwestern tip of Europe through what is now Iceland and Greenland, but the biotics of North African and Mediterranean culture had not reached these Northernmost peoples, whose routes were also later sealed off.

34 Jared Diamond (1997). *Guns, Germs, and Steel: The Fates of Human Societies*. W.W. Norton & Company.

35 Mayr, Ernst (1948). "The Bearing of the New Systematics on Genetical Problems: The Nature of Species," *Adv. Genet.* 2: 205-237.

36 Charles Darwin identified intrasexual competition as a major force of selection. See Darwin, Charles (1871). *Principles of Sexual Selection. From The Descent of Man, and Selection in Relation to Sex.* London..

37 Familial relationships may be *consanguine* (of the same "blood," meaning of the same genetic lineage or kin), or *by marriage* or other social bond, such as adoption, step-relationships, etc.)

38 Theories of education such as those forwarded by John Dewey or Maria Montessori, assume that educating children is of social value. Many theories address social matters, because social realities do not lend themselves readily to experimental protocol. A theory can be metaphysical, dealing in abstractions supposedly proven by internal logic rather than reference to material objects or events (for example, Thomas Aquinas' proofs of the existence of God and Cartesian dualism).

39 The term "radical" means or "of the root".

40 An excellent online source on Marx, Engels is: http://www.cpm.ehime-u.ac.jp/akamacHomePage/Akamac_E-text_Links/M.E.html

41 Marx attempted to show that historic forces would bring about an inevitable transition from capitalism. He constructed his case masterfully but not fully recognize or disclose his own point-of-view. He and Engels were deeply and justifiably motivated by moral outrage over the squalid conditions of industrial capitalism. Feminist point-of-view philosophers advocate that scientists assess and disclose their point of view in association with a research project. See: Potter, Elizabeth (1994) "Methodological Norms in Traditional and Feminist Philosophy of Science." *PSA: Proceedings of the Biennial Meeting of the Philosophy of Science Association* (2).

42 Marx, Karl, *Capital* 3:745; reprinted in Merchant, Carolyn (2008), *Ecology*.

43 A feminist critique has been well formulated concerning the exploitation of domestic labor. Two excellent sources on the subject are della Costa, Mariorosa, and Selma James (1953). "The Power of

Women and the Subversion of the Community." (Pamphlet); and Fortunati, Leopoldina (1995). *The Arcane of Reproduction, Housework, Prostitution, Labor and Capital*, Autonomedia: New York. The International Wages for Housework Campaign, founded by della Costa and James, continues to campaign for an international regime providing domestic wages (<http://www.globalwomenstrike.net/>).

44 To read a digest of the writings of Marx and Engels on Ecology, see "Karl Marx and Friedrich Engels", Ed by Howard L. Parsons. In Merchant, Carolyn, Ed. (2008). *Ecology*. 2nd edition, 2008. Humanity Books/Prometheus Books: Amherst.

45 That a scientific hypothesis must be falsifiable is a long tradition though not always practiced. It was stated as a principle in the 1930s by Karl Popper. The doctrine of creationism, for example, is not a scientific hypothesis. Creationists attempt to array scientific proof that all creatures were made by God, but since the existence of God cannot be proven or disproven, creationism is falsifiable, therefore not scientific. As a scientist, Darwin assembled an enormous amount of evidence in support of his theory of the origin of species due to natural selection, contradicting the "scientific" beliefs of his time. Even so, the science of evolution based in Darwin's theory has not "falsified" creationism as a religious belief that was not a scientific hypothesis to begin with. Instead, creationist doctrine simply disappeared as a concern of legitimate science.

46 A problem in science is that often experiments are too expensive to repeat; and some researchers did not provide sufficient data for others to confirm.

47 Even the great Swedish botanist and zoologist, Carolus Linnaeus, described fixed racial characteristics aggrandizing the race "*Europeanus*" and demeaning other races in his (mistaken) classification. Georges Vacher de Lapouge, an anthropologist the University of Paris, developed a theory of the superiority of the Aryan "race." Charles Darwin expressed a more advanced view, though he also was susceptible to the views of his time: (1) "It may be doubted whether any character can be named which is distinctive of a race and is constant... they graduate into each other, and it is hardly possible to discover clear distinctive characters between them... As it is improbable

that the numerous and unimportant points of resemblance between the several races of man in bodily structure and mental faculties (I do not here refer to similar customs) should all have been independently acquired, they must have been inherited from progenitors who had these same characters. "Darwin, Charles (1871), *The descent of man, and selection in relation to sex*. London: John Murray. Volume 1. 1st ed.: 225-226; and (2) "[Man] has diverged into distinct races, or as they may be more fitly called, sub-species. Some of these, such as the Negro and the European, are so distinct that, if specimens had been brought to a naturalist without any further information, they would undoubtedly have been considered as good and true species." (Darwin, Charles (1874). *The Descent of Man and Selection in Relation to Sex*, 2nd ed., John Murray, London: 929. As I point out later, Darwin's views of sex were less egalitarian..

48 Kuhn, Thomas (1962). *The Structure of Scientific Revolutions*. University of Chicago Press: Chicago.

49 Descartes, René (1648), *Ouvres Complètes*. Ed. G. Rodis Lewis. Paris.

50 Including evolutionary psychology, evolutionary anthropology, paleontology, and other disciplines,

51 Ardrey, Robert (1961). *African Genesis*. MacMillan, New York.

52 Rowley-Conwy, Peter (1993a) "Mighty Hunter or Marginal Scavenger?" In: Burenhult, Goran (ed.) *The First Humans: Human Origins and History to 10,000 B.C.* New York: Harper-Collins Publishers. See also Sussman, R.W. (1999). "The Myth of Man the Hunter: Man the Killer and the Evolution of Human Morality." *Zygon: Journal of Religion and Science*: 34.

53 AM Hurtado, K Hawkes, K Hill, H Kaplan (1985) "Female subsistence strategies among Ache hunter-gatherers of Eastern Paraguay." *Human Ecology*, 1 (1).

54 Bahn, Paul G. (1988) *Rock Art and Prehistory*. Oxbow Monograph 10, Oxford..

55 Huffman, Michael A. and Mohamedi Seifu Kalunde (1993). "Tool-assisted predation on a squirrel by a female chimpanzee in the Mahale Mountains, Tanzania," *Primates*, 34 (1).

