

Revisiting Reprotech: Firestone and the Question of Technology

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If any single argument is associated with *The Dialectic of Sex*, it is Firestone's claim that women will only be freed from the tyranny of biology through new reproductive technologies. This is not an inaccurate attribution—artificial reproduction was central to Firestone's manifesto and the first demand of her “alternative system” is “the freeing of women from the tyranny of their reproductive biology by every means available” including the “more distant solutions based on the potentials of modern embryology.”¹ She argued that artificial reproduction is necessary to seize control of human fertility and overthrow the tyranny of the nuclear family,

[T]he elimination of sexual classes requires the revolt of the underclass (women) and the seizure of control of *reproduction*: not only the full restoration to women of ownership in their own bodies, but also their (temporary) seizure of control of human fertility—the new population biology as well as all the institutions of childbearing and childrearing . . . The reproduction of the species by one sex for the benefit of both would be replaced by (at least the option of) artificial reproduction: children would be born to both sexes equally, or independently of either . . . The tyranny of the biological family would be broken.²

At the same time it is striking how this single aspect of her 245-page “case for feminist revolution” has become almost synonymous with both Firestone and her influence on feminism,³ and it is noticeable how often formulaic summaries of Firestone's argument are offered as

a reproach to other feminists. As Juliet Mitchell writes in one of the more recent critiques of Firestone, published in 2004,

[M]any texts of second wave feminism of which Shulamith Firestone's (1971) *The Dialectics* [sic.] of *Sex* was, perhaps, only the most far-reaching, proclaimed that women would only be free from oppression when freed from childbirth. Firestone's argument . . . was made entirely within the terms of the ideology [she was critiquing]: women were mothers, women were oppressed, not to be oppressed meant not to be mothers or, at most, only part-time mothers. It was this thinking [that] led to [the feminist] demand for women to be child-free or birth-free as in Firestone's account.⁴

The prominence of her radical take on reproduction in many accounts of Firestone's work reflects, in part, the extensive debate and division among feminists concerning new techniques of assisted conception that have developed over the past fifty years, and the rapid expansion of in-vitro fertilization (IVF) technology. In the 1980s and 1990s an enormous feminist literature was generated in response to the development of IVF—much of it critical of various aspects of what is now known as reproductive biomedicine, but little of it influential in public debate or policy formation. Retrospectively, Firestone is often read as symptomatic of feminist failure, on this and other fronts, as if her attention to reproductive technology was historically prescient, but analytically misguided.⁵ Firestone was famously controversial in her insistence that "*Pregnancy is barbaric*"⁶—even though she prefaced this view (which she shared with Simone de Beauvoir and other prominent feminist activists including Germaine Greer) by stating that childbirth should remain a choice (and that it was the *option to use the technology*, not the technology "itself" that would enable women to participate more equitably in childrearing). Despite her careful qualifications about both maternity and technology, however, the famous Firestone fallacy appears primarily to circulate as a cautionary tale against all manners of theoretical errors—from technological determinism and biological essentialism to 1970s feminist political naiveté.⁷

In the mid-1980s Maria Mies characterized the dangers of the "technocratic illusion many feminists pursue in the wake of Shulamith Firestone" in a typically hyperbolic account of Firestone's argument:

They think the new reproductive technology and genetics could, if they were in the control of women be used for finally abolishing men (by cloning them off). These women not only fail to realize that

economic/political and military power is not in the hands of Lesbians . . . Ultimately, all these arguments are based on a biologicistic interpretation of a historical and social relationship. They are without doubt going in the direction of racist and fascist thinking.⁸

Like too many other indignant and unscholarly interlocutors, Mies overlooks the care, intelligence, and skepticism with which Firestone repeatedly qualified her arguments about technology, reproduction, and maternity. The famous feminist fallacy version of Firestone also requires that we forget her repeated proviso that without a revolutionary transformation of society's views of gender, kinship, and marriage new reproductive technologies would be more likely to further subordinate women than to liberate them ("to envision it in the hands of the present powers is to envision a nightmare," she cautioned).⁹ As Debora Halbert points out in a more careful reading of *The Dialectic of Sex* on the question of technology,

Firestone clearly articulated [that] the problem is not [reproductive] technology but the underlying sex-roles that it may or may not reproduce . . . [T]echnology alone will not liberate women and men, instead there must be a transformation in the way sex-roles are understood, a transformation that can only take place if technology is used to give women choices other than childrearing.¹⁰

In the wake of the thirtieth birthday of the first IVF baby, Louise Brown, and the subsequent births of more than 5 million IVF children worldwide, Firestone's invocation of a technological solution to the "barbaric" fact of childbirth and the widespread circulation of this claim as a means of discrediting both her arguments and those of radical feminism more broadly deserve to be carefully reconsidered.¹¹ It is not enough simply to point out that Firestone insisted that technology alone can never "liberate" social relations. Such a response leaves unanswered the question of why she has been so often portrayed as saying that it can.¹² Ironically, the common misreading of Firestone on this point only confirms one of her manifesto's central claims—that the "dialectic of sex" cannot even be fully comprehended in a society in which questioning its a priori status is so counter-intuitive as to appear "insane." It thus remains important to ask what the positioning of Firestone as a naïve technological determinist and the frequent chastisement of (an oversimplified version of) her claim that new reproductive technologies could bring about women's liberation reveals about the evolution of feminist debate over reproduction and technology? What does that debate look like forty years

later? How have feminist understandings of reproduction, liberation, and technology changed, and how might we reflect on these changes?

In this chapter I suggest that the future imagined by Firestone still offers a more viable and credible vision of socially responsible technological development than many of today's pro- and anti-technology prescriptions, and that its sophistication and prescience, along with other parts of her manifesto, can only be properly appreciated when the negative conditions of social and political understanding she anticipated and described are less powerful than they are today. Far from signifying the naïve "[19]70s feminist" utopianism with which they are commonly equated, Firestone's arguments about technology have stood the test of time, and have usefully been developed further in the work of Donna Haraway, Evelyn Fox Keller, Ruth Hubbard, Anne Fausto-Sterling, and many other prominent scholars within feminist science studies.¹³ In the following reading of Firestone on the question of technology I suggest we do read her as flawed and as "failed," but that this is both a necessary condition of the well-known contradictions that inevitably beset the feminist movement more broadly, and that they are what Firestone told us to expect (and why). Taking a cue from Haraway's successor manifesto (for cyborgs, 1985), I propose an ironic and indicative reading of Firestone, pointing out that she is one of the few feminists to take the emerging science of reproductive biology, and its clinical implications for humans, seriously across a range of issues including birth control as well as fertility technologies (which is what she meant by the "new population biology"). I conclude, somewhat speculatively, with some post-Firestone predictions of my own.

