

## **Inner Space and Outer Space as CyberSpace? Technocratizing Womb and World**

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### **Abstract**

**Current planning for the commercialization of outer space by a NASA/aerospace industry interface group called SATWG (Strategic Avionics Technology Working Group) is focusing on the creation of a "shared vision" that stresses increased launch vehicle capacity, with one end goal being the ready delivery of more and more satellites into LEO (low earth orbit). This emergent phenomenon--an organic, living planet ringed by thousands and thousands of satellites, all sucking information up from the earth and beaming information down at it--seems to me to constitute a techno-organic system, a cyborg. At the same time, and not coincidentally, regular technological invasions of the womb (ultrasound, amniocentesis, parents talking/reading/playing music to their unborns through "prega-phones," external and internal electronic fetal monitoring during labor, and the new reproductive technologies) are becoming increasingly characteristic of postmodern pregnancy. This paper compares the motivations of those engaged in cyborgifying the planet with the motivations of those engaged in cyborgifying the fetus, to identify the underlying ideologies that inspire both groups, and to point out the structural similarities in and implications of the increasing technocratization of womb and world.**

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**In her formative and influential "Cyborg Manifesto," Donna Haraway presents a paradigm of cyborgification that balances irony with positivism, skepticism with hopefulness. Rejecting both the mind-focused patriarchy of old and the body-focused new feminisms, she eschews God and Goddess in favor of the "dangerous possibilities," the infinite expansions, allowed and potentiated by transgressing the boundaries between**

organisms and machines. Haraway takes the notion of the cyborg--"an ultimate self untied at last from all dependency" from prosthetized humans, through science fiction characters, all the way to "a man in space." Looking at objects and persons as integrated systems, she sees no "natural" architectural constraints on system design, noting that in a cybernetic world "the entire universe of objects that can be known scientifically [can] be formulated as problems in communications engineering." (1991:163).

This paper addresses both macro- and micro-cosmic versions of these systemic problems in communications engineering, in remembrance of that ancient Hermetic phrase that was at one time supposed to encapsulate universal truth--*as above, so below*. In the past, that phrase evoked mystery--the miracle and wonder of seeing the universe in a grain of sand, or the human life cycle writ large in the stars. Unwilling to remain in the mystery, Western culture has probed and penetrated the natural world, both stellar and cellular, and is now engaged in the technological transformation of that world on all levels. I want to speak about about cybernetic transformations on two of those levels--the part of outer space most contiguous to the planet (once the domain of myth, and now the domain of satellites), and the fetus in the womb (once the domain of woman and of nature, and now, increasingly, the domain of technology and of culture). The cyborgian transformations we are wringing on each of these levels parallel each other, and speak in their own expressive ways of our massive technological incursions into all organic domains. The picture they paint is clear enough to me. I hope in this brief time to paint that picture for you as well. Its outlines are just now being drawn. Whether they are all filled in is still a matter of human choice.

*As above, so below* - so let's begin with the cyborgification of the planet. For the past year and a half, I have been attending the meetings of a NASA/aerospace industry group called the Strategic Avionics Technology Working Group (acronymically known as SATWG). The participants in the SATWG forums include avionics experts from NASA headquarters and field centers, aerospace integrating prime contractors, leading avionics systems suppliers, small businesses that support NASA programs, professional societies, and selected universities. SATWG holds meetings twice a year, usually

hosted by major aerospace corporations at hotels near their corporate headquarters. The host companies, which in the past have included Boeing, Rockwell, Hughes, Lockheed, McDonnell Douglas, and Motorola, offer SATWG participants guided tours of their plants and offices as well as demonstrations of new products and technologies. Such companies are looking for an end to the painful layoffs and 'downsizings' they were forced to undergo by government budget cuts in the late 80s. They are finding that some of that end in the development of new commercial products such as Boeing's 777 airplane, and they hope to find a great deal more of it in the commercial development and exploitation of outer space. My interest in this group was originally sparked by the oxymoronic nature of its major charter--to develop a "shared vision for the commercialization of outer space." The juxtaposition of "vision" with "commercialization" which took me aback turns out to quite accurately express a set of tensions and paradoxes in their collaborative work between the simple capitalist desire to make a buck, and the unavoidable sense that efforts to fulfill this desire in outer space intrinsically carry a transcendent meaning and purpose--the next evolutionary jump for the human species.

