

The Premise of Recombinant Architecture: One

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Recombinant architecture examines the deep cultural impact of biotechnologies, including genetic, genomic and transgenic engineering, on the architectural imagination.

This short essay maps several of theoretical and ethical positions on the dark matter of recombinant design, and seeks to clear the ground for a material architecture based on these complex technologies of self, space and matter. Recombinant architecture explodes allegorical relationships between body and structure, incorporating biologic and architectural bodies into indiscrete and reversible interiors and exteriors including cyborgs and transgenic bodies, generative tissue textiles, body-architecture hybrids, replicating habitats and genetically engineered architectures and building materials.

Recombinant architecture is multiple, and this essay considers it according to three interrelate indexes: (1) the conception of architectonic forms in the image of genetic, biomorphic corporeality (architecture as physiognomic index of the posthuman), (2) the deliberate fashioning of recombinant bodily forms (genomic

entities in the image of architecture) and (3) the application of artificial biomaterials in the construction of the built environment (architecture as the result of genomic design) - from bodies to buildings and back again. [i]

Genomic Programs/ Bodies

Recombinant technologies (genomic mapping, gene therapy, nanobiotechnologies, etc.) radically refigure the body as a site of production, reproduction, habitation, sensation, ambulation and temporal becoming. Because these sitings co-ordinate with architecture úas scale, shelter, symbol, and scenario - we anticipate that recombinant technologies will impact architecture in an equally radical fashion.

Even as genomic and transgenic design destabilizes the very bodies with which we inhabit our shared worlds, what is most crucially at stake is not the physical body per se, but rather the local and global social institutions built over centuries upon concepts of the body as stable, natural referent. As the biological bodily medium fragments from universal singularity to (digital) genetic assemblage, the worlds we define through the body become themselves equally destabilized and redetermined by recombinant imaginaries. Any institution based on bodily discourses is a potential site for some recombinant revolution (the family, the home, the nation-state, 'space' itself,) and this leads us in several contradictory and sometimes dangerous directions. The 21st century will be populated with genomically reflexive/self-conscious children, born and growing in bodies known to them as inhabitable expressions of 'binary code'. [ii] Are we populating the early years of a eugenic century with a nightmarish biotechnological singularization of humanity? Are we also participating in the first years of a new society of biomaterial freedom, an architecture of the self that will allow (and demand) new reflexive practices of bodily expression and purpose?

As allegory, the genetic turn animates several contemporary architectural projects. But as tactile and textile materiality, and as a sociocultural unconscious that underlies every 'program,' the eventual impact of genetic technologies can hardly now be measured. Recombinant architecture is a radical questioning of the most fundamental programmatic assumptions about the logical affordances of built space. When both architecture and the bodies that inhabit it are themselves both organic and inorganic, when both are materially alive and not-alive, when the natures of both are understood as artificial and artifactual, the first premises of their interactions in space and over time are reopened.

Genetic Architecture: Algorithmic Biomorphology the conception of architectonic forms in the image of genetic, biomorphic corporeality (architecture as

physiognomic index of the posthuman The genetic imaginary has insinuated itself across architectural investigation in a variety of ways, and drives several experimental approaches. [iii] Incursions into genetic architecture elaborate the epistemic centrality of a now genomically self-conscious body as a methodological index of structural investigation. The genetic body names and contains multiple, incongruous animate forms to be given architectural expansion. For each, attention is paid to genetics and genomics as figurative principles that transcend and extend purely biological processes into more comprehensive bio-technical systems.

For Karl Chu, organic and inorganic phyla intermingle in mutually constitutive limit-horizons of informational materiality. These territorializations emerge in vivo across the physicality of earth-surface as multiple algorithmic transvaluations.

“Genetic space is the domain of the set of possible worlds generated and mitigated by the machinic phylum over time. This is the zone of emission radiating out from the decompression of reality, a supercritical explosion of genetic algorithms latent with the capacity to exfoliate out into genetic space. This is not a passive receptacle but an active evolutionary space endowed with dynamical properties and behavior of the epigenetic landscape.”[iv]

According to Chu’s theory of a hyperzoic space, laws of physics that ordinate the play between genotype, phenotype and environment, are themselves evolving, and are condensations of multiple manifest and virtual modulations of genetic-algorithmic enunciation. Chu names the emergence of a Hyperzoic Era, in which information-as-capital and capital-as-information, condense and decode into manifold species of artificial life.[v]

Manuel De Landa, now teaching in the architecture and planning graduate school at Columbia, maps the promiscuous intraevolution of geologic, linguistic, biological and mechanical intelligences across multiple sites of intensification and convergence. Within De Landa’s transversal history of polyscalar incorporation, architecture becomes a site for the manifestation of multiple concurrent evolutionary vectors: semiotic, military, meteorological, and viral. This evolution of forms is realized by the differential interrelations of genetic replication and dynamic environments. The plural agencies of design are located across the two: in the incremental durations of singular life spans and in the limit trajectories of impact they have on the habitat. Environmental history persists - is translated and miniaturized- in both the genetic signatures of the traits for which it selects, and in the species-bodies animated by those same genetic signatures.