THE DIALECTICS OF TECH

In order to reassess Firestone's claims about reproductive technology, it is first necessary to examine her view of science and technology more broadly, and to consider its importance to the overall analytical structure of *The Dialectic of Sex*. Like sex, the question of technology for Firestone was conceived as a series of dialectics at the levels of sex, class, and culture. For Firestone, these dialectics ran "all the way down"—for example, she argued that scientific knowledge production was dialectical in the sense that it contained the seeds of its own transformation (a view of science popularized through the work of Thomas Kuhn), and, like Marx, that science and technology help set the stage for revolution by providing the conditions to make it both

possible and necessary.¹⁴ Many of the best-known arguments about technology in the contemporary era rely on variations of these dialectical models, such as Ulrich Beck's influential argument that because technology produces not only new goods, but new bads, we need a continual supply of newer technologies to help solve the problems created by the previous generation.¹⁵ Such models can be described as dialectical either in the simple sense of presuming a mutually constitutive interaction between "society" and "technology," or in the more formal Hegelian or Marxist sense that both social patterns and technologies contain their own antitheses. Firestone's model can be read as invoking both of these dialectical models as well as others.¹⁶

Despite its central importance to her argument, however, Firestone is not alone in providing a rather vague, and often contradictory, account of the relationship between technology and social change. This criticism applies to many of her contemporaries and predecessors, including her theoretical bellwether, Engels, since "the problem of technology" remains among the most difficult theoretical challenges of modernity. Raymond Williams provides one of the most eloquent diagnoses available of the problem of theorizing the relationship of modern technology to social change in the opening pages of his book *Television: Technology and Cultural Form*. In particular Williams emphasizes the problems of terminology and agency that "isolate" the question of technology—reifying it as an independent causal force in the very process of "explaining" its causal (and indeed casual) agency (i.e., garden variety technological determinism). As Williams writes of the problem of theorizing technology's causality,

It is either a self-acting force which creates new ways of life ("technological determinism") or it is a self-acting force which provides materials for a new way of life ("symptomatic technology"). These positions are so deeply established in modern social thought that it is very difficult to think beyond them.¹⁷

The isolation problem, as Williams points out in his opening chapter "The technology and the society," is partly a product of the very ordinary and habitual tendency to speak of technology as independently agentic—a sui generis source of the new.

[P]eople often speak of a new world, a new society, a new phase of history, being created—"brought about"—by this or that new technology: the steam engine, the automobile, the atomic bomb. Most of us know what is generally implied when these things are said. But this may be the central difficulty: that we have got so used to statements of

this general kind, in our most ordinary discussions, that we can fail to realise their specific meanings. For behind these statements lie some of the most difficult and most unresolved historical and philosophical questions. Yet the questions are not posed by the statements: indeed they are ordinarily masked by them.¹⁸

As we shall see, although her arguments about technology are in places both determinist and symptomatic (in Williams's senses), Firestone also developed a more complex analysis of "the Technological Mode," as she called it. Indeed, Firestone's dialectical analysis of technology must be read as one of the central features of her manifesto, as it demonstrates "how the history of culture mirrors the sex dichotomy in its very organization and development." Without understanding the complexity of her analysis of the role of technology in establishing the "triplicate set of preconditions for revolution,"¹⁹ it is impossible to appreciate the full dimensions of her arguments about either cybernation or artificial reproduction.²⁰ Nor is it possible to comprehend the full dialectical structure and scope of Firestone's argument, in which she contends that

Culture develops not only out of the underlying economic dialectic, but also out of the deeper sex dialectic. Thus, there is not only a horizontal dynamic, but a vertical one as well: each of these three strata forms one more story of the dialectics of history based on the biological dualism... We shall soon have a triplicate set of preconditions for revolution... The cultural revolution, like the economic revolution, must be predicated on the elimination of the (sex) dualism at the origins of class, but also of cultural division.²¹

In Firestone's "triplicate" historical analysis, then, technology is presented as both a driver and a symptom, imbricated in a wider process of historical unfolding that is driven by the formal, law-like principles of dialectical materialism "forward" through the stages of thesis and antithesis to synthesis (post-revolutionary society).²² Like most theorists of technology, Firestone offers contradictory accounts of technology, defined as the application of pure science. It is at once a means to an end ("Empiricism itself is only a means, a quicker and more effective technique, for achieving technology's ultimate cultural goal: the building of the ideal in the real world")²³ and a "means" that is embedded in and shaped by social forces ("I submit that not only were the arts and humanities corrupted by the sex duality, but that modern science has been determined by it").²⁴ Firestone argues that technology provides the crucial tools for the mastery of nature, that it

is historically cumulative, and that it is directed while she also depicts the forward march of empirical discovery as unbalanced, out of control and dangerous (indeed, "so dangerous that many scientists are wondering whether they shouldn't put a lid on certain types of research"). Thus, important though "the machine of empiricism" is to "the ultimate goal" of complete mastery over nature, Firestone's view of what today might be called technoscience is that it is "completely out of control" and barely conscious:

The machine of empiricism has its own momentum, and is... completely out of control. Could one actually decide what to discover or not discover? That is, by definition, antithetical to the whole empirical process that Bacon set in motion. Many of the most important discoveries have been practically laboratory accidents, with social implications barely realised by the scientists who stumbled into them.²⁵

Citing cloning, the atom bomb, and LSD, Firestone depicts scientific and technological innovation as chaotic, arguing that the very same objectivism and mechanism that define its ethos and give it potency leave it ethically rudderless, "deterministic," and "soulless."²⁶ This is a far cry from the uncritical stance toward scientific and technological progress with which she is often associated (indeed it is the reverse). Notably, like more contemporary theorists, Firestone's view of science and technology is both contradictory and dynamic. She both relies on a model of technological innovation as essential to human progress and argues that science and technology are themselves incapable of producing "the imaginative constructions that preceded by several centuries the corresponding technological acumen."²⁷ In a classically dialectical manner, the strengths of the Baconian empirical project are also its weaknesses, and in turn are symptomatic of the underlying sex polarity that defines empiricism's primary deficit—its "male vices":

The catalogue of scientific vices is familiar: it duplicates, exaggerates, the catalogue of "male" vices in general. This is to be expected: if the technological mode develops from the male principle then it follows that its practitioners would develop the warpings of the male personality in the extreme.²⁸

The metaphors through which Firestone sought to envisage a synthesis of art and science no doubt clumsily showcase her rather hackneyed male and female principles (a fault exacerbated by her excessive fondness for conjugal and procreative imagery in these sections). It is

also debatable to claim that science is completely out of control, has its own momentum, or largely discovers things by accident. Firestone is prone to the twin tendencies described by Williams of attributing to technology at once too much deterministic *sui generis* momentum and agency, while simultaneously arguing it is the product of cultural values, social institutions, and individual ambitions. And readers of much 1970s feminist theory will recognize a familiar matrix of tire-some polarities at work—somewhat tautologically.

However, while it is often all too easy to pull the rug out from under revolutionary zeal, and the grand narratives of history that are less popular in the contemporary era of situated, local, and contextual understandings, it is perhaps just as easy to overlook the insights that lurk in their interstices, and the broad trends they anticipate. For while it shares many of the failings of logic, coherence and consistency common to forays into technofuturology (one thinks here in particular of how well Haraway has characterized the Salvationist ethic of much writing on both the promises and perils of new technology), Firestone also accurately anticipates much of the work by feminist science and technology scholars on the gendering of knowledge and the complex interplay between cultural values, “pure research,” and the translation of knowledge into applications.

BIOFUTURISM

In short, one of the main lessons to emerge from a careful reading of Firestone is that scientific and technological progress was one of her major political and philosophical themes—and arguably much more so than for most other feminist theorists of her era. She might even be said to have as much in common with other theorists of technology of her era as she does with feminism (one thinks, for example, of Baudrillard or Heidegger). As she says herself, her model of culture is fundamentally based on the realization of human potential through technology fused with a Marxist political utopianism.