One of the major areas of concern for these NASA and aerospace industry leaders is the enormously lucrative satellite market--a commercial venture which can be seen as a first step toward the stars, but which itself remains closer to earth, exploiting the market niche of LEO--low earth orbit. At my first SATWG meeting in D.C. one year ago, a presentation by Ken Cureton of Rockwell on "International Space Competitiveness Issues" identified four primary areas in today's international commercial space market: communications satellites and services, weather satellites, earth observation satellites, and the vehicles needed to launch them. For example, although at the moment space communications only account for 5%/year of the total worldwide communications industry (\$40 billion/year in 1993), Cureton pointed out that space communications are expected to continue as the largest potential growth space market, constituting a tremendous opportunity for commercial competition. Thus, the key to increased competitiveness in the satellite communications market is launch vehicle capacity. Moans and groans were heard when Cureton noted that in the 1970s the U.S. had held 100% of the commercial launch vehicle market, a percentage

which dropped to 51% in the 1980s as the French gained a corner on the market (40% ESA, 9% others) through their Ariane program; and to 34% in the 1990s, as ESA's market share climbed to 52% percent, and China's new program took 8%, with 6% split between the Russians and the Japanese. Concurrently, the U. S. lost its edge in the commercial satellite market as well (87% in the 1970s, 71% in the 1980s, 63% in the 1990s). SATWG as a group is dedicated in part to helping the U.S. aerospace industry reclaim as much as possible of that lost market share. The more launch vehicles we can produce, they said, the more satellites we can put into low earth orbit, and the more money we can make.

At that point it occurred to me to look at the big picture, and I began to wonder how many satellites are presently in orbit all together. Every time I asked one of the guys, he would look at me funny, because that is not the kind of question aerospace engineers ask. Nobody knew exactly, and I haven't yet gotten through to the North American Aerospace Defense Command in Colorado Springs to ask. But here is what I have learned so far:

Communications satellites: Ellipso (MCHI) 20

Odyssey (TRW) 20

Globalstar (Lora) 48

Iridium (Motorola and Sprint) 66

Teledesic (Gates and the cable companies) 840

That makes 994 communications satellites either in orbit now, or soon to be, not to mention the weather, earth monitoring, and spy satellites up there, which will bring the total of satellites in orbit to around 1200. And what will all these satellites do? They will ensure that anyone with a cellular phone can call anyone else, anywhere in the world, through the interaction of signals bounced between satellites and terrestrial systems. They will let somebody in the middle of the Amazon pinpoint his exact location on the map on his PC, or, as in the commercial, send a fax from the beach. They will allow any and every TV station to send a clear signal through their very own satellite system, and any home anywhere to receive it. They already track weather patterns with high efficiency,

and take extraordinarily detailed photographs of toxic waste dumps, soil erosion patterns, and the effects of acid rain, not to mention of the armaments, military training sites, aircraft capabilities etc. of other nations and of terrorist groups.

Then I discovered that, including satellites, there are 7000 objects bigger than 10 centimeters in low earth orbit that are presently being tracked by the North American Aerospace Defense Command. So I started to wonder, how many satellites can be tracked? And how many would fit in LEO before they start running into each other? No one could give me a clear answer about that--it depends on type and altitude of orbit, etc., but the overall message was, in effect, the sky's the limit--they were talking *tens of thousands*. I woke up that night dreaming about the planet ringed by thousands and thousands and thousands of satellites, all sucking information up from the earth, zinging that information back and forth to each other, and beaming it back down. My *American Heritage Dictionary* defines symbiosis as "a close, prolonged association between two or more different organisms of different species that may, but does not necessarily, benefit each member." If a cyborg is a techno-organic system, a symbiotic fusion of organism and machine, then I believe that the system created by the organic earth orbited by technological artifacts and in constant interaction with those artifacts is a cyborg--and that is a happening thing (*slide: graphic representation of the earth as a cyborg*).