56 Holmes, Bob (1997) 1997. *New Scientist*, 153, (2068): 17. Reported concurrently by Reuters and in *Archaeology*. Whether this huntress was part of an all-woman society is questionable, but given the extreme diversity and transitioning character of human cultures during Neolithic times, the myth of a band of women (like a band of men) is not intrinsically false.

57 See especially Jost, John T., Jack Glaser, Arie W. Kruglanski, and Frank J. Sulloway (2003). Political Conservatism as Motivated Social Cognition, *Psychological Bulletin* (American Psychological Association): 129 (3).

58 I describe d'Eaubonne's views fully in the chapter on Ecofeminism.

59 See especially Merchant, Carolyn (1990). *Ecological Revolutions*, Chapel Hill, North Carolina.

60 Merchant, Carolyn. 1996. *Earthcare: Women and the Environment*. London: Routledge; also developed in other works by Merchant.

61 In 1979, Canadian anthropologist, Richard Borshay Lee discussed the interaction of production and reproduction in his instructive investigation of gender and work among !Kung peoples. See: Lee, Richard B. (1979). *The !Kung San: Men, Women and Work in a Foraging Society*. Cambridge University Press: Cambridge and New York; and (1965). "Subsistence Ecology of !Kung Bushmen." PhD Dissertation, University of California, Berkeley.

62 Darwin, see above.

63 Darwin, Charles (1859). *Origin of the Species*. London.

64 Darwin, Charles (1871). *Principles of Sexual Selection. From The Descent of Man, and Selection in Relation to Sex*. London.

65 Hamilton, W.D. (1963) "The Evolution of Altruistic Behavior." *The American Naturalist*: 97 (896); also: Axelrod, R. and W.D. Hamilton (1981). "The evolution of co-operation" *Science* 211.

66 Trivers, Robert (1972) "Parental Investment and Sexual Selection". *From Sexual Selection and the Descent of Man 1871-1971*. . Bernard Campbell, Ed. Chicago: Aldine Publishing Company.;

also, Trivers, Robert L. (1974). Parent-Offspring Conflict by Robert L. Trivers. From *American Zoologist*, 14: 249-264.

67 Wilson, E.O. (1975). *Sociobiology*. Harvard University Press: Cambridge.

68 Hrdy, Sarah (1999), *Mother Nature: Maternal Instincts and How They Shape the Human Species*. Random House, New York.

69 In 1997, Patricia Adair Gowaty edited a groundbreaking volume, *Feminism and Evolutionary Biology: Boundaries, Intersections, and Frontiers*, Chapman Hall: New York.

70 Darwin, Charles (1871). *Principles of Sexual Selection. From The Descent of Man, and Selection in Relation to Sex*. London.

71 See especially Churchland, Patricia (1998). *Neurophilosophy: Toward a Unified Science of the Mind-Brain*. M.I.T. Press.

72 Firestone, Shulamith (1970) *The Dialectics of Sex: the Case for Feminist Revolution*. New York: *Morrow*.

73 G.W.F. Hegel proposed a dynamic model of "being/nothingness/becoming." his dialectic was elaborated by future Hegelians, such as the philosophers Johann Gottlieb Fichte and Hermann Hesse, and by historical materialists, Karl Marx and Friederich Engels. Applied to nature and history the Hegelian dialectic is the interactive set: "thesis/antithesis/synthesis." See Hegel, Georg Wilhelm Friedrich. *Lectures on the History of Philosophy*. London. For a discussion of the evolution of Hegelian thought, see: Marcuse (1941). *Reason and Revolution*. 1964 paperback ed., Ark Publishers: New York.

74 See especially Marx, Karl, (1848), *The Communist Manifesto*. Hegelian Dialectics was also used by Engels in his ecological writings (See Engels, Friedrich, (1883). *The Dialectics of Nature*).

75 Freud, Sigmund (1924). *Collected Writings*. London.

76 All quotations by Firestone are taken from *The Dialectics of Sex*.

77 Pragmatic gains in reproductive rights achieved in the early 1970s began to erode in the 1980s and now face a formidable institutionalized challenge from the right.

78 This was especially true in medieval times and the early Renaissance. See Margaret Murray (1921), *The Witch Cult in Western Europe*. Oxford University Press: London; Oxford; New York.

79 Wilson, E.O. (1975). *Sociobiology*. Harvard University Press: Cambridge.

80 Lynch, Micheal. Lynch' cites, "an increase in the power of random genetic drift among eukaryotes, by establishing an essentially permanent change in the population-genetic environment permissive to the genome-wide repatterning of gene structure, the eukaryotic condition also promoted a reliable resource from which natural selection could secondarily build novel forms of organismal complexity." He concludes that, "...natural selection is just one of several forces contributing to the evolutionary process," something Darwin knew but extreme adaptionism has forgotten.

81 Many early hominid women found themselves in patrilocal settings (according to Morgan around half of the societies discovered in the era of imperialist expansion were patrilocal); further, many women today find themselves living under extreme patriarchies. Given the heavy investment in pregnancy, birth, nursing, and long-term parental care of her offspring and in a social system requiring male support, would it not be irrational for a woman to not look at the resources, whether personal or sociocultural of a potential male mate? Out of pure necessity, some women value the capacity in a man for resource mobilization? If this tendency does exist, would this mean it is biological fixed? Absolutely not. First, a few recent studies coming from standard social science research on spousal selection in contemporary Western societies show that as women gain economic power, woman and men are equally concerned with spousal resources. These studies show that resource-garnering behavior in mating is not hardwired but simply a strategic tendency based on the exigencies of biological and human history.

82 Dawkins, Richard (1996). *The Selfish Gene*, Oxford University Press: Oxford.

83 Leigh, Egbert (1971) *Adaptation and Diversity*. Cooper: San Francisco.

84 Haig, David (1996a). "Altercations of Generations: Genetic Conflicts of Pregnancy," *American Journal of Reproductive Immunology*, 35. Quoted in Hrdy, Sarah (1999). *Mother Nature: Maternal Instincts and How They Shape the Human Species*. Random House Publishing Group: New York.

85 Takasaki, Hiroyuki (2000), "Traditions of the Kyoto School of Field Primatology in Japan." In Ed., Shirley C. Strum and Linda M. Fedigan, *Primate Encounters: Models of Science, Gender, and Society*. University of Chicago Press: Chicago, London.