For our analysis we shall define culture in the following way: *culture is the attempt to realise the conceivable in the possible*. Man's consciousness of himself within his environment distinguishes him from the lower animals, and turns him into the only animal capable of culture.²⁹

It is consciousness and the imagination that have enabled humans to become makers of things that do not exist, Firestone argues, claiming

that: “This accumulation of skills for controlling the environment, technology, is another means to reaching the same end, the realization of the conceivable in the possible.”³⁰ Technology, “the accumulation of practical skills,” created new possibilities, and these in turn changed society. In particular the power of Baconian empiricism has enabled science to decipher many of the fundamental laws of nature, so that:

Now, in 1970, we are experiencing a major scientific breakthrough. The new physics, relativity, and the astrophysical theories of contemporary science had already been realized by the first part of this century. Now, in the latter part, we are arriving, with the help of the electron microscope and other new tools, at similar achievements in biology, biochemistry, and all the life sciences. Important discoveries are made yearly... of the magnitude of DNA... or the origins of life. Full mastery of the reproductive process is in sight, and there has been significant advance in understanding the basic life and death process. The nature of aging and growth, sleep and hibernation, the chemical functioning of the brain and the development of consciousness and memory are all beginning to be understood in their entirety. This acceleration promises to continue for another century, or however long it takes to understand the goal of Empiricism: total understanding of the laws of nature.³¹

Such a positive view of scientific reason and technological progress was significantly at odds with the skepticism toward them shared by many of Firestone's contemporaries within the feminist movement and on the Left. However it is a position that is highly consistent with her reliance on the work of Marx and Engels, the latter of whose “final goal” she quotes twice (first, more fully, in the epigraph) in *The Dialectic of Sex*: “The whole sphere of the conditions of life which environ man, and have hitherto ruled him, now comes under the dominion and control of man, who for the first time becomes the real conscious Lord of Nature.”³²

In the same way that Firestone's embrace of scientific and technological progress as manifest destiny tips its hat to Marx and Engels, so also it resembles (perhaps even more closely) the Marxist-inspired biofuturism of the interwar period, particularly in Britain, in the work of writers such as H. G. Wells, J. B. S. Haldane, J. D. Bernal, Julian Huxley, Conrad Waddington, and their contemporaries (including Gregory Bateson and Joseph Needham, the latter of whose embryological interests led to his enduring fascination with the history of technology in China). Interestingly, it is also in these early twentieth century writings that ideas about artificial reproduction, cybernation,

space travel, genetic modification, and ectogenesis abound. As cultural theorist Susan Squier has demonstrated, debates about ectogenesis were crucial to both the scientific ambitions and futuristic narratives of many of the United Kingdom's most eminent biologists from the 1920s and the 1930s onward. As John Burdon Sanderson ("Jack") Haldane speculated in his famous 1923 paper "Daedalus, or Science and the Future" (originally read to the Heretics society in Cambridge) ectogenesis could provide a more efficient and rational basis for human reproduction in the future:

[W]e can take an ovary from a woman, and keep it growing in a suitable fluid for as long as twenty years, producing a fresh ovum each month, of which 90 per cent can be fertilized, and the embryos grown successfully for nine months, and then brought out into the air.³³

In addition to being prominent and influential scientists, H. G. Wells, Haldane, and the Huxleys were popularizers of scientific ideas. For them science, technological innovation and a progressive human future were virtually synonymous.³⁴ The terms "clone" and "ectogenesis" were coined by Haldane in the 1920s, as was the term "transhumanism" by Huxley. Notably, British biofuturism was influenced by the ideals of scientific socialism (many of its proponents were members of the Communist Party of Great Britain) and a desire to popularize them through both literature and education. H. G. Wells's socialism is evident, for example, both in his advocacy of science and technology as peaceful, rationalizing forces for good, and, in novels such as *The Island of Doctor Moreau* which critique their potential to engender techno-dictatorships. Across all of these works, the theme of *taking control of evolution* was central, and it appears to have influenced Firestone far more than many of her contemporaries, most clearly in her views about reproduction.

REPRODUCTIVE CONTROL

Firestone's comprehensive vision of a future, more progressive era defined by greater reproductive control seems strongly influenced by the tradition that equated technological innovation with social progress through greater mastery of human evolution—a tradition we might call progressive biofuturism. She was also very influenced by the dominant reproductive control issue of her day—the so-called population bomb. In the 1960s the discourse surrounding population control had much in common with earlier eras in its concern

with the necessity of promoting scientific control of reproduction to bring about an improved future for the human race. Firestone was clearly preoccupied with the "future disaster" of "dangerously prolific reproduction" which she saw as one of the most pressing and unifying challenges of her generation. In the Chapter 10 section "Feminism and Ecology," she elaborates at length on the seriousness of "the population explosion,"³⁵ describing it as the key issue linking feminist concerns to revolutionary ecology (then in its infancy as a social movement). Both movements, she argued, faced the same essential contradiction which she called "animal life within a technology," as a result of which:

Humanity can no longer afford to remain in the transitional stage between simple animal existence and full control of nature. And we are much closer to a major evolutionary jump, indeed, to *direction of our own evolution*, than we are to a return to the animal kingdom through which we evolved.³⁶

The trajectory depicted in this passage is a familiar one—technologically assisted progress away from a "simple animal existence" toward "full control of nature" based on improved scientific understanding of its internal mechanisms. Technological innovation and application enable this "evolutionary jump" to *direct our own evolution*. The above passage is striking not only because of its similarity to much of the rhetoric today, in the post-cloning, post-stem cells era, concerning what Ian Wilmut calls "the future of biological control," in which humans are similarly depicted as taking responsibility for "our own evolution."³⁷ It is also notable as a feminist contribution to a long tradition of literary and polemical works written by (mostly male) scientists—often embryologists—such as Conrad Hal Waddington, whose *The Man-Made Future*, published in 1978, was stimulated by his friendship with Gregory Bateson and Margaret Mead and centrally concerned population growth. In essence, Firestone fuses this focus with the feminist emphasis on the "invisible" structures of sex class that limit our understanding of so many basic problems—including population growth. Thus she also adds to the long tradition of (mostly female) activists and novelists, such as Mary Wollstonecraft, Margaret Sanger, and Marie Stopes, in her insistence on an explicit analogy between the current threats to the human species (pollution, famine, overcrowding, etc.) and *the degraded status of the female of the species*. Thus, at its very core, in its emphasis on increasing biological control representing a choice between "simple animal

existence” or “full control of nature,” Firestone invokes a familiar developmental model, according to which the female is the biological base, or stock, of the human species. In a nutshell, reproductive control *is* biological control for Firestone—*both for women and the human race*. This also means that the same imperative propelling the liberation of the human race from its brute biological bondage is what will require women to be given the choice to leave the shackles of their animal nature behind them.

It is important to point out that whatever importance artificial gestation may have had in the vision articulated by Firestone in the *Dialectic of Sex*, the overwhelming emphasis within the feminist political world Firestone helped galvanize was on access to abortion and contraception. The critique of the male medical establishment and in particular the medicalization of childbirth were already becoming prominent concerns within the emerging women’s health movement, and engendering its related critiques of biological determinism, sexism in science, and patriarchal epistemology.³⁸ At the same time, the issue of population control dominated the global planning agenda, as well as the family planning one. The intertwined debates about abortion, contraception, planned parenthood, and population growth all concerned access to technology, improvements in basic research on reproduction, and technological innovation, and espoused a linear technological trajectory of increased biological control in which birth control = population control = evolutionary control.