As Haraway might point out, there is much that is positive in this symbiotic fusion. For example, warnings of weather shifts can save thousands of lives. Earth monitoring satellites are showing us extremely detailed and impressive photographs of the environmental degradation that is only visible in its full ugliness from way way up high. We can see the effects of the toxins leaking out of the barrels near Niagara, the massive soil erosion of the Everglades, the silt pileup in the Mississippi Delta, the changes in ocean color from pollution. Such information is enormously useful to environmentalists, to legislators, to all those who are trying to get us to clean ourselves up. Communications satellites increase human contact--it will surely be useful to reach out and touch someone, anyone, anywhere on a cellphone--it may even give rise to ads reminding us that we are all cybernetically connected in the vast web of technolife. And TV broadcasts--

well, I leave it to you to decide whether they are useful. In this limitless market, the opportunities for profit, for jobs, for the continued growth of our service- and information-based economy, are truly awesome.

But what about the dangers in those cyborgian "dangerous possibilities"? At SATWG meetings, I hear only unreflexive enthusiasm about the good things that are coming from this techogrowth. The only price these engineers and industry leaders see that will have to be paid is the cost of developing new and more efficient launch vehicles to compete for market share with the Russians, the French, the Chinese, and the Japanese. This price is so enormous--more than \$15 billion to develop one new rocket--that the government is not willing to fund the development of the needed launch capability, and no one company is capable of doing so. Consequently, at SATWG meetings, there is much discussion about how to share that price between industry and government, and even between nations. What is never discussed is the other price--the environmental price. No one asks what will be the effects on humans, animals, the ecosystem of vastly increasing the number of satellite signal waves passing through our bodies, through our food, through the body of the planet. No one proposes studies on what effects the ever-increasing number of rockets taking off to launch those satellites might have on the ozone layer every time they punch a hole through it. What about the exhaust chemicals? the space debris? Instead, they talk about poking more and more holes--they want to add to the satellites in orbit (and to the thousands of pieces of space trash also in orbit), passenger vehicles so tourists can take a spin into outer space at \$50,000 a pop, planes that can circle the globe in two hours by penetrating to outer space, going halfway around the world, penetrating the atmosphere again, then landing. They are green with envy over Japanese plans to build earth-orbiting hotels and a lunar outpost by 2020, a full-fledged lunar-orbiting hotel by 2030, an outpost on Mars and a Mars orbiting hotel by 2040, and a colony on Mars by 2050, and especially over the fact that those plans are being laid by a consortium of Japanese corporations who can afford to carry them out.

Now, I must tell you that this sort of fieldwork is a real departure for me. For the past ten years I have been engaged in research on pregnancy and childbirth in the United States--

an area which I have approached from the perspectives of medical and symbolic anthropology and feminist studies. I have interviewed over 140 women about their pregnancy and birth experiences, as well as dozens of obstetricians, nurses, childbirth educators, and midwives. Oddly enough, it was this birth research that brought me to my current interest in cyborgs.