This animation inscribes the inhabited, material world according to mediated parameters of use, exchange, signification and symbolic excess. How a given form comes to occupy a given position within the actor network of human and inhuman agency, from the microbial to the continental, and the contingent durations of those variant occupations, is the architectonic horizon of code.

Mutation, noise within the infogenetic signal, locates the principle of variation (innovation) within the bioinformatic code that always already contains its own contradiction, its own possibility for random alternative iteration. But any mutation (any innovation) has duration only to the extent that it has mediation, that it can sustain a circuit on a given environmental scale. To do so entails a transfiguration of value between bodily limit-form and environmental limit-horizon - a reterritorializing of the machinic architectonics of inhabitation. These take place on multiple temporal scales, from nanoseconds to millennia, and as a Geology of Morals fabricate with us the condition of durable space.

It is precisely on the fissuring cusps of such convergences and divergences that Marcos Novak locates the evolutionary logic of architecture itself. For Novak, the emergence of the digital as a sovereign space constitutes a novel speciation within the genealogy of architectonic investigation. Far from being mere tool, digital spatiality is a new body, a new environment and new condition of intra- and interselective pressures of ecto-, exo-, xeno- and allogeneses as architectonic event-machines. [vi] Building and hyperbuilding become phenotype, a manifestation of form according to the conditional pressures of transitory economies of space-habitation. Because digital architecture constitutes a vector of epistemological speciation from purely molecular architecture, allogenic processes can be anticipated. Modulations of systemic form that emerge on the digital savannah will in turn be spliced into the host bodies of physical architecture. The precondition of this hybridization is the evolutionary differentiation of the digital as a discrete axis of code-form-selection, and its ability to thereby generate otherwise unforeseeable mutations to be later recouped.

Greg Lynn's Embryological House, likely the most publicly appreciated genetic architectural project, reimagines dwelling according to genetic form as a first principle of iterative animation, "You can start with a primitive (in other words, highly symmetrical) form, like an egg, and start to develop rules for breaking the symmetry, is the strategy I took with the Embryological House. It's designed as a roughly spherical form, which has all the linkages and connections of components to it, and then you set maximum and minimum limits for each of those components, and then the interaction of all of those things is what gives you the endless possibilities of mutation." [vii]

The House's double skin reacts and anticipates sunlight and environmental variables according to data received and adjusts itself accordingly. Like an animal body, the House-body modulates its posture to any surface, and architectonic apertures are really orifices; "the door is sphincter-like and irises open and shut."

In important ways Embryological House (and perhaps Genetic Architecture as a whole, as of this moment) remains too beholden to traditional architectural problematics. For all its very real merit, the Embryological House is an icon of the genetic metaphor in architecture, and in its signaling of bodily forms and human morphologies for building systems remains, it remains at this stage of its evolution, allegorical of genetic processes. The dwelling system looks like the outcome of genetic processes, the biological body, but is it itself a genetic process? It is undecided whether Embryological House is yet genetic architecture, or rather still architecture about genetics. The SF story that ends Embryological House leaves all the mutation on the architecture. [viii] But we, the corporeal inhabitants, want to be part of the mutation too! Nevertheless, for recombinant architecture, the clear brilliance of Lynn's project will be more fully realized when the Embryological House is (a) grown in a dish, and/or (b) when it is able to sexually reproduce.

Post bodies the deliberate fashioning of recombinant bodily forms (genomic entities in the image of architecture)

Recombinant architecture presumes the wisdom of these projects and is an elaboration of them. But where genetic architecture in these instances infers or applies genetic grammars into the moment of creating formal architecture, recombinant architecture looks to the figure of the artificially designed body (genomically, surgically or otherwise realized) as a cyborgian measure of both structure and inhabitant. To locate the genetic turn in flesh, and not just in replicant codes or bodily signifiers, is based on comprehensive precedent. The body is the first architecture: the habitat that precedes habitation. Architecture looks toward the body for its telos, its image of unified singularity, its continuous historicity. The condition of embodiment and its material poetics of scale, temperature, solidity and pliability, reproducibility and singularity have located the horizon of design from Vitruvius to Virilio.