86 The prevailing "male-centric" model was based on work primarily with baboons done by S. Zuckerman, C.R. Carpenter, and R.M. Yerkes, and was popularized by writers like Robert Ardrey. See: Zuckerman, S. (1932). *The Social Life of Monkeys and Apes*. Routledge and Kegan: London; Carpenter, C.R. (1934). "A field study of the behavior and social relations of howling monkeys," In, Carpenter, Ed., *Naturalistic Behavior in Nonhuman Primates*, Penn. State University Press: University Park. More recent and detailed empirical studies of baboons refute their original observations that baboon society formed around dominant male(s). Despite the fact that this view of primates was widely debunked, popular authors like Audrey (*The Territorial Imperative*, 1966), continued to promote the view.

87 Koyama, N. (1967). "On dominance rank and kinship of a wild Japanese monkey troop in Arashiyama." *Primates*: 8. See also: Imanishi, K. (1951). *Prehuman Societies*. Tokyo: Iwanami-shoten; and Imanishi, K and S. A. Altmann (1965). *Japanese Monkeys*. Trans ed., A. S. Altmann: Chicago.

88 Wranghum, R. W., and Barbara Smuts (1980). "Sex differences in the behavioral ecology of chimpanzees in Gombe National Park. *Journal of Reproduction and Fertility*: 28.

89 Wranghum, R. W. (1979). "On the evolution of ape social systems," *Social Science Inform.*: 18(3); and (1979). "Sex Differences in Chimpanze Dispersion. In Ed., Hamburg, D. and E. McCown, *The Great Apes*, Benjamin/Cummings: Menlo Park, Ca.

90 "Morphing in the Order" (2000). In Eds., Strum, Shirley C. and Linda Fedigan (2000), *Primate Encounters: Models of Science, Gender, and Society*. University of Chicago Press: Chicago, London.

91 Hamilton, W.D. (1963) "The Evolution of Altruistic Behavior." *The American Naturalist*: 97 (896).

92 Strum, Shirley C. and Linda Fedigan, Eds. (2000), *Primate Encounters: Models of Science, Gender, and Society*. University of Chicago Press: Chicago, London.

93 Strum, Shirley C. and Linda Fedigan, Eds. (2000), *Primate Encounters: Models of Science, Gender, and Society*. University of Chicago Press: Chicago, London.

94 Hrdy, Mother Nature.

95 Koyama, N. (1967). "On dominance rank and kinship of a wild Japanese monkey troop in Arashiyama." *Primates*: 8. See also: Imanishi, K. (1951). *Prehuman Societies*. Tokyo: Iwanami-shoten; and Imanishi, K and S. A. Altmann (1965). *Japanese Monkeys*. Trans ed., A. S. Altmann: Chicago.

115 Darwin, Charles (1859). *Origin of the Species*. London.

116 For an up-to-date and highly readable narrative of on how Darwin arrived at the theory of natural selection, read Frank J. Sulloway's essay, "The Evolution of Charles Darwin."

117 Mendel, J.G. (1865). *Versuche über Pflanzenhybriden Verhandlungen des naturforschenden Vereines*. Brünn.. First translated into English translation by Druery, C.T and William Bateson (1901). "Experiments in plant hybridization." *Journal of the Royal Horticultural Society*, 26.

132 Even this dictum is subject to change. In 2008 a female-to-male transsexual appeared on the Oprah Winfrey show is impregnated with a fetus. The transsexual is classified officially as a male. There is concern that the pregnancy may endanger the fetus, since the female-to-male transsexual has been taking high doses of testosterone for a long period. (Hunter, Aina, "Transgender Man's Baby May

Have Health Problems: Experts Debate the Long-Term Effects of Testosterone on Eggs." ABCNews.com, March 26, 2008)

133 Emlen, Douglas J. (2001). "Costs and the Diversification of Exaggerated Animal Structures," *Science*, 291(5508).

134 See Gould, Stepehn .J. 1977. "The misnamed, mistreated, and misunderstood Irish elk." In *Ever Since Darwin*. W.W. Norton, New York. Exaggerated secondary sexual characteristic can sometimes increase viability (See Kokko, Hannah and Robert Brooks (2003). "Sexy to die for? Sexual selection and the risk of extinction." *Annals of Zoology, Fennici*, 40.

135 Oxford English Dictionary (1993): Oxford.

136 Forty, Richard (1998). *Life*. Alfred Knopf: New York. This discussion and further quotes in this section are taken from Dr. Forty. If his account is correct, life began in an environment similar to the Hades of the Greeks or the Biblical hell.

137 Prigogone, Ilya and Paul Glansdorf (1971), *Thermodynamic Theory of Structure*; Maturano, Humberto and Francisco Varela (1980), *Autopoiesis and Cognition*; Capra, Fritjof (1996), *The Web of Life*.

138 Kaufman, Stuart, *The Origins of Order* (1991). New York: Oxford University Press.

139 The words *organism* and *organization* acquired their contemporary usage more or less contemporaneously.

140 Kant, Immanuel (1790). "Critique of Judgment" (*Kritik der Urtheilskraft*, 1790). Quoted in the *Catholic Encyclopedia*, VIII (1910). Robert Appleton Company: New York.

141 This paragraph paraphrases Keller (2000).

142 Such discoveries might disgruntle those who find refuge in the idea of an all-encompassing or transcendent creator. On the other hand, the provocation of each creature to survive and reproduce confutes a completely reductionist account. As life gained motility and sensory perception, the

compulsion to live and procreate involves increasingly existential acts: to seek water and food, flee from danger, discriminate features of habitat, stalk prey, engage a quest for a mate or mates, etc. Hindu-generated Buddhism poses the idea of *satchidananda* ("existence-consciousness-bliss") as the true reality;¹⁴² it seems to me some such (senseless) intuition formed the motivational ground accompanying life, at least from this point of motility, and possibly urged on the very first replicator.

¹⁴³ Hrdy, Sarah Blaffer (1999). *Mother Nature: Maternal Instincts and How They Shape the Human Species*. Random House: New York.

¹⁴⁴ Ernest Hung Yu Ng1, Oi Shan Tang and Pak Chung Ho (2000). "The significance of the number of antral follicles prior to stimulation in predicting ovarian responses in an IVF programme," *Human Reproduction*, 15(9).

¹⁴⁵ Forming a bridge between living Bacteria and non-living entities is the virus, a submicroscopic, noncellular entity composed of a single core of nucleic acid within in a protein coating that has no interior power of reproduction but replicates within host cells.