In my first book, *Birth as an American Rite of Passage*, I analyze obstetrical procedures as ritual enactments of the technocratic myth of ultimate control of and transcendence over nature (*slide of a delivery room full of machines*). Through hospital routines, organic childbirth is deconstructed into identifiable and controllable segments (*slide of an IV insertion, slide of forceps delivery*), and reconstructed as a mechanistic process of production of new social members (*obstetricians proudly holding up a newborn*). At first shocked by women's complicity with such a system, I ultimately came to understand how it serves women's felt needs to be full partners in the technocracy. When I asked professional women, what is your body? I was told, "My body is a vehicle that carries me around, a tool for my success in the world." They insisted that they did not want to "drop down into biology," that they preferred to be intellectual and emotional women, but would just as soon leave the biology behind. I came to see the epidurals they were demanding (*slide of needle being inserted into a laboring woman's back*) as the perfect lived expression of Cartesian mind/body dualism (*close up of same*)--a dualism which these women experienced as real and actually valued, for in the separation of intellect from biology they felt that they achieved a degree of freedom from both the biological and the psychological constraints of womanhood that their predecessors would have envied (*slide of a professional woman carrying briefcase, baby, and cellular phone*).

I came finally to understand the American obstetrical system as the co-creation of women and obstetricians who profoundly distrust nature and the human body, and just as profoundly trust the technological manifestations produced by human bodies (*slide of a bank of electronic monitors at the nursing station, with the laboring woman visible in her room, reading a magazine*). So when I first read Donna Haraway on cyborgs, I felt the shock of recognition--the most graphic example of a cyborg that I personally could think of was a laboring woman

belted to a fetal monitor (*slide of the huge belts strapped around her waist*), especially when her consciousness became interlinked with that monitor (*slide of a woman staring at the EFM*). One such woman said, "Once I was hooked up, no one even looked at me any more--they all just stared at the machine. So I started staring at it too, and pretty soon I got the feeling that *it* was having the baby, not me." Was she horrified by this psychic techno-takeover, this cybernetic cooption of her birth experience? Not really. Her response was to demand a Cesarean (*slide of a woman prepped for a C/section*). Through the further cyborgification of her body and the technological production of her fetus, she found both release from bothersome biology and a way to regain a measure of personal control--she lived, in other words, Haraway's optimistic scenarios of "dangerous possibilities and infinite expansions." As an anthropologist, my job was to not to judge, but to understand and speak for her, showing the correspondences between her attitudes and those of the wider culture, which I have done, I hope successfully, in a number of publications.

Personally, I could not relate. I found the measure of my own subjectivities in the unadulterated organicity of the homebirthers I both interviewed and emulated (*slide of a very pregnant homebirther naked on the beach, slide of another naked on her sofa and grinning at the camera*). I could simultaneously study and identify with ecofeminism (*slide of woman as tree*), both interview and become an active supporter of the home birth midwives who supported women to live out their organic embodiedness (*slide of a midwife kneeling in front of a laboring woman, holding her hands, and gazing up into her face*). I plunged into research on home birth midwifery, and soon completed a paper on midwives' astonishing willingness to sometimes rely solely on intuition--embodied inner knowing (*slide of a midwife holding a laboring woman on her lap, their faces together*)--even in this technocratic society which officially respects only information obtained from external diagnostic technologies. But, in my ideological alignment with the Goddess these midwives represent (*slide of the Goddess--a batik by Sheila Kitzinger*) and my growing understanding of the degree to which this Goddess was excised from hospital technobirth (*slide of a woman in the lithotomy position, with all but the vaginal opening covered by white sheets*), I was left with the dichotomies of mechanicity

and holism, and I longed for a bridge. I found such a bridge in Haraway's cyborg visions, but I am uncomfortable standing on it, as the tensions between the dangers and the possibilities fill me with profound anxiety. That bridge does, however, allow me a hopeful and even heartfelt way of dealing with the thorough technologization of reproduction, a useful third perspective on the mechanistic-holistic dichotomy in which my birthwork had me stuck.