Taking the demographic experts³⁹ at their word, Firestone described the population issue as “a genuine ecological problem which no number of fancy arguments and bogey statistics can erase.” As a problem that “exists independently of traditional politics and economics” it was thus also one that could not be solved “by traditional politics and economics alone.”⁴⁰ Firestone’s concern about population growth was such that she describes having “previously . . . taken copious notes [and] written whole drafts on the population explosion” for her monograph—only to discard them when she realized that since everyone already knows all of the “frightening statistics” the more relevant task is to understand why these facts are “so consistently ignored . . . despite increasingly dire pronouncements from every expert in the field.”⁴¹ Dismissing the anti-science, anti-technology skepticism of the Left as irresponsible, she mocked her fellow radicals for their false priorities, advising they would be “much more effective by concentrating their *full* energies on demands for control of scientific discoveries by and for the people” than “breast-beating about the immorality of scientific research.”⁴²

Firestone’s position at such moments is equivalent to that of the scientist, or the objective historical materialist attempting to lay bare the genuine facts and the “historical truth” that will require “new theories and new movements” as well as “the necessary solutions to new problems.”⁴³ Like her British bio-socialist predecessors, Firestone invokes a grand plan for a dialectical process of human evolution led by a combination of progressive social ideals and increasing technological sophistication. (This includes the evolution of a non-sexually polarized science, as outlined in the ambitious Chapter 9, which transcends the stagnant “two cultures” division diagnosed by C. P. Snow to produce “an androgynous culture” that “surpasses . . . even . . . the sum of their integrations”⁴⁴). In Firestone’s dialectic of tech (or specifically reprotech), it is *the revolutionary capacity of technological progress* that establishes the crucial link between feminism, population control, and ecological sustainability. Greater technological control over both production and reproduction is thus the ultimate ethical and political imperative that links the future of the female to the future of the human race, as the rate of population growth eventually becomes a matter of human survival, against which biology can no longer be protected as a “moral” question. “Thus,” she argued,

in view of accelerating technology, a revolutionary ecological movement would have the same aim as the feminist movement: control of the new technology for humane purposes, the establishment of a new equilibrium between man and the new artificial environment he is creating, to replace the destroyed “natural” balance.⁴⁵

In this way, Firestone envisaged technology both as an agent of, and a means of salvation from, social and environmental degradation, while constantly reminding her readers that science and technology could not achieve these ends in the absence of radical social change, including a wholesale regendering of scientific knowledge. It was for this reason, in her view, that a feminist revolution was the necessary precondition for “establishing a new ecological balance” by presenting “an alternative to the oppressions of the biological family” and thus enabling “a total redefinition of the economy” by uniting the productive and the reproductive revolutions with the overthrow of sex and class oppression.

To further these aims, Firestone advocated progressive social evolution away from the rigid and moralistic biologism nostalgically imagined to underpin the “naturalness” of gender, parenthood, the nuclear family, and reproduction. Thus, while she famously argued,

like Beauvoir, that women's experience of childbirth was "barbaric," so too she abhorred the inhumane and diminishing conditions of factory workers, which she saw legitimated within the naturalizing acquisitive logic of capitalism. For both these and other ills she sought technological, sociological, and philosophical solutions, primarily focusing on control of production ("cybernation") and of reproduction (through artificial means).

CYBERNETIC REPRODUCTION

Although Firestone is most well known for her views on cybernetic reproduction and artificial wombs, her interest in fertility was largely based, like Margaret Sanger's, on a desire to inhibit it. As we have seen, improvements in contraception were the template on which Firestone imagined the technological achievements of *in vitro* fertilization, "inovation," and gestation. Scientifically, these fields were closely linked. Gregory Pincus, who co-invented the Pill, was also one of the first practitioners of IVF in mammals, succeeding with the rabbit in 1934. His colleagues Min Chueh Chang at the Worcester Institute for Experimental Biology and John Rock at Harvard were also early pioneers of both IVF and contraception. The Ford Foundation, which poured money into population control programs, also funded much of the basic biological research both in the United States and the United Kingdom that yielded many of the most well known discoveries in human medicine, veterinary science, and livestock improvement, including embryo transfer, preimplantation sexing, cryopreservation, sperm capacitation, in-vitro maturation of gametes, and in-vitro fertilization.

In Firestone's view, these developments were "more efficient means" only—they extended human capacities for biological control, and "in themselves" were essentially benevolent, liberating, progressive, and desirable. In relation to scientific progress in the field of human reproduction, Firestone appeared unequivocal: more progress and more efficient devices were liberating for women.

Like atomic energy, fertility control, artificial reproduction, [and] cybernation, in themselves, are liberating.... Already we have more and better contraception than ever before in history... Soon we shall have a complete understanding of the entire reproductive process in all its complexity, including the subtle dynamics of hormones and their full effect on the nervous system. Present oral contraception is at only a primitive (faulty) stage, only one of many types of fertility control

now under experiment. Artificial insemination and artificial inovation are already a reality....⁴⁶

The history of the contraceptive pill in many ways confirms Firestone's argument, developed in Chapter 9, that the outcomes of scientific research "in themselves" are less revealing than the process of discovery, investment, and prioritization that precedes and determines them. Without doubt the combined oral contraceptive pill that is today used by more than 100 million women worldwide could have been developed much more quickly if efforts to establish it as a political, economic, scientific or medical priority had not met with precisely the "cultural lag and sexual bias" described by Firestone as an irrational and morally retrograde anxiety about allowing women more reproductive choice and control.⁴⁷ It was largely the efforts of social activists such as Margaret Sanger in the United States and Marie Stopes in Britain that catalyzed proper ("pure") scientific research into human reproduction by internationally recognized experts such as Pincus. Indeed the birth of a new scientific field—reproductive biology—has been described as particularly indebted to Sanger and her vast international network of colleagues and supporters (including prominent scientists and physicians such as Julian Huxley, Robert Dickenson, and Clarence C. Little⁴⁸). As a report on the activities of the Ford Foundation pointed out in the mid-1970s, the successful initiation of research in the reproductive sciences from the 1930s onward was the result of "more than half a century of concerted effort by interested individuals and private organisations, mainly from outside the mainstreams of the biomedical research community."⁴⁹ As medical historian Merrily Borrell summarizes:

The activities of birth control activists and their supporting agencies, and the financial backing of private contributors and foundations, notably the Rockefeller philanthropies, provided an important new stimulus to the development of research on the biology of reproduction in the late 1920s and early 1930s. Biologists were able to claim an enlarged realm of issues for scientific study through their activities as advocates and as investigators for the birth control movement. At the same time they promised as-yet undiscovered possibilities for regulating human reproduction once its physiology was understood.⁵⁰

These new possibilities for reproductive control could only be pursued as part of an "enlarged realm of issues for scientific study" by being shorn of their moral and political connotations, their

constitution as a proper scientific study of physiological facts and biological principles was entirely made possible by the networking, persuasion, international organizing efforts, and material support provided by the birth control movement and its supporters. This interplay between social activism, global political priorities, the material support of philanthropic institutions, and “pure” scientific research illustrates well the “dialectical” complexities Firestone sought to convey, much as they led her to employ somewhat contradictory models of both technology and society in the process.

Among other things, the history of birth control demonstrates Firestone’s keen awareness that new reproductive technologies were unlikely to be used to benefit women without a struggle of the kind Sanger, Stopes and their allies waged for the better part of half a century to develop a safe, reliable and freely available contraceptive pill (a goal that still today remains unmet anywhere in the world, and not for reasons of technological incapacity). As Firestone noted of the history of birth control, “the kinds of research [for which] money [is] allocated . . . are only incidentally in the interests of women when at all.”⁵¹ The anovulatory effects of steroids were discovered in the 1930s by the Penn State research scientist Russell Marker, who synthesized progesterone from sarsaparilla, and later from Mexican yams. Marker was unable to generate support to research contraception from his corporate sponsor, Parke-Davis, and went on to found the Laboratorios Syntex SA in Mexico, which quickly came to dominate the market for therapeutic steroid products. It was not until a decade later that the eminent reproductive physiologist Gregory Pincus met Margaret Sanger, founder of the Planned Parenthood Foundation of America (PPFA), at a dinner party in New York. The PPFA funded Pincus to undertake hormonal contraceptive research, but he too was unable to attract research funding from his corporate partner, G. D. Searle & Co. Not until Sanger interested the independent corporate philanthropist Katharine Dexter McCormick in Pincus’s research could it move forward on a properly funded basis, which it then quickly did, first in animal trials and later in humans. (The first clinical trials were initiated in 1954 by recruiting infertile women volunteers from John Rock’s Brookline clinic.) The FDA approved the first contraceptive pill in 1960. Within three years more than half a million women had used it. However it was not made legally available to unmarried women in all states until 1972.