¹⁴⁶ The earliest bacteria dating from at least 3.5 billion years ago (hyperthermophiles) reduced the molecules in their environment to produce new chemicals, and energy, as byproducts. The methanogens, for example reduced hydrogen and carbon dioxide to produce methane and water, while others reduced sulphates. They lived one by one and alone. They replicated by splitting (division) or fission, often producing exact copies of themselves. Many bacteria living in the early age of microorganism have survived largely unchanged to the present time.

¹⁴⁷ The vital chlorophyll molecules arranged in plates inside the bacterium maximize the efficiency of the process. Some early photosynthesizers did not produce oxygen but others did, emitting infinitesimal amounts of it . "Using light upon the green pigment chlorophyll to break gaseous carbon dioxide into two parts: carbon for its nourishment and growth, and oxygen ...[released as a by-product] became the most precious waste in the firmament." (Forty).

148 The most ancient fossils are 3,500 million year old objects recovered from the Fig Tree rocks of the Transvalle, South Africa. By 2,700 million years ago, they began to form fingers and columns as well as mats.

149 Algae are sometimes separately classified and some other classifications might vary.

150 Such behaviors are the result of practices across organisms and species so ritualized and imprinted over time that it is impossible to tease out power politics from long-term fixed behaviors, for example, the nasty habit of the black widow of devouring her mate after coition, or the clamp mechanisms male scorpion flies use to affix females during copulation. The scorpion fly was noted enthusiastically by Thornhill and Palmer in support of their "rape hypothesis", which has been much disputed by evolutionary scientists as well as social scientists. For a discussion of the scorpion fly mating behavior, see note 6 in Sanday, P. Reeves (2003). "Rape-Free versus Rape-Prone: How Culture Makes a Difference." In Travis, Cheryl Brown, Ed. *Evolution, Gender, and Rape*. MIT Press: Cambridge. The book is a collection of essays addressing and refuting the Thornhill-Palmer hypothesis.

151 "The basic unit of kinship is therefore not the nuclear family but the mother-child unit." Fox, Robin (1967). *Kinship and Marriage*. 2nd Edition (1983), Cambridge University Press: Cambridge.

152 The wages the current AIDS epidemic in Africa, and disasters of war have produced such orphaned family units in which an older sibling takes on the parental role.

153 "Sexual Dialectics, Sexual Selection, and Variation in Reproductive Behavior" by Patricia Gowaty (1997). From *Feminism and Evolutionary Biology: Boundaries, Intersections, and Frontiers*. Edited by Patricia Gowaty, Chapman Hall New York.

154 This immediately calls to mind the obverse case of the technology of cloning, a human-manufactured bridge between reproduction and production.

155 The word "meiosis" comes from the Greek *meioun*, meaning "to make smaller." Meiosis reduces the chromosomal material to produce the gamete cell (ovum or sperm). The gamete is the only cell

that consists of only (roughly) half of the genetic material of the parent; all of the other cells in the parent are complete (somatic). Fertilization produces a new individual created when chromosomes from each gamete align into alleles, comprising the somatic cells of the offspring.

156 Trivers, Robert L. (1972). "Parental Investment and Sexual Selection." In *Sexual Selection and the Descent of Man 1871-1971*, Ed. Bernard Campbell. Aldine Publishing Company: Chicago.

157 Simmel, Georg (1902). "The Number of Members as Determining the Sociological Form of the Group, II." *American Journal of Sociology* 8.

158 Trivers, Robert L (1974). "Parent-Offspring Conflict," *American Zoologist*, 14.

159 Hrdy, Sarah (1999). *Mother Nature: Maternal Instincts and How They Shape the Human Species*. Random House: New York.

160 Bowlby, John (1969). *Attachment and Loss, v. I. Attachment*, Basic Books: New York.

161 Haig, David (2004). "Genomic Imprinting and Kinship: How Good is the Evidence?" *Annual Review of Genetics*, 38.

162 Hrdy (1999).

163 Mackey, Wade C. *Fathering Behaviors: The Dynamics of the Man-Child Bond*. Plenum Press, 1985.

164 Punctuated equilibrium theory conceived by Ernst Mayr and further developed by Stephen J. Gould, proposes that in times of geologic, climate upheaval, extreme conditions prevail in a population resulting in gene flow changes at a greater rate, producing new species or subspecies.

165 Hamilton, William, discussed in Sarah Hrdy, *Mother Nature*.

166 Ross, Robert M., George S. Losey, And Milton Diamond (1983). "Sex Change in a Coral-Reef Fish: Dependence of Stimulation and Inhibition on Relative Size," *Science*, 5(221).

167 Rodgers, Edmund W., Shelia Drane and Matthew S. Grober (2005). "Sex Reversal in Pairs of *Lythrypnus dalli*: Behavioral and Morphological Changes," *Biological Bulletin*, 208. Marine Biological Laboratory.

168 Gardner, Andy, David J. Allsop, Eric L. Charnov, and Stuart A. West (2005). "A Dimensionless Invariant for Relative Size at Sex Change in Animals: Explanation and Implications," *American Naturalist*, 165.

169 See especially Merchant, Carolyn (1990). *Ecological Revolutions*, Chapel Hill, North Carolina.

170 Merchant, Carolyn. 1996. *Earthcare: Women and the Environment*. London: Routledge; also developed in other works by Merchant.

171 In 1979, Canadian anthropologist, Richard Borshay Lee discussed the interaction of production and reproduction in his instructive investigation of gender and work among !Kung peoples. See: Lee, Richard B. (1979). *The !Kung San: Men, Women and Work in a Foraging Society*. Cambridge University Press: Cambridge and New York; and (1965). "Subsistence Ecology of !Kung Bushmen." PhD Dissertation, University of California, Berkeley.

172 Merchant, Carolyn (1990) *Ecological Revolutions*. North Carolina Press, Chapel Hill.

173 Merchant, Carolyn (1990). *Ecological Revolutions*. See esp. Figure 11.

174 de Waal, Franz (2005). *Our Inner Ape*, Riverhead Books: New York. p. 65.

175 de Waal, Franz, *Our Inner Ape*, p. 80.

176 In more human terms, the realm of "sexual politics" can be viewed, as Karen Horney so eloquently did in the context psychology, along the axis of love→ power.