But bodies, sliced into component subvariables and statistical predispositions, are imaged now as genomic territories, as cities of DNA-events. Bodies, fleshy viscous bodies, are now not only the first architecture; they are practically the first digital architecture. DNA is binary code: it is a computational principle, and it images of the body as a mutable infomatic field. But the body-as-digital-

medium, still at the foundation of the architectural imaginary, is like other digital media available to cut & paste mixology. A recombinant architecture conceives the design of the built environment according to the discursive technology the genome, "DNA makes architecture." The bodily forms it produces are themselves architectonic in the highest order. These genomic manifestations are like other naturally occurring architectures, both incredibly perfect as they are, and also available to the modifications that practical and symbolic habitation makes from them.

From Prometheus to Rabbi Loew and from Victor Frankenstein to Stan Lee, hero-villain creators are signatories of the complex condensations of body, biology, technology, and myth that appear as quasi-human icons of emergent technological systems. [ix] In 1995, Dr. Joseph Vacanti, a transplant surgeon at Harvard, cultured a human ear under the skin of a mouse. The workable ear was removed and the mouse survived in tact. Vacanti's mouse is a genesis figure for an era of radical elective restructuring of what bodies are as machines, and machines are as bodies - an origin myth for multiple new design practices. This startling transgenic being-object is a contemporary Chimera, is partially magic. [x] The image of the Ear Mouse is an icon of radical tissue engineering, of the creative violence of science, and of the biological body now recombinant architectonic form. [xi]

For legal, ethical, and technological reasons, the ultimate realization of genomic digital auto-fabrication may never be fully realized, but at the level of primary mechanics the ultramodern Body is already a highly recombinant form. Even a cursory read through the advertisements for innovative elective surgeries in any newspaper makes this clear. Extreme body modification is a decidedly architectural discourse and practice. It is a deliberate renovation of that first habitat (of the self), and of the public production of performative space (of the singular Other). This practice takes many guises that each constitute qualitatively different architectonic visions, some toward a radical alien, others toward a singular standard, though often what appears at first to be one, turns out to be the other. From piercing fads to elective surgery, the financial and symbolic economies of radical body modification are the precursors to a potential era of radical genomic self-fashioning.

But where piercing, tattooing, or even more radical modifications like implants and other plastic surgeries, are interesting in their location of structural redesign in the flesh, it is the She-Male that most decisively signals the sort of Chimeric complication toward which recombinant architecture always gravitates. The She-Male, the both/and of human bio-sexuality, is more that an affective refinishing of the corporeal form, s/he sites the reconfigurability of even the most primary and significant structural elements of the body. For recombinant architecture,

transsexuality is a key design index. It situates technobiology as a malleable and reflexive structural language that can be articulated in deliberately novel ways. Transsexuality also complicates the alibi of deep function that accompanies speculative research into recombinant technologies. [xii] The surgeries are not exactly medical procedures, nor are they merely cosmetic. They are metamorphoses into innovative liminality, and productive disruptions of the categorical universals that arbitrarily determine the premises of both architecture as body, and body as architecture.

The body around which we situate the premise of recombinant architecture is reconfigurable, but not necessarily organic. Bruno Latour's work locates the production of structural agency inside and across both human and non-human actors. These organic-inorganic circuits mutually contextualize and activate each other in practical performance. These actor-networks also locate the sites where desire flips from organic to inorganic modes of investment and back again, from the incremental artificialization of the sensual body to the sensualization of the anthropomorphic artifact. That is, correspondent to the surgical refiguring of plasticized performative-aesthetic self is the eroticization of the inorganic matter.

Recombinant architecture re-designs the built environment both as and with artificially derived biomaterials. This is only possible because it first understands the primary figure of biomateriality, the habiting organism, as itself an architectural event. As ever, buildings become bodies only as bodies become buildings. Because we look at architecture as genetic bodies, we look at genetic bodies as architecture [xiii].

This conversion is also one between newly confused axes of interiority and exteriority. As we come to imagine building systems in the terms and technologies with which we understand our own bodies, as expressions of genetic code, and also come to imagine our bodies as expressions of architectonic-aesthetic criteria, a kind of symbolic cannibalization takes place. The body eats the space, as the space eats the body. This omnivorous circuit will only intensify as we come to realize úfor reasons practical and affective- architecture that you can literally eat.