As Firestone predicted, both contraceptive and reproductive technology are good places to look for technological “revolutions” that have been constrained in their potential to benefit women as a result

of a variety of social attitudes and a large dose of what she described as biological moralism. This remains a crucial aspect of women’s relationship to “reproductive technology” if we include in this phrase (as we should) the ability to restrict fertility as well as its promotion. Access to contraception is still denied to the majority of the world’s women despite the fact that control over reproduction is one of the most significant factors contributing to successful health, development and agriculture policies. It also correlates positively with increased literacy and education rates for women, which in turn yield higher rates of economic independence.

In contrast to the oft-repeated characterization of Firestone’s argument as having put too much faith in the capacity of new reproductive technologies to liberate women, her assessment of their potential precisely anticipated that they would reinforce gender polarity if their use was not accompanied by a radical redefinition of gender, parenthood, and the family. As she presciently warned, “in the hands of our current society and under the direction of current scientists (few of whom are female or even feminist), any attempt to use technology to ‘free’ anybody is suspect.”⁵² Indeed on the topic of the “revolutionary” consequences of new reproductive technologies Firestone is arguably most accurately prescient in her descriptions of their intransigence, as in the case of birth control. Far from naïve, her argument about technology is as focused on its propensity to fail as its potentially transformative capacities, much as later risk society theorists have argued its “dialectic” is defined.

The lessons from Firestone for today’s debates about technology thus remain fully available to the conscientious reader, and may indeed offer some of the most enduring insights from *The Dialectic of Sex*—at the core of which is a dialectical model of what Raymond Williams called “the technology and the society.” Keeping in mind that a manifesto is formally characterized by compression, and that its rhetoric is inherently hyperbolic, we can read Firestone most instructively by altering her sense of scale. Scaled down to case studies of particular technologies, the essential mechanics of her argument emerge as both cogent and contemporary. Let us conclude, therefore, with two of the cases that most concerned her.

REPRODUCTIVE RIGHTS, NEW REPRODUCTIVE TECHNOLOGIES

As has been documented in the many excellent histories available of the development of birth control,⁵³ the pursuit of a safe, reliable, and

efficient means of contraception based on modern scientific principles represents one of the longest and most important feminist struggles to enable women to exercise greater choice and control over their reproductive biology. This effort has yielded a range of options that have brought a significant number of benefits to women, but human fertility control remains a good example of the limits of technology to bring about social change, as well as the limits of social change to bring about technology. Women still bear the vast brunt of the physical, emotional, and organizational labor involved in contraceptive use—whether any devices are available at all, whether they are safe or not, and when they fail. For the majority of the world's women modern contraceptive measures such as the pill, condoms, injectibles, or IUDs are simply not an option—a situation that is exacerbated by the matricidal policies toward abortion and family planning by many of the world's wealthiest countries (only family planning based on abstinence was supported under the “pro-Africa” Bush administration—a policy with extremely deleterious consequences for the ability of anti-retroviral treatment to prevent the spread of AIDS as well as for rates of maternal and child mortality).

Access to safe, affordable, or free abortion is similarly limited. Famously, there is no country in the world where women have the legal right freely to make up their own minds about termination or continuation of pregnancy. Thus, despite the emphasis by many modern democratic nations on the protection of various individual rights and freedoms, women's reproductive rights remain in an essentially pre-modern condition—a condition decried by both Firestone and Beauvoir as biological feudalism.

As generations of feminists have pointed out, no amount of legislative, regulatory, or technological change is likely to significantly increase women's reproductive rights until gender inequality is less rigidly enforced and policed by the institutions of marriage, the sexual division of labor, and the nuclear family. So long as naturalized patriarchal authority, the codes of competitive (and violent) masculinity, religiously sanctioned sexism, and the everyday fraternal contract celebrated daily on the sports pages remain so dominant as to appear unquestionable, it will be, as Firestone repeatedly argued, impossible (if not “insane”) even to imagine genuine alternatives.

If we remember that the bulk of Firestone's manifesto was based on an analysis of what has held a certain gender stratification in place for millennia, and in particular on the difficulties of fully comprehending the consequences of women's subordination (and the structures that uphold it), the emphasis on one aspect of her views of new reproductive technology seems misplaced. Read as an analysis of why women still

do not have adequate scientific and technological support to control their reproductive health, or to more fully and freely exercise reproductive choice, Firestone's account takes some bettering.

The situation presented by the proliferation of assisted conception techniques is very different from the history of the oral contraceptive pill, but equally telling in terms of the ongoing relevance of Firestone's many accurate predictions about the relationship of reproductive control to feminist politics. The most prominent issue here in relation to *The Dialectic of Sex* is the rapid expansion of IVF from the mid-1980s onward, and the increasing range of options enabled by the IVF platform (such as preimplantation genetic diagnosis [PGD], intracytoplasmic sperm injection [ICSI], gestational surrogacy, egg donation, and sex selection). This expansion raises a wide range of issues that exceed the space available here, but that represent a contrasting point of convergence (from birth control) with Firestone's emphasis on technological control of fertility. One of the most divisive issues for feminists is the tremendous popularity of IVF in spite of its significant failings and considerable health costs to women (and, it increasingly appears, risks to their offspring). From one point of view,⁵⁴ new reproductive technologies (NRTS) such as IVF represent an intensification of the exploitation of women via their reproductive capacity. As in Firestone's day, feminist attitudes toward maternity, reproduction and technology differ to the point of easily becoming polarized, and since much of the demand for IVF comes from women, the technique is not incorrectly recognized to give women options they value and seek to maximize.⁵⁵ Similarly, the media enthusiasm for polarizing women's options, and then “debating” them (work vs. family, care for others vs. “having it all,” unattractive vs. too sexual, etc.) has not abated. Thus, feminist positions on NRTS have ranged from outright opposition to critical acceptance.⁵⁶ Yet other feminists, in the tradition of the women's health movement, have written feminist guidebooks to new reproductive technologies aimed at empowering women who use them.⁵⁷ Within the genre of feminist literature that is based on a more ethnographic or sociological analysis of IVF, the best adjective to describe the “position” taken by feminist authors over the past two decades, beginning with a string of early studies in the 1980s and early 1990s might be “ambivalent.”⁵⁸ Other empirically based studies of women's experience of IVF are more explicitly critical of the technology—essentially arguing that it is, to use Judith Lorber's phrase, a “patriarchal bargain” through which women are subordinated rather than empowered.⁵⁹

Ultimately it would be difficult to know which “side” Firestone might take in the longstanding, extensive, sophisticated, thorough

and often passionate but ultimately inconclusive feminist literature on NRTS (a literature that of course now also includes a literature about itself).⁶⁰ However, the real lesson from Firestone may be that this is not the most helpful question to ask. Indeed it may be the very form of this question which Firestone's early, prescient and sensible analysis of "the question of technology and society" enables us to reconsider. It might also help us understand the enduring hold of the Firestone feminist fallacy, whereby the question of reproductive technology stands for Firestone, and Firestone stands for feminist folly. So long as feminist debates do not have any serious role in public policy-making concerning the regulation of new reproductive technologies we are returned to the persistent situation concerning women's health and birth control, which is that of basic political exclusion.

In relation to a future in which a differentially sexed biological contribution to the reproduction of the species was likely to remain one of the most intransigent obstacles to "the overthrow of sex polarity," Firestone's vision of prosthetic gestation is fundamentally different from today's increasing range of fertility enhancement options. Indeed they are entirely opposite—while the former seeks to eliminate reproductive difference the latter intensifies it. If there is any take-home lesson from the literature on IVF or surrogacy it is that they are costly, painful and labor intensive procedures in which women are not less defined by sex, gender or biology but more so. As a consequence this highly medicalized and increasingly commercialized—but almost wholly unregulated, undocumented and unmonitored—sector, which is largely orientated toward the production of nuclear families (even, controversially, among lesbians⁶¹), is unlikely to become a force that liberates women. What Firestone provides is a helpful set of insights into precisely how and why this would be exactly what we would expect to happen, much as she might be as unlikely as any of her feminist contemporaries to prescribe a solution (though one suspects she would have told women to abandon the take-home baby aspiration along with the quest for a perfect bustline).