177 For evidence of cooperation, see Axelrod, Robert (1985), *The Evolution of Cooperation*. New York: Basic Books; Dugatkin, Lee Alan (1997) *Cooperation among Animals: An Evolutionary Perspective*. Oxford Series in Ecology and Evolution; Horn, J. (1997) "The Nature of Nicheing:, Genetic Algorithms and the Evolution of Optimal, Cooperative Populations." University of Illinois at

Urbana. Thesis; Department of Computer Science, University of Illinois; and other works. Regarding evidence of conflict, there are many more works focusing on competition. For references in on conflict and violence in humans, see Martin Wilson and Margo Daly's M2 Research Group site bibliography: <http://psych.mcmaster.ca/dalywilson/homicide.html>.

178 Sarah Hrdy (Hrdy, 1999) gives an excellent discussion of limitations on pregnancy in primordial and primitive women, unmercifully digested in the above paragraph, along with the findings of other women and men in evolutionary biology. In a future chapter, I refer to these researchers in expanding on the conditions of mammalian and human mothers.

179 As I will discuss below, the first wave of feminism obtained the vote for women as well as crucial changes in marriage and divorce law and the beginning of a birth control movement.

180 Like all revolutions, the feminist second wave involved on a tiny minority of the population, probably less than 1% of adult women. The Bolshevik Revolution was incited by "a small movement" and at its height its participants are estimated to not have exceeded 1% of the adult population of Russia. (Alan Woods [1999]. *Bolshevism: The Road to Revolution*, Wellred Publications.)

181 Over the subsequent decades, lesbian relationships moved toward higher fertility and parenting, though during this period, lesbian relationships did not often involve creating a reproductive unit.

182 A "strategy" is a metaphorical way of describing a genetic trait or behavior that endured because at various points and under various circumstances the organism possessing it was able to survive and reproduce. This hindsight approach requires careful use, as it incurs the danger of circuitous thinking.

183 Firestone, Shulamith (1970) *The Dialectics of Sex: the Case for Feminist Revolution*. *New York: Morrow*.

184 G.W.F. Hegel proposed a dynamic model of "being/nothingness/becoming." his dialectic was elaborated by future Hegelians, such as the philosophers Johann Gottlieb Fichte and Hermann Hesse,

and by historical materialists, Karl Marx and Friederich Engels. Applied to nature and history the Hegelian dialectic is the interactive set: "thesis/antithesis/synthesis." See Hegel, Georg Wilhelm Friedrich. *Lectures on the History of Philosophy*. London. For a discussion of the evolution of Hegelian thought, see: Marcuse (1941). *Reason and Revolution*. 1964 paperback ed., Ark Publishers: New York.

185 See especially Marx, Karl, (1848), *The Communist Manifesto*. Hegelian Dialectics was also used by Engels in his ecological writings (See Engels, Friedrich, (1883). *The Dialectics of Nature*).

186 Freud, Sigmund (1924). *Collected Writings*. London.

187 All quotations by Firestone are taken from *The Dialectics of Sex*.

188 Identifying Firestone's biologically based theory as "essentialist"—essentialism is defined by gender theorists as a form of reductionism in which biological sexual categories were mistakenly conflated with social role and status—and conceptualized the term “gender” as a preferable term than sex, because it included the full spectrum of factors appropriate to feminist analysis.

189 Remnants of separatism continue in women's land cooperatives, however, cultural feminism as a whole reintegrated into the mainstream, producing lasting effects in gender attitudes, traditions of women's health, women's music, etc.

190 Gould, Elizabeth Page (1971) *The First Sex*, Penguin Books: New York. A librarian, Gould romped encyclopedically through a massive amount materials, flattening out prior considerations of validity (which she believed were based on biased patriarchal attitudes). Her book was not only influential, but her process of assembling information heralded mass-information techniques utilized today on the Internet.

191 Renewed interest in myths and antiquities suggesting a primordial "Great Mother" inspired the creation of a separatist women's culture reminiscent of the mythical Amazons and the first in known history. Works addressing matriarchal feminism range from the level of high scholarship to pop-publications. Among the most respected matriarchal theorists is Marija Gimbutas.(See: Gimbutas,

Marija (1965). *Bronze Age cultures in Central and Eastern Europe*. The Hague/London: Mouton; (1974) *The Goddesses and Gods of Old Europe*; and (1991) *The Civilization of the Goddess*. The joint website of Joseph Campbell and Marija Gimbutas is located at: <http://www.online.pacifica.edu/cgl/about>.

192 See Zeitlin, Froma I. (1996) *Playing the Other: Gender and Society in Classical Greek Literature*. University of Chicago Press. Mostly, feminist sentiments of the time were expressed by men, as literacy was far more prevalent among males. Women left some written record of feminist of at least pro-woman sentiment, for example, in the affirmations of female bonding were found famously in the poetry of Sappho of Lesbos.

193 Hypatia of Alexandria was widely revered. In "The School of Athens" ("Scuola di Atene") by Italian Renaissance artist Raphael, Hypatia is the only woman depicted among his 21 "greatest philosophers".

194 Wollstonecraft, Mary (1792). *Vindication of the Rights of Women*. Her work probably reflected up to a century of informal discourse among educated women and men. For more information on the feminist and utopian thinker, François Marie Charles Fourier, see Beecher, Jonathan (1986). *Charles Fourier: the visionary and his world*. Berkeley: University of California Press.

195 The first wave also influenced countries under British Imperial control. In post-colonial countries, a necessary reaction against imperialism tended to facilitate the reinstatement of gender traditionalism, which left the task of reintroducing feminist ideas to the second wave of the mid-to-late 20th century. Many writers now refer to a Third Wave of international feminism. Despite the pernicious existence of patriarchal traditions and the continuing responsibility of women of embodying and expressing nationalist traditions, feminist organizations and ideas have infiltrated every nation. The radical suffrage movement in Britain began as a response to the 1832 Reform Act, a law which for the first time, formally prohibited women from voting in England (prior to that time, women voted in some areas). Emmeline Pankhurst and other leaders of the Women's Social and Political Union invented tactics of civil disobedience later used by Mahatma Gandhi (who studied in

England during a part of the suffrage period). These tactic included mass peaceful demonstrations and acts of civil disobedience, acts of real or potential self-destruction such as hunger strikes and dramatic gestures of personal risk This included widespread hunger strikes including a 91 hour fast by Marion Wallace Dunlop; the “Mud March” of 1907, which was to that date the largest open air demonstration ever held; the commission of dramatic acts of real or potential self-destruction, such as Emily Davison throwing herself under the King’s Horse at the Epsom Derby; and formation of a single-issue national political organization. Radical suffragists also committed violent civil disobedience; before committing crimes against property, however, they distributed warnings informing all persons who might be harmed by an action to avoid the scene.