Genomic spatial systems: the application of artificial biomaterials in the construction of the built environment (architecture as the result of genomic design)

As the application of genetic material engineering to the design of physical habitats (and the reconceptualization of the material body as a now configurable architectonic entity) recombinant architecture collapses literal gaps between

body and architecture, and names the emergence of artificial/ artifactual genomic habitats. An ever-growing library of structural biomaterials, genetic and genomically designed fabric systems, measured in nanometers and kilometers, is being employed in medicine, agriculture, military and even conceptual art. Recombinant architecture activates these as architectural media for the purposes of making durable human habitats.

The premise of recombinant architecture is not simply for artificial biomaterials to replace traditional materials in the formation of traditional forms, spaces, and programs (box, room, dwelling, house.) It is not satisfied by 'biomorphic chairs,' nor even chairs made of genomically designed materials. The premise rather is to explode the sitting-machine into new bodies of spatial narrative, new modes of habitat-circuit, new questions, and not just new answers. This redefinition of program 'from the DNA out' will undoubtedly result in several recognizable forms. Buildings, like bodies, have membranes, and the vocabularies of 'skin' should only become more pronounced. Buildings, like bodies, have orifices, and the materialities of interiorization/ exteriorization should likewise become further pronounced, even as bodily-programmatic conventions based on them (kitchen/ bathroom, for example) mutate beyond recognition.

The deliberate material design of tissue engineering is a far more advanced practice than many readers in the architectural community may realize. The range and precision with which structural biomaterials can be elaborated in the laboratory is astonishing. Pigs may even soon fly. [xiv]

Tissue Culture Project has made pig wings. For reals. Guy Ben-Ary, Ionat Zurr and Oron Catts are genetic artists at the University of Western Australia in Perth. In 2000 they took umbilical pig stem cells and cultured them into and across a sort of biopolymer net. Like ivy growing into a lattice, the cultured pig cells multiplied and grew along this biopolymer infrastructure shaped into the form of little wing. The pig wings will be animated (flapping?) by muscle tissue harvested from rats. Next on the agenda for Tissue Culture Project is to grow steak in a dish from cells taken from a still-living sheep. They plan to eat the steak in the immediate vicinity of the donor animal. Welcome cruelty-free meat. [xv]

If 'mammalian' flesh can be conceived, designed and constructed with this level of precision, we anticipate that media that can be done at two inches by two inches today could be realized tomorrow at twenty inches by twenty inches, then twenty feet by twenty feet, then even two hundred feet by two hundred feet. Witness a dramatic debut of the structural-architectural career of flesh, in which the bodily matter interacts with structural systems to create highly intricate material forms.

But Tissue Culture Project is far from the only radical gambit. Makoto Asashima of the Institute of Medical Technology at Tokyo University led the team that grew frog eyes. These were grown from stem cells and implanted into blind tadpoles, which could see after the implantation. The now-sighted tadpoles grew into frogs, which could still see with their artificially realized eyes. [xvi]

Nexia Biotechnologies of Quebec have injected a spider's gene into a goat named Willow. Willow's milk will be processed so the protein can be used. This silk, called Biosteel, is many times stronger than steel and has a breaking strength of nearly three hundred thousand pounds per square inch. It is also 25 percent lighter than synthetic petroleum-based polymers. Another advantage of spider silk is that it is compatible with the human body. 'BioSteel could be used for strong, tough artificial tendons, ligaments and limbs. The new material could also be used to help tissue repair, wound healing and to create super-thin, biodegradable sutures for eye - or neurosurgery.' Nexia anticipates the production of very large quantities of BioSteel the material could be used to create microscopic, super strong sutures for operations, or as aircraft skin, or in bulletproof clothing. Biosteel could also be used as architectural media. [xvii]

Projects like Nexia's afford architectonic machines through the merging of genetic material from different species. This transgenic system frames the genetic landscapes of multiple species vast territories of recombinant media. Even organic and inorganic incorporations are mutually constitutive within and across transversal evolutionary striations. Organic and inorganic machines, animal and machinic phyla, are already coordinated forms in mutual evolutionary constitution. Accordingly, xenotransplantation, should be comprehensively conceived not just as transgenic (between genus) but also transphylic (between phylum). Reflexive architecture manifests from the indiscrete incorporation of the genetic-machinic codes of these multiple animal-machines. [xviii]

One step toward realizing that incorporation as an architectonic medium is to realize it as an organic one. In January, scientists at Kinki University near Osaka announced that they had spliced spinach gene into a pig. [xix] By splicing the spinach FAD2 gene into a fertilized pig egg, then implanted into a pig's womb, scientists were able to convert about a fifth of the piglets' saturated fatty acids into healthier linoleic acids. The first clear advantage is that these pigs, now yet further translated into pure pork-machines, are healthier for humans to eat. The blending of animal and vegetable code allows for the production potentially more radically combinatory 'materials,' which may be appropriate for eating, living in, or both.