CONCLUSION: REEVOLUTION

If the most common response to *The Dialectic of Sex* is a caricature of her position on technology, reproduction, and social change, it is a highly indicative misreading. Like the smoke that indicates a fire, the obfuscation of Firestone points at the core of the problem she set out to diagnose—the "categories that don't apply," the "painful" problem that is "everywhere," in "the very organisation of culture

itself"⁶²—the problem of the unthinkability of anything outside and beyond the legacies of sexual polarization that limit perception, and above all *the invisibility of this problem*. From this perspective, the wide variation in feminist responses to new reproductive technology would be expected, especially when, as Firestone repeatedly points out, neither the production nor the application of such technologies can occur outside of the currently male-dominated institutions of science, medicine, and engineering. Variation, division, equivocation, confusion, and ambivalence would be politically predictable in response to the scale, and stage, of the problem.

Given her enthusiasm for technological and scientific progress, a bridge Firestone might want to see strengthened would be that between women scientists and technicians and the new biological possibilities opened up, for example, by stem cells, artificial gametes, cloning, and genetic modification. To a certain extent this is already beginning to occur, as certain areas of biology become more feminized, and as the crossover region between basic research and applications in the areas of human, plant and animal reproduction expands. In the past a healthy dose of science-skepticism has been justifiably present within feminism—and so it should be given the male-dominated histories of science, medicine, and engineering. But this skepticism must also be ambivalent: it needs to be accompanied by greater integration of feminist perspectives into science, technology design, clinical medicine, and engineering which in turn must involve a greater integration of women scientists into feminism—something that is likely to become more of a priority within feminist scholarship.⁶³ This integration will be especially difficult for women scientists due to the general taboo that still surrounds mere mention of the F-word in most laboratories. However "the science question in feminism" may well prove an increasingly important priority in what the *Economist* has called "the age of biology."

Ironically, this would mean that an important legacy of Firestone's manifesto will today be manifest at the level of what is traditionally called a liberal feminist agenda—the concern with issues such as getting more women into science and engineering. Indeed, on this point Firestone herself is both adamant and strikingly contemporary. In her characteristically blithe and searing manner, she summarizes the situation of women and science (or the "Larry Summers question") in a single paragraph:

The absence of women at all levels of the scientific disciplines is so commonplace as to lead many (otherwise intelligent) people to attribute

it to some deficiency (logic?) in women themselves. Or to women's own predilections for the emotional and the subjective over the practical and the rational. But the question cannot be so easily dismissed. It is true that women in science are in foreign territory—but how has this situation evolved? Why are there disciplines or branches of inquiry that demand only a “male” mind? Why would a woman, to qualify, have to develop an alien psychology? When and why was the female excluded from this type of mind? How and why has science come to be defined as, and restricted to, the “objective?”⁶⁴

In another ironic twist, the most radical proposal in *The Dialectic of Sex*—of eliminating sexual difference—may also be gaining some traction in the post-Dolly context of sex-as-mix, albeit in ways Firestone did not anticipate.⁶⁵ Now that a skin cell can be made into an artificial gamete, and an artificial egg into an artificial sperm, and an embryoid body into a viable offspring, it is no longer clear what “sexual difference” consists of in “strictly biological” terms.

It is similarly worth remembering that although new reproductive technologies have largely been legitimated through the promotion of normative, heterosexual, nuclear families, they have also, in Marilyn Strathern's words, “travelled back” to denaturalize some of these same traditional idioms—such as biological relatedness, which, as Charis Thompson has pointed out,⁶⁶ is now explicitly constructed, or “strategically naturalised,” in complex exchanges of reproductive substance between siblings, across generations, and through complex, multiparty financial transactions. As a consequence, the very meaning of “biology” and “biological” is changing rapidly, and these terms no longer signify conditional or “given” attributes but something more amorphous, malleable, plastic, and fluid.

The true heir to Firestone is Donna Haraway, who has never allowed science, technology, biology or the search for “solutions” to be oversimplified. Properly, Haraway is not a dutiful daughter and would not share Firestone's over-reliance on either bio-pessimism or techno-optimism. Rather, Haraway has devotedly morphed these very categories through (in)tolerance, persistence, love, labor, and imagination. In her own Cyborg Manifesto twenty-five years ago, Haraway rejected the ecological sentimentalism of a return to holistic values in favor of something queerer, less predictable, and more difficult in the form of a situated ethics that is at once principled but uncontrolled. As a way-finding ethics, she has forged a feminist political discipline as a form of companionship within the project of *revolution*. This is an approach that shares with Firestone an enthusiasm both for biology and the technological means of changing it. Above

all it shares Firestone's distaste for substance-based familialism and blood kinship in all of its forms.

Reading Firestone and Haraway together in the first decades of the twenty-first century reminds us of the importance of the constellation of issues they both positioned at the heart of their feminist manifestos, while providing a useful contrast in the way they assembled their arguments. For both Firestone and Haraway the control of biology is inseparable from an evolutionary narrative that is increasingly hybridized with technological Salvationism. Similarly for both theorists the relationship of gender to biology is radically denaturalized in the service of a revolutionary agenda that requires the destruction of familiar categories, identities, and ways of life. In particular the ability to radically reimagine kinship, family, and reproduction is crucial to the liberation of gender categories, and for both theorists a radical rethink of reproduction enables a reimagining of what technological control is in aid of (which is largely the opposite of its normatively presumed function of improving the status quo). Notable too is the extent to which both Firestone and Haraway part company with their feminist contemporaries on “the question of technology” by placing it at the heart of their feminist visions. This is what they have in common, and what sets them apart from their peers, both in their political aspirations (which are revolutionary) and in their theoretical models (which are in some ways more conventional than they seem in their enthusiasm for science and technology). It is also what establishes them as the origin of a tradition of feminist critical engagement with science and technology that is likely to become increasingly more mainstream as the era of reengineered, transgenic, and synthesized biology begins to regender us all.

NOTES

1. Shulamith Firestone, *The Dialectic of Sex: The Case for Feminist Revolution* (originally New York: William Morrow, 1970; this edition New York: Farrar, Straus and Giroux, 2003), 185 (italics in original).
2. Firestone, *The Dialectic of Sex*, 11.
3. Indeed this claim is not uncommonly used to represent all of 1970s feminism as a lunatic fringe in what I refer to as the famous Firestone fallacy.
4. Juliet Mitchell, “Procreative Mothers (Sexual Difference) and Child-Free Sisters (Gender): Feminism and Fertility,” *European Journal of Women's Studies* 11, no. 4 (2004), 420.
5. Or as if, like Darwin or Mendel, she had accurately predicted the genetic mechanisms of heredity but failed to identify genes (except that this failure was not used to discredit all of evolutionary biology).