For example, my previous interpretations of this slide (*a woman hooked up to the monitor*) had to do with the symbolic messages of mechanicity sent to the mother through her attachment to the monitor--the message that her body is a defective machine that cannot give birth without the assistance of these other, more perfect machines. In contrast, the cyborgian perspective enables me to look at this slide from multiple points of view. From the point of view of the woman--I know that the symbiosis between her body and the machine makes her feel reassured that everything is under control. She can be told when a contraction is coming, can prepare herself mentally, and can feel certain that the baby is fine when it is over, because of her faith in the authority of the machine and those who interpret its squiggles to her. They engage her mind, the part she most values, in the enterprise of controlling a biological process of which she is somewhat afraid. From the point of view of the hospital staff--as long as the monitor is in place, so is the woman. They don't have to try to track her as she wanders the halls. They too can feel safe, in control, on top of the situation, because they have continuous access to the information they want--information that also enhances their authority. From the point of view of the woman's body and the baby inside--well, that's a different story. This machine has her imprisoned in a position that is dysfunctional for labor. It compresses the blood vessels flowing to the baby, and cuts down on the baby's oxygen supply, suppressing the bodily movements she might make that would correct this problem, and making the baby's active descent into the vagina more difficult because the compression of her pelvic bones from lying flat on her back gives the baby less room. These conditions often lead to cesarean section for fetal distress caused by the machine. Or the machine may give faulty readouts that lead to an unnecessary cesarean. Or it may diagnose real danger, real distress, and lead to a Cesarean that is lifesaving. So we can see how this prosthetized human, this temporary cyborg, is

fraught with ambiguity--the dangerous possibilities and infinite expansions of Haraway's vision.

Interestingly enough, I can apply that cyborgian perspective with far less anxiety to the cyborgification of the planet than to the cyborgification of the unborn child. There, my holism haunts me (*slide of a pregnant tummy with the mother's and father's hands resting on it*). I am only too aware of how a holistic perspective conceptualizes a child--as a conscious being, with intelligence, emotions, memory, awareness (*slide of a researcher and a newborn sticking out their tongues at each other*). Here a midwife treats a child in that way (*slide of a midwife at a home birth eye-to-eye with the baby*)--asking permission to weigh, explaining the procedure, and then weighing the baby in a soft cloth hanger. Contrast that with the mechanistic approach to weighing that sees the baby as product, unaware, without memory (*slide of a nurse weighing the baby on metal scales while the child cries and waves its arms frantically*).

I cannot forget or ignore the holistic assertion that conscious babies are damaged, wounded, traumatized by technobirth. Holistic homebirthers and midwives reject amniocentesis as an invasion of the sacred space of the womb disturbs the child's cocooned sense of safety. They reject repeated ultrasounds (*slide of an ultrasound being performed*) as harmful sonic disturbance (here they are supported by two recent large-scale studies, one showing hearing and equilibrium impairment from ultrasound, the other showing an increase in left-handed babies after exposure to ultrasound). They say that babies taken to nurseries too soon (*slide of babies in plastic bassinets*), and raised in cribs, plastic carriers, and playpens instead of being held in human hands will grow up bonded to technology instead of people (*slide of an ad for a cloth baby swing that actually touts "Your baby's health, development, and happiness lie here."*).

The implications of this are, of course, that we are creating a closed system--that the more we technologize birth and childraising, the more the adults so raised will want to technologize their environments, the more they will extend those technologies to conception, pregnancy, birth, and childraising. And so the notion of the cyborg becomes the only hopeful way of interpreting this process, because at least, even

as cyborgification mechanizes humans, it also anthropomorphizes machines. And maybe that will get us somewhere good. I mean, if Data is any kind of a model, there may be benefits to this process that we have not foreseen. I don't see them yet. Instead, I see technocratic forces focused like lasers on babies (*drawing of a baby in the womb looking out at a large graph whose lines go into the womb*), too often in lieu of human touch. We can grow them younger and younger now (*slide of a tiny preemie in the NICU full of wires and tubes*). Will the day come when we grow them from scratch? (*slide of a fetus floating in an artificial womb*).