196 Stanton, Elizabeth Cady (January 18, 1892). "Solitude of Self" address delivered to the U.S. Congressional Judiciary Committee.

197 Elizabeth Cady Stanton gained strong support, however, at Seneca Falls from Frederick Douglas, who persuaded many at the meeting to support the suffrage proposal. In later years, Stanton and Douglas were to part ways, when the efforts were defeated of Anthony and Stanton to incorporate the word "sex" into the 14th Amendment.

198 Royer's translaton appeared in 1862. An excellent source work on Royer Harvey, Joy (1998). *"Almost a Man of Genius": Clemence Royer, Feminism, and Nineteenth-Century Science*. WH Schneider; University of Chicago Press.

199 Margaret Sanger wrote *Woman Citizen*, 1924, and other writings on reproductive rights including *Woman and the New Race*, 1920; "What Every Girl Should Know", 1916; "What Every Woman Should Know," 1917; and *The Case for Birth Control*, 1924.

200 1900 marked the formation of the International Ladies' Garment Workers Union (ILGWU). An informative treatment of the subject of women factory workers is by Nancy J. Barrett of the Organization of American Historians is found at:

<http://www.oah.org/pubs/magazine/progressive/barrett.html>.

202 Freudianism can be distinguished from the work of Sigmund Freud, himself, however, Freud bore some responsibility for the that the agenda of psychoanalysis. Confronted with a lack of neuroanatomical conformation of his theories, rather than dealing face-on with the contradictions, Freud allowed a quasi-empirical cult to flourish around him. For the story, see Frank J Sulloway (1979): *Freud: Biologist of the Mind*. Basic Books, In. New York.

203 Pop-Freudianism defined women as riddled with penis envy and charged with the task of moving the center of orgasmic pleasure from the clitoris to the vagina; to do this women needed to accept their inferiority and learn sexual surrender. For a powerful work on the anti-woman aspects of Freudianism, see Weisstein, Naomi, "Kinder, Kirche, Kuche: Psyvhology Constructs the Female." Online several places, including the Chicago Women's Liberation Union website at <http://www.uic.edu/orgs/cwluherstory/CWLUArchive/psych.html>.

204 Hudson, Valerie M. and Andrea M. den Boer (2004). *Bare Branches: The Security Implications of Asia's Surplus Male Population*. The MIT Press, Cambridge, Massachusetts; London. The authors focus on the fact that in regions where female infanticide leads to asymmetric sex ratios, many males are reproductively disenfranchised in that there are not sufficient numbers of women to mate with. These circumstances correlate with high crime rates, militarism, and high levels of prostitution.

205 Dylan, Bob (1964). "You say you're lookin' for someone / Never weak but always strong, / To protect you an' defend you / Whether you are right or wrong, / Someone to open each and every door, / But it ain't me, babe, / No, no, no, it ain't me, babe, / It ain't me you're lookin' for, babe."

206 Young women faced sexual dilemmas individually, often without knowledgeable advice from female relatives and friends. As a young woman, I negotiated personal passage through such attitudes in New York and New Orleans during my dating years, from 1957 to 1965. This exploitative attitude toward sex on the part of men began to moderate during the mid-1970s. A good example of this attitude was expressed by a man I dated in 1961, quite handsome and intelligent as I remember, who has me: "What do you think about the fact that all chess champions are male? Doesn't that mean that men are superior?" I remember feeling extremely angry but not able to find

an answer. In 1969, when I brought the incident before my consciousness raising ("rap") group, one of the women quipped, "Maybe it means they like playing games more." thus, nine years later, I found my response.

207 Sexual encounters that would now fall under the rubric of "date rape" were rampant and nameless during this period. The "Playboy philosophy" encouraged men to "not take 'no' for an answer." According to *The Rhetoric*, an sympathetic online history site, "Hugh Hefner began writing *The Playboy Philosophy* in 1962... Each chapter of *The Playboy Philosophy* was printed in an issue of the magazine..." (See <http://therhetoric.net/2007/04/08/the-playboy-philosophy/>, *The Playboy Forum*.) Men who did not get sex from women often felt belittled and lied about it to their male friends, thus women were "damned if they did and damned if they didn't." Susan Brownmiller's *Against Our Will* first published in 1971 (Simon and Schuster Edition, 1975), was formative in expressing this shift in attitudes on the part of women as well as men.

208 For a recent discussion of the unwanted increase in unmarried pregnancies from the 1950s through the early 1970s, see Fessler, Ann (2004) *The Girls Who Went Away: The Hidden History of Women Who Surrendered Children for Adoption in the Decades Before Roe v. Wade*. New York: Penguin Group. Studies indicate higher risks in post-relinquishing mothers of depression, complicated mourning, substance abuse, and secondary infertility. For recent research on newly relinquishing mothers, see: Askren, Holli Ann and Kathaleen C. Bloom (1999). "Postadoptive Reactions of the Relinquishing Mother: A Review" *Journal of Obstetric, Gynecologic, & Neonatal Nursing*, 28 (4). Although the majority of adopted children are well-adjusted, adopted children evidence proportionately more behavior problems when compared to nonadopted children in both clinic and nonclinic populations. See: Peters, Beth R., Marc S. Atkins and Mary McKernan McKay (1999). "Adopted children's behavior problems: A review of five explanatory models," *Clinical Psychology Review*, 19 (3).

209 The description in this section of the conditions of the late 1950s throughout the 1960s, when radical feminism was submerged beneath the mainstream, is based on the reader entitled, "History of

the Second Wave of Feminism", which I prepared for a course at City College of San Francisco (CCSF).

210 This is a simplistic description given for the sake of brevity. In fact, as in all other human conflicts, those actively embattled were a small proportion of the population. Further, the opposing sides mingled far more than is the case in most historic conflicts. A minority of men took on the battle of women, many women invested in the existing system began to organize against feminists, and most people of both sexes stayed out of the arena of conflict.

211 Sex was determined by the male sperm consisting of either XX (producing a girl) or XY (producing a boy). A long history of persecution of women who were considered inadequate in bearing sons was thus placed in perspective. This is but one example of the manner in scientific evidence both vindicated the female sex and fueled female anger.