Genomic Affect and Instrumental Sustainability: Bio-Ethics of Multiplication and Singularization

The social, cultural and ethical implications of these questions raised by human, mammalian, or living organic materials as architectural media are enormously complex. This literally organic architecture can be benign, such as Paul Laffoley's vegetable house, or horrific, such as the human skin lampshade of Buchenwald. [xx]

But the risk of very real danger can't dissuade us from activating genomic technologies and making potentially crucial design interventions. The vision of a truly sustainable architecture extends the responsibility of the designer to the molecular and genetic levels of materiality. Accordingly, architecture as a deliberate organization of matter into durable form must locate its perspective as accountable to every possible option for the ecologies of production-as-consumption and consumption-as-production. Guided by this principle, William McDonough and Michael Braungart explain how products can be "designed from the outset so that, after their useful lives, they will provide nourishment for something new. They can be conceived as 'biological nutrients' that will easily reenter the water or soil without depositing synthetic materials and toxins. Or they can be 'technical nutrients' that will continually circulate as pure and valuable materials within closed-loop industrial cycles, rather than being 'recycled' - really, downcycled - into low-grade materials and uses." [xxi]

But simultaneous to the utopic logic of this vision, is also dangerous technologization of biological expression, a reduction, in a Heideggerian sense, of material (animal, vegetable, mineral) not just to genetic-chemical retention cycles and matrices, but to something artificially 'available' to what we might call a 'post-natural attitude,' a utilitarian reduction of the 'givenness of being' to an instrument of recombinant invention. [xxii] One of the foci of recombinant architecture's focus on the body is a foregrounding of desire as both an engine and benchmark of good design, Will the architecture that results from the 'sustainable' eradication of material/symbolic expenditure be more livable, or just more rational? After Heidegger, Paul Rabinow characterizes this later potentiality as one that turns all the world into resource, into fund. But the irreducibility of affect finally makes the instrumental reduction, however well meaning as in the case of McDonough and Braungart, always incomplete, always in need of further alibi in order to circumvent the functional excessiveness of expressivity. [xxiii]

Anthony Vidler characterizes contemporary space in the terms of a post-existentialist estrangement, an inability to ever be at home. The dweller, now a dark cyborg, cycles from one uncanny displacement to another. In Vidler's view

not one but many derangements of body and space characterize the modern and post-modern conditions. It is an open question as to whether the recombinant hyperintegrations of body-as-structure into structure-as-body signal, a delicate new intradependence between building and inhabitant, will bring therapeutic transformative reintegrations of self and space, or further anomie, or somehow both. [xxiv] We may find ourselves in recombinant habitats simultaneously more similar and responsive to our sensate bodies, more intimately incorporated with our biological presence, and also entirely unrecognizable to us as architecture, let alone as homes. As programmatic criteria are recalibrated according to their deep corporeal-genetic forms (kitchen as interiorization zone, bathroom as exteriorization zone, etc.) structural disruptions are inevitable. No more houses, no more offices, no more chairs, no more bathrooms. Instead impossible space/form machines that distribute these 'uses' across manifold monstrous surfaces, orifices, membranes, circulation and detoxification networks; some inside of us, some outside of us, some we are born with, some we fashion.

When architecture becomes genomic, the ecological circuit between human immune system and a building's immune system is raised to primary importance. The notion of a sick building syndrome takes on unimagined ethical ramifications. Whether or not we come to eat our architecture, we will internalize it on a micrological level, as we would the viruses, bacteria, diseases of any complex organism with which we share close quarters. When we get sick, the building gets sick. When the building gets sick, do we get sick? Is this the hypermodern uncanny, in Vidler's sense, or the precise opposite - a radical reconnection with space on the most fundamental level? And if our architecture is another sensate body with which and in which we live, spend our most intimate moments, connect with on a most intimate way; what kinds of erotic desire for our habitats are then inevitable? What kinds of desire will it have for us? Will we fuck our architecture, and if not, what good is it? Will our architecture sexually reproduce, with us or on its own? [xxv] What selection variables might pressure our architecture to move toward parthenogenic strategies?