It seems quite clear, at least for now, that the limits to the cyborgification of womb and world will not come from the technology. Every time I ask a techie at Motorola, at Draper, at JSC, Can we really send faxes from the beach, make watches into phones, design our genes, grow babies in artificial wombs, build launch vehicles that are safe, fast, and cheap, put a hotel into low earth orbit? What are the limits to this technology? I always get the same answer: "There are no limits. We can do anything. All we need is the money." So I am left to wonder, will the organisms set the limits? Will sinkholes in the ozone put an end not only to spaceflight, but also airplanes? Will babies grown artificially turn out to be monsters incapable of love? Will the satellite waves buzzing around the earth give us all cancer when they reach some critical mass? Will we break through the dangers and expand into the very real possibilities? or will the public make the paradigm shift so dear to the hearts of New Agers, alternative healers, and environmentalists, and go back to a more organic way of life? (*slide of women in a forest*)

After four days at the first SATWG meeting I attended in Washington D.C.--four days of intense interaction with aerospace engineers and managers, intense effort to learn their language, see the world through their eyes, I was sufficiently on the inside to find myself accompanying them to a reception on Capitol Hill, to watch them lobby members of Congress to fund government support for a commercial space program. They were lobbying because they were nervous. The Challenger disaster had severely shaken public enthusiasm for the space program, and continuing cost overruns had eroded congressional support. The space station had survived by the thinnest of margins--two votes the other way could have killed

it. There were many who felt that the money that was feeding NASA would be far better spent on feeding the homeless-- including the wife of one of the prime movers at SATWG, who sat next to me on the subway all the way back to the hotel, confiding in me that she simply did not understand why the government should be encouraged to spend billions on space when there was so much that needed to be done right here on earth, in this country, even.

I opened my mouth to agree, but what came out wasn't what I'd planned. What did I, the staunch defender of organic childbirth, of women's bodies, of the environment, say to this woman who was espousing what no doubt should have been my own position? I told her that I thought that the space program was essential to the future of our species, that we had to reach to the stars in order to improve life on earth! I cannot even plead total cooption by the engineers I was studying as my excuse--rather, I blame it all on Captains Kirk and Picard. Can it be cultural accident that these latter two appear on the cover of last week's Time, on the same day as the cover of Newsweek (*slide of Newsweek cover: "In Search of the Sacred"*) insisted that we are engaged in a new quest for the sacred? (*Switch to slide of Kirk and Picard on cover of Time*). There they are, folks, look no further, the answer to all our prayers for a better world.

Okay fine, I admit it--HI, I'm Robbie and I'm a Trekkie! I've seen every single episode at least three times, and my personal vision of humans in space is permanently warped by Star Trek's ongoing enactment of Roddenberry's vision that space travel will help us improve ourselves, rise above our imperfections to create an earth without war, pollution, gender hierarchies, or capitalist greed, and that space technologies will solve our physical and environmental problems. I may be a true believer, but I want you to know that science is supporting me here. My faith was confirmed during the last SATWG meeting I attended, at MIT last month, when John Hines from NASA began to talk about a program they are developing at Ames Research Center called Sensors 2000 (*slide, Sensors 2000*)--a system of remote medical monitoring devices (*slide--diagram of human figures from which dotted lines emanate, to indicate data going into a machine*). When Hines got to the part about remote monitoring of the fetus during labor, and whipped out a model of a Star Trek tricorder, saying this was what they were developing to

scan the laboring woman's body for the same information they now have to hook her up to the fetal monitor to provide, I *knew* that my prayers would be answered for sure--the techies are going to save us after all!

*As above, so below.* Let me conclude with a quote from a friend I ran into at the grocery store last week. She said that for her birthday, she had been invited to Florida to watch the shuttle launch, and it was one of the greatest thrills of her life. "It's just like--your're not going to believe this," she said, "but it's so big a thrill (*slide of boosters firing*), it's better than sex (*slide of liftoff*). The only way I can describe it is that it's just like--giving birth!" (*slide of laboring woman standing upright, knees bent, ecstatic expression on her face as the baby crowns*).

Thank you!