212 Knowledge of and increased visualization of pregnancy and of birth launched a tradition of respect and intrigue concerning reproduction that ran counter to its general devaluation.

213 Ashley Montague encapsulated much of this thinking in *The Natural Superiority of Women* (1953). New York, Macmillan.

214 Murdoch's report of extensive existence of matrilineage and matrilocal societies encountered by imperialist expansion proved additional moral support for women in creating a new feminist agenda.

215 de Beauvoir, *The Second Sex*.

216 Montague, *Natural Superiority*.

217 *New Yorker*, 2997.

219 Wittig, Monique (1965). *Les Guérillères*. English translation (1969).

220 Plath, Sylvia (1965). *Ariel*. Publisher: New York: Harper & Row; and reprints. Also: (1962). *The Bell Jar*. Originally published in England under the pseudonym Victoria Lucas.

221 Mitchell, Juliette (1966) "The Longest Revolution". *New Left Review*. Also Dunbar, Roxanne (circa 1969). "Female Liberation as the Basis for Social Revolution. Reprinted in *Sisterhood is Powerful* (1970).

222 Newbrough, Celeste (1970) Parthenogenesis. *DISTAFF*: New Orleans.

223 Jill Johnston (1973). *Lesbian Nation*, Simon & Schuster, New York.

224 Katie Sarachild along with a small core of companions invented and popularized the concept of consciousness-raising and organized "rap sessions" across the country. See Sarachild, Kathie (1967). "On consciousness-raising groups". Reprinted in *Sisterhood Is Powerful* (1970), New York: Random House, c. 1978.

225 Shulamith Firestone was a member of Redstockings Collective.

226 Robin Morgan (1970) Ed. *Sisterhood Is Powerful*.

229 Firestone, Shulamith (1970). *The Dialectics of Sex*. New York: William Morrow and Company, Inc.

230 Technocratic feminist analysis was initiated by Donna J. Haraway (1991). "A Cyborg Manifesto: Science, Technology, and Socialist-Feminism in the Late Twentieth Century." In Haraway, D. J. *Simians, Cyborgs and Women: The Reinvention of Nature*. New York; Routledge.

231 Blackwell, Anoinette (1875). *The Sexes Throughout Nature*. New York: G.P. Putnam and Sons.

232 Atkinson, Ti-Grace (1974). *Amazon Odyssey*, New York & London: Links Books.

233 Koedt, Anne (1968) *The 'Vaginal Orgasm'*. In *Radical Feminism, 1968*.

234 Johnston, Jill (1973). *Lesbian Nation : The Feminist Solution*. New York: Simon and Schuster.

235 Radical feminist theory was enormously successful in mobilizing the women's movement in seizing the agenda of the power elite as well as of women and men on a personal and social basis to restore a perceived imbalance in sexual equality. While the majority of women were initially

confounded and many rejected a feminist identity, women consciously or unconsciously seized the conceptual tools invented by radical feminists to place pressure upon men and male-governed institutions, resulting in massive structural changes. Only a brief summary of facts “befores” and “afters” over a period of little more than a decade, attests to the societal shift. Dating and sexual relations began to incorporate a consciousness of and taboo against male sexual aggression (this did not stop it forced sex became less acceptable and less prevalent). A male-pro-woman movement organized, which, though small in numbers, was influential. Widespread interest in childbirth and childcare was almost non-existent when the option to abort a pregnancy was a rarity, yet as *Roe v. Wade* took effect throughout the nation and the ability to control pregnancies was brought within the reach of most women, and as scientific conceptions and images of reproduction advanced, male interest in and participation in childbirth blossomed. In the 1950s, the conviction of women’s inferiority was pervasive, by the early 1970s, popular opinion shifted toward the conviction that the sexes, if different, were equal. So successful was the feminist revolution that in the U.S. that a counter-revolution of profound proportions was spawned during the seventies. This rising counterrevolution, which sought to reestablish a static and fundamentalist view of sexuality, reached the highest levels of government in the U.S. by 1980 with the election of Ronald Reagan. In other Western countries, the countermovement was less pronounced and the gains more formalized over time.

²³⁶ Ehrlich, P. and A. Erhlich (1990). *The Population Explosion*. New York: Simon and Schuster.

236 For thorough data on women's reproductive lives in medieval and renaissance times, see Davis, Natalie Zeon, Ed. *A History of Women In the West* (3 volumes). Harvard University Press: Cambridge. For lives of women of ancient times, see Lefkowitz, Mary and Maureen Fant (1982). *Women's Life in Greece and Rome*, Johns Hopkins University Press, Washington, D.C.

237 Gould, Elizabeth Page (1979). *The First Sex*. Penguin Books: New York.

238 Marija Gimbutas earned a reputation as a world-class specialist on the Indo-European Bronze Age, with her "Kurgan hypothesis" on the origin and migrations of Proto-Indo-European (PIE)

speaking peoples. This hypothesis has had an enduring and significant impact on Indo-European studies. As a professor of archaeology at UCLA, Gimbutas excavated Neolithic sites in southeastern Europe then-Yugoslavia and in Thessaly. Digging through layers of earth representing a period of time before contemporaneous estimates for Neolithic habitation and other archaeologists would not have expected further finds, she unearthed a great number of artifacts of daily life and of religious cults, which she researched and documented throughout her career. Her books include *The Gods and Goddesses of Old Europe* (1960s, republished in 1974 as *The Goddesses and Gods of Old Europe*), *The Language of the Goddess* (1989), and *Civilization of the Goddess* (1991), which presented an overview of her speculations about Neolithic cultures across Europe. Though her reconstruction of gynocentric culture is disputed, few have been able to find much to dispute in her actual research and excavations, which tell their own story.

239 Works addressing matriarchal feminism range from the level of high scholarship to pop-publications. Among the most respected matriarchal theorists is Marija Gimbutas. (See: Gimbutas, Marija (1965). *Bronze Age cultures in Central and Eastern Europe*. The Hague/London: Mouton; (1974) *The Goddesses and Gods of Old Europe*; and (1991) *The Civilization of the Goddess*. The joint website of Joseph Campbell and Marija Gimbutas is located at: <http://www.online.pacifica.edu/cgl/about>.