6. Firestone, *The Dialectic of Sex*, 180.
7. This is not to say that Firestone's work has not received more careful critical attention from many leading feminist scholars. See, e.g., Heidi Hartmann, "The Unhappy Marriage of Marxism and Feminism: Towards a More Progressive Union." *Capital and Class*, 1979; Alice Echols, *Daring to be Bad: Radical Feminism in America, 1967–1975* (Minneapolis: University of Minnesota Press, 1989); Joan Scott, *Gender and the Politics of History* (Princeton, NJ: Princeton University Press, 1988); Linda Nicholson, *Gender and History: The Limits of Social Theory in the Age of the Family* (New York: Columbia University Press, 1986).
8. Maria Mies, "'Why Do We Need All This?': A Call Against Genetic Engineering and Reproductive Technology," *Women's Studies International Forum* 8, no. 6 (1985), 557.
9. Firestone, *The Dialectic of Sex*, 182.
10. Debora Halbert, "Shulamith Firestone: Radical Feminism and Visions of the Information Society," *Information, Communication and Society* 7, no. 1 (2004), 124–25.
11. Typical feminist dismissals of Firestone include descriptions of her argument as a "technocratic illusion" (Mies) or as "bravely utopian" (Marcus), casting her in the role of naive technological determinist. As Marcus announces with the characteristic indignation of those who have not appreciated the theoretical density of *The Dialectic of Sex*: "It is strikingly and painfully clear that Shulamith Firestone's utopian vision has no purchase among contemporary scholars. Liberation has not come about through contemporary use of reproductive technologies." (Isabel Marcus, "A Sexy New Twist: Reproductive Technologies and Feminism," *Law and Social Inquiry* 15, no. 2 [1990], 268.)
12. The first statement addressed to new reproductive technology in *The Dialectic of Sex* explicitly clarifies that "the new technology, especially fertility control, may be used against [women] to reinforce the entrenched system of exploitation" (11).
13. This chapter builds on two previous publications addressing Firestone's work: Sarah Franklin, *Dolly Mixtures: The Remaking of Genealogy* (Durham, NC: Duke University Press, 2007); Sarah Franklin and Celia Roberts, *Born and Made: An Ethnography of Preimplantation Genetic Diagnosis* (Princeton, NJ: Princeton University Press, 2006).
14. What is most important about dialectical models is that they do not propose a simple "impact," or hydraulic, model of technological change—such as those commonly used to describe reproductive technologies by mainstream commentators such as Jürgen Habermas (*The Future of Human Nature* [Cambridge: Polity, 2003]), Frances Fukuyama (*Our Posthuman Future: Consequences of the Biotechnology Revolution* [New York: Farrar, Strauss and Giroux, 2002]); Bill

- McKibben (*Enough: The Dangers of Being Superhuman* [London: Bloomsbury, 2003]) who (unlike Firestone) posit that society must protect itself against the dangers of runaway technologies such as cloning or preimplantation genetic diagnosis. For further discussion on this issue see Franklin, *Dolly Mixtures*, and Franklin and Roberts, *Born and Made*.
15. See Ulrich Beck, *Risk Society: Towards a New Modernity* (London: Sage, 1999). Whether it be the carbon economy's costs to the climate, the toxic effects of intensive agriculture on the food chain, or the evolution of multidrug resistant TB, yesterday's technological solutions are inevitably also the source of tomorrow's new risks. However, although Beck's thesis is wrongly described as pessimistic, its optimism does not come from technological potential so much as the possibility of mobilizing it with greater social awareness, specifically different models of risk. Still, Beck's thesis is not wrongly placed in the genealogy of critique of scientific and technological progress associated with the Frankfurt School, the critique of medicalization by figures such as Ivan Illich (*The Limits to Medicine* [Harmondsworth: Penguin, 1975]), and the vein of feminist critique of science extending from Carolyn Merchant's *The Death of Nature: Women, Ecology and the Scientific Revolution* (San Francisco, CA: Harper & Row, 1979) to Barbara Duden's *The Woman Beneath the Skin: A Doctor's Patients in Eighteenth Century Germany* (Cambridge, MA: Harvard University Press, 1991).
 16. In contrast to the law-like formalism of Hegelian dialectics, which are based on opposition, it should be remembered that the primary dictionary definition of "dialectic" (according to the Merriam-Webster's) refers to its Greek etymology, from *dialektikos*, meaning "of conversation." Thus, the definition from LOGIC states that: "discussion and reasoning by dialogue as a method of intellectual investigation" as in "the Socratic techniques of exposing false beliefs and eliciting truth" or "the Platonic investigation of the eternal ideas" (Merriam-Webster's). Thus, although Firestone frequently refers to the dialectical materialism of Marx and Engels, which, as in Hegel, describe a developmental sequence from thesis to antithesis to synthesis—and although Firestone makes liberal use of this model—she also uses a wider range of dialectical arguments and strategies, for many of which "dialectical" has the broader meaning of being critical, analytical, or questioning.
 17. Raymond Williams, *Television: Technology as Cultural Form* (London: Fontana, 1974), 6.
 18. Williams, *Television*, 1.
 19. Firestone, *The Dialectic of Sex*, 171.
 20. As the diagrams in the manifesto illustrates, The Technological Mode is the co-parent with the Aesthetic Mode of the "realization of the conceivable in the actual" brought about by a breakdown of

cultural categories and the birth of a new era in which art and science merge, culture disappears, and the “anticulture” revolution begins: “More than a marriage, rather an abolition of the cultural categories themselves, a mutual cancellation—a matter-antimatter explosion, ending with a poof! culture itself” (174).

21. Firestone, *The Dialectic of Sex*, 171.
22. Firestone’s model of historical change is thus based on the matrix—interestingly a word that means both female progenitor and the “magic square” used for calculation in linear algebra. Matrices have long been used for purposes of prediction and are today increasingly the preferred mathematical modeling device for understanding biological development.
23. Firestone, *The Dialectic of Sex*, 162–63.
24. Firestone, *The Dialectic of Sex*, 154.
25. Firestone, *The Dialectic of Sex*, 164.
26. Firestone, *The Dialectic of Sex*, 164.
27. Firestone, *The Dialectic of Sex*, 155.
28. Firestone, *The Dialectic of Sex*, 165.
29. Firestone, *The Dialectic of Sex*, 154.
30. Firestone, *The Dialectic of Sex*, 155.
31. Firestone, *The Dialectic of Sex*, 162.
32. Firestone, *The Dialectic of Sex*, 163.
33. <http://www.marxists.org/archive/haldane/works/1920s/daedalus.htm>
34. The 1936 British film production of HG Wells’s “Things to Come” is an excellent example of the optimistic biofuturism of the era. The film begins in war-torn central London and progresses through a barbaric “dark ages” to a future world of peace, order and prosperity. The cast is led by Raymond Massey, who plays visionary scientist John Cabal (1936, and is produced by Alexander Korda and directed by William Cameron Menzies).
35. Firestone, *The Dialectic of Sex*, 177.
36. Firestone, *The Dialectic of Sex*, 175–76, emphasis added.
37. Ian Wilmut, Keith Campbell and Colin Tudge, *The Second Creation: The Age of Biological Control by the Scientists who Cloned Dolly* (London: Headline, 2000).
38. Barbara Ehrenreich and Dierdre English, *For Her Own Good: 150 Years of the Experts’ Advice to Women* (Garden City, NY: Anchor Press, 1978); Boston Women’s Health Collective, *Our Bodies, Ourselves: A Course By and For Women* (Boston: Boston Women’s Health Collective, 1973); and for an overview see Sandra Morgen, *Into Our Own Hands: The Women’s Health Movement in the United States, 1969–1990* (New Brunswick, NJ: Rutgers University Press, 2002).
39. Among the sources Firestone cites are Lincoln and Alice Day’s *Too Many Americans* (New York: Dell, 1965).
40. Firestone, *The Dialectic of Sex*, 178.

41. Firestone, *The Dialectic of Sex*, 176.
42. Firestone, *The Dialectic of Sex*, 179.
43. Firestone, *The Dialectic of Sex*, 175.
44. Firestone, *The Dialectic of Sex*, 174.
45. Firestone, *The Dialectic of Sex*, 176.
46. Firestone, *The Dialectic of Sex*, 179. The term “inovation” refers to what is now described as embryo transfer, in other words technologically assisted transfer of a fertilised ovum into the womb to establish a pregnancy.
47. Firestone, *The Dialectic of Sex*, 180.
48. See for example Lara Marks, *Sexual Chemistry: A History of the Contraceptive Pill* (New Haven, CT: Yale University Press, 2001).
49. See Merriley Borrell, “Biologists and the Promotion of Birth Control Research, 1918–1938,” *Journal of the History of Biology* 20 (1987), 82.
50. Borell “Biologists and the Promotion of Birth Control Research,” 85.
51. Firestone, *The Dialectic of Sex*, 180.
52. Firestone, *The Dialectic of Sex*, 185.
53. Lara Marks, *Sexual Chemistry*; Andrea Tone, *Devices and Desires: A History of Contraceptives in America* (New York: Hill and Wang, 2002); Elizabeth Siegal Watkins, *On the Pill: A Social History of Oral Contraceptives, 1950–1970* (Baltimore, MD: Johns Hopkins University Press, 2007); Linda Gordon, *The Moral Property of Women: A History of Birth Control Politics in America* (Urbana: University of Illinois press, 2002).
54. Although the Feminist International Network of Resistance to Reproductive and Genetic Engineering, founded in the mid-1980s, was defined by a critical feminist perspective on new reproductive technologies, there was never consensus within the network as to the degree of opposition this required. Some favored an all-out ban whereas others favored selective use and some promoted the development of improved services—thus replicating within FINRRAGE much of the same division that characterized the feminist debate over NRTS more broadly. See, e.g., Rita Arditti, Renate Klein, and Shelley Minden, eds., *Test Tube Women: What Future for Motherhood?* (London: Pandora, 1984) and Deborah Steinberg and Patricia Spallone, eds., *Made to Order: The Myth of Reproductive and Genetic Progress* (London: Pergamon 1988).
55. Demand for IVF is widespread globally and cross-culturally. Demand is also often from comparatively well-educated and privileged women, although, as Emily Martin has shown, being middle-class may increase a willingness to conform to both normative and medical expectations. See Emily Martin *The Woman in the Body: A Cultural Analysis of Reproduction* (Boston, MA: Beacon Press, 1986).
56. For opposition to NRTS see Gena Corea, *The Mother Machine: Reproductive Technologies From Artificial Insemination to Artificial*

- Wombs* (New York: Harper and Row, 1985); Renate Klein, *Infertility: Women Speak Out About Their Experiences of Reproductive Medicine* (London: Virago, 1989); Barbara Katz Rothman, *Recreating Motherhood: Ideology and Technology in a Patriarchal Society* (New York: W. W. Norton, 1989); Jocelynne Scutt, ed., *The Baby Machine: Reproductive Technology and the Commercialisation of Motherhood* (London: Green Print, 1990); Pat Spallone, *Beyond Conception: The New Politics of Reproduction* (London: Macmillan, 1989). For critical acceptance see Michelle Stanworth, ed., *Reproductive Technologies: Gender, Motherhood and Medicine* (Cambridge: Polity, 1987); Barbara Katz Rothman, *The Tentative Pregnancy: How Amniocentesis Changes the Experience of Motherhood* (New York: W. W. Norton, 1986); Rayna Rapp, *Testing Women, Testing the Fetus: Amniocentesis in America* (New York: Routledge, 1999).
57. Naomi Pfeffer and Anne Wollett, *The Experience of Infertility* (London: Virago, 1983); Lynda Birke, Susan Himmelweit, and Gail Vines, *Tomorrow's Child: Reproductive Technologies in the 1990s* (London: Virago, 1990).
 58. See, e.g., Gay Becker, *The Elusive Embryo: How Men and Women Approach New Reproductive Technologies* (Berkeley: University of California Press, 2000); Christine Crowe, "Women Want It: In Vitro Fertilization and Women's Motivations for Participation," *Women's Studies International Forum* 8, (1985), 547-52; Linda Williams, "It's Going to Work for Me: Responses to Failures of IVF," *Birth* 15, no. 3 (1988), 153-56; Lene Koch, "IVF: An Irrational Choice?" *Reproductive and Genetic Engineering* 3 (1990), 225-32; Margarete Sandelowski and Christine Pollock, "Women's Experiences of Infertility," *Journal of Nursing Scholarship* 18, no. 4 (1986), 140-144; Meg Stacey, ed., *Changing Human Reproduction: Social Science Perspectives* (London: Sage, 1990); Maureen McNeil et al., eds., *New Reproductive Technologies* (London: Macmillan, 1991); Sarah Franklin, "Deconstructing 'Desperateneness': The Social Construction of Infertility in Popular Media Representations" in M. McNeil, I. Varcoe, and S. Yearley, eds., *The New Reproductive Technologies* (London: Macmillan, 1992), 200-229; "Making Sense of Misconceptions: Anthropological Approaches to Unexplained Infertility," in M. Stacey, ed., *Changing Human Reproduction: Social Science Perspectives* (London: Sage, 1992), 75-91; Marcia Inhorn, *Quest for Conception: Gender, Infertility and Egyptian Medical Traditions* (Philadelphia: University of Pennsylvania Press, 1994).
 59. Judith Lorber, "Choice, Gift or Patriarchal Bargain?: Women's Consent to In Vitro Fertilization in Male Infertility," *Hypatia* 4, no. 3 (1989), 31. See also and see Renate Klein *Infertility* and Karen Throsby, *When IVF Fails* (London: Palgrave Macmillan, 2004).
 60. Dion Farquhar, *The Other Machine: Discourse and New Reproductive Technologies* (New York: Routledge, 1996); Karin Lesnik-Oberstein,

On Having an Own Child: Reproductive Technologies and the Cultural Construction of Childhood (London: Karnac, 2008).

61. Laura Mamo, *Queering Reproduction: Achieving Pregnancy in the Age of Technoscience* (Durham, NC: Duke University Press, 2007).
62. Firestone, *The Dialectic of Sex*, 3, 4.
63. Angela Creager, Elizabeth Lunbeck, and Londa Schiebinger, eds., *Feminism in Twentieth-Century Science, Technology, and Medicine* (Chicago, IL: University of Chicago Press, 2001).
64. Firestone, *The Dialectic of Sex*, 154.
65. For more on the world's most famous clone, Dolly the sheep, see Franklin, *Dolly Mixtures*.
66. Charis Thompson, *Making Parents: The Ontological Choreography of New Reproductive Technologies* (Cambridge, MA: MIT Press, 2006).

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CHAPTER 2

From Cybernation to Feminization: Firestone and Cyberfeminism

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The first wave of cyberfeminism—various projects, publications and debates—came in the 1990s. The artist group VNS Matrix, inspired by Donna Haraway’s 1985 “A Manifesto for Cyborgs,” authored their own cyberfeminist manifesto in 1991;¹ Sadie Plant first theorized the feminization of culture through digital networks and complex connections;² artists, scholars and activists investigated the meanings of bioengineering and technoculture³ and the three biannual Cyberfeminist Internationals (1997–2001) organized by the Old Boys Network (OBN) brought together a mix of people interested in such developments. Combining theoretical speculation, science fiction and artistic experimentation, cyberfeminism became a “brand name” and an umbrella term for a range of practices that did not necessitate identification with feminism. In fact, the cyberfeminists of the 1990s often defined themselves through their differences from and rupture with, rather than connections to or legacies of, the “second wave” as well as the general category of feminism.⁴ With the exception of Haraway, whose manifesto has been well remembered, this tended to involve a certain lack of critical dialogue with the traditions of feminist thought, and feminist investigations into computer cultures and digital technologies in particular.

The cyberfeminist terminology of “internationals,” “manifestos” and (digital) “revolutions” might seem to resonate with Shulamith Firestone’s theorizations of cybernation (namely, the end of labor brought forth by intelligent machines freeing people to play and create), as outlined in her 1970 *The Dialectic of Sex*—a book animated by