240 See Ortner, Sherry B. (1974). "Is female to male as nature is to culture?" In M. Z. Rosaldo and L. Lamphere. Eds., *Woman, culture, and society*. Stanford, CA: Stanford University Press,

241 See especially her essays, "One is Not Born a Woman, The Category of Sex", and "The Mark of Gender". However, Cybelle McFadden (2004) challenges the view that in works such as *Les Guérillères* Wittig is an essentialist by "appropriating the universal." McFadden argues, "Wittig's work "is an allegory, the telling of a story in a figurative language requiring interpretation, which shows women defining themselves as they seek to represent the universal... For women to lay claim to the universal simply implies taking back what should never have been denied in the first place: the right to be representative of humanity, which is different from appropriation. To appropriate suggests

the taking or making use of without authority or right, when in fact *elles* have every right to belong to the universal, to the general, the whole." *H-France Review*, 6 (139). Reprinted (2006) in Namascar Shaktini, Ed., *On Monique Wittig: Theoretical, Political and Literary Essays*. Urbana: University of Illinois Press.

242 Fuss, Diana (1990) *Essentially Speaking: Feminism, Nature and Difference*. Routledge: New York.

243 No one in France says "La Dordogne Riviere" ("[the-she] river named Dordogne"), or "Dordogne La Riviere" ("Dorgogne the name of [the-she] river"), but they say, in effect, "She, Dordogne, [the] river."

244 Oakley, Ann (1972). *Sex, Gender and Society*, Harper and Row: New York.

245 de Beauvoir, Simone (1952). *The Second Sex*. Lnopf: New York.

246 Fedigan, Linda M., "Gender Encounters" (2000). In *Primate Encounters: Models of Science, Gender, and Society*. University of Chicago Press: Chicago, London.

247 Fedigan, "Gender Encounters"

248 Friedman, Marilyn (2001) "Nancy J. Hirschmann on the Social Construction of Women's Freedom." *Hypatia*: 16.

249 See especially Ilya Prigogine & Isabelle Stengers (1984). *Order Out of Chaos: Man's new dialogue with nature*, Flamingo: London.

251 NARAL: National Abortion Rights League. Even though during the 1990s, the Catholic bishops put forward an attractive young woman to advance their view, the spokesperson for "choice" remained postmenopausal Kate Michelson.

252 Merchant, Carolyn, *The Death of Nature* (1980). Harper, San Francisco.

253 I am not familiar with evidence of in-depth cross-fertilization of ideas between second wave feminists and evolutionary biologists, though on in 1974, Robert Trivers referred to the assumptions

of another evolutionary biologist as "sexist". There is an intriguing synchronicity of timing and content coming from these different intellectual currents. Political theory is grounded in the conditions of a time and place and even science does not exist in a sociocultural vacuum. I do not want to oversimplify the similarities between sexual selection theory and radical feminist political theory. Evolutionary science supplies evidence of several conundrums for feminism, for example, intrasexual competition among females as well as males belies the utopian optimism of the radical feminist slogan, "sisterhood is powerful."

258 See especially, Haig, David, "Genetic Conflicts in Human Pregnancy." *Quarterly Review of Biology*, 68 (4).

259 Gowaty, Patricia Adair (1997). "Sexual Dialectics, Sexual Selection, and Variation in Reproductive Behavior". *Feminism and Evolutionary Biology: Boundaries, Intersections, and Frontiers*. Edited by Patricia A. Gowaty. New York: Chapman Hall.

260 Hrdy, Sarah (1997) "Raising Darwin's Consciousness: Female Sexuality and the Prehominid Origins of Patriarchy." *Human Nature*: 8(1).

261 A chromosome is the part of an RNA or DNA molecule that contains all or most of the genetic material. This section is a summary of Kidd, J.S. and R.A. Kidd (1999), *Life Lines*, Facts On File, New York, NY.

262 A new study into the genetic basis of a CNS disorder has revealed that, in fact, some disease-causing changes in genomic structure might arise from errors that happen during DNA replication, suggesting a new mechanism for generating structural variation in the human genome. Given the growing recognized importance of small-scale structural variation, it is conceivable that errors during replication contribute not only to other genomic disorders but also to inducing changes, such as gene duplications, that have short- and long-term evolutionary consequences.

263 Quoted in Keller, Evelyn Fox (2000), *The Century of the Gene*. Harvard University Press, Cambridge. Massachusetts and London.

264 Keller (2000).

265 The bands of a strand of DNA might read: TGCCAG along one side and ACGGTC on the other (T↔A/G↔C/C↔G/A↔T/ G↔C). In order to build a required new protein molecule, three of the four bases must connect with an amino acid. A set of three bases (for example, TGC or CAG) is called a *codon*, and by determining the overall sequencing of codons the geneticist is able to establish a genetic code.

266 Kidd and Kidd (1999).

267 Fortey, Richard (1997).

268 Williams described the then-prevailing focus on group- or species-based selection, as "an "onerous" concept that should only be invoked when necessary."

269 Gould, S. J. and R. C. Lewontin (1979). The Spandrels of San Marco and the Panglossian Paradigm: A Critique of the Adaptationist Programme. *Proceedings of the Royal Society of London. Series B, Biological Sciences*, 205 (1161).

270 Information on MtDNA is taken from Lewin, Roger and Robert A. Foley (2004). "Principles of human evolution," *Biology of Reproduction* 63.

271 Santos-Lopes, SS, Pereira RW, Wilson IJ, Pena SD (2007). "A Worldwide Phylogeography for the Human X Chromosome. *PLoS ONE*, 2 (6)." We reasoned that by identifying genetic markers on human X chromosome regions where recombination is rare or absent, we should be able to construct X chromosome genealogies analogous to those based on Y chromosome and mitochondrial DNA polymorphisms, with the advantage of providing information about both male and female components of the population. "Altogether, our data support a single origin of modern man in Africa and migration to occupy the other continents by serial founder effects. Coalescent analysis permitted estimation of the time of the most recent common ancestor as 182,000 years...and the estimated time of the [Y-chromosome marker insertion] of 94,400 years." (Santos-Lopes)

272 Lewin and Foley (2004).

273 Wells, R. Spencer, et. al. (2001). "The Eurasian Heartland: A continental perspective on Y-chromosome diversity," *Proceedings of the National Academy of Science (PNAS)*, 98 (18).

274 Harris, Eugene E. and Jody Hey (1999). "X chromosome evidence for ancient human histories." *Proc Natl Acad Sci U S A*: 96(6).