The integrations of recombinant, nanotechnological and pervasive computational technologies into a indiscrete hybrid of digital, mechanical, and biotechnologies drive radical shifts in our perceptions of body, family, collective, space, city, region and environment. As a momentum of desolidification, this techno-genomic modernity is of course about much more than architecture per se. These integrations and disintegrations reopen Ocode' to radical, even monstrous modes of experimentation that leave us without adequate Oexpert systems' to arbitrate them, and without certain capacity to adjudicate in advance our own inevitable involvements.

A few months ago, when asked by a New York Times reporter about the ethical

difference between genomic design and eugenics, I said that “projects which singularize our standards of beauty are probably bad, and projects which multiply our standards of beauty are probably good.” Bioartist Adam Zaretsky wants blue-skinned children, and why, ultimately, is that worse than wanting blue-eyed children? [xxvi]

Notes

[i] This essay summarizes the research agenda of a seminar I am currently teaching at SCI_Arc, The Southern California Institute of Architecture, Summer 2002. Thanks are due to Karl Chu for helping clear the institutional ground for this unusual investigation, and to my students for their support and criticism. Thanks also to Ed Keller, Willea Ferris, Barbara Huang, Norman Klein, Adam Eeuwens, Kazys Varnelis, Roger Friedland, Robert Sumrell, Alexi Bourbeau and Autolux, Lev Manovich, Christian Moeller, Miltos Manetas, Richard Metzger, Coco Conn, Jane Metcalfe, Marcos Novak, Silvia Rigon, Jessica D’Elena, Steve from Critical Art Ensemble, Ruth West, Barbara Kruger, Sean Crowe, Josh Nimoy, Lida Abdullah, Michael Speaks, Paul Petriunia, Mark Pauline, Bruna Mori, Richard Widick, Eric Owen Moss, Victoria Vesna, Katharine Wright, and especially Adam Zaretsky for the conversations that lead the to formulation of these premises.

[ii] Genomic infomatics as the new mirror stage: Lacan’s theory of the mirror stage narrates the construction of self in developmental relationship to its reflection, its specific inscription as an optical auto-response. Contemporary and emergent technologies of genomic imaging (genetic screening, mapping and differentiation, among them) may work to produce an axis of martial differentiation of the social body (the Gattica scenario) but also a inscription of self-image that displaces the literal Omirror’ as primary info-architectural device of self-becoming.

[iii] While our contemporary moment, one in which fundamental understandings of body and matter are being redefined before us, is historically specific and radically unique, it is important to understand that the recombinant imaginary is a transvaluation of deep and varied mythological, scientific, literary and practical histories of the biological body as a Chimeric and hybrid machine. A current favorite of mine the Lamb-Tree. I quote Claude Doret’s early 17th Century description, “a zoophyte, or plant animal, called in the Hebrew Jeduah. It was in form like a lamb, and from its navel, grew a stem or root by which this Zoophyte, or plant-animal, was fixed attached, like a gourd to the soil below the surface of the ground, and, according to the length of its stem or root, it devoured all the herbage which it was able to reach within the circle of its tether. The

hunters who went in search of this creature were unable to capture, or remove it, until they had succeeded in cutting the stem by well-aimed arrows, or darts, when the animal immediately fell prostrate to the earth, and died. Its bones being placed with certain ceremonies and incantations in the mouth of one desiring to foretell the future, he was instantly seized with a gift of divination, and endowed with the gift of prophesy.” (Claude Douret, *Historie Admirable des Plantes*, 1605).

[iv] Karl Chu, “Genetic Space” http://www.azw.at/aust/soft_structures/allgemein/genetic.htm

[v] Chu, “The Unconscious Destiny of Capital (Architecture In Vitro/ Machinic In Vivo)” in Neil Leach, ed. *Designing For the Digital World*. Wiley-Academy. West Sussex, 2002. pp. 127-133.

[vi] See Mark/Space: <http://www.euro.net/mark-space/GeneticEngineering.html>

Exogenesis: “genesis from anterior source,” “genesis from outer space;” see: <http://abob.libs.uga.edu/bobk/ccc/ce120600.html>

Ectogenesis: “genesis outside the womb”, “genesis is artificial or exterior womb architectures” see:

<http://www.stanford.edu/dept/HPS/ectogenesis/introduction.html>

Xenogenesis: “sexual reproduction with aliens, different species,” “the supposed generation of offspring completely and permanently different from the parent” see:

<http://www.stanford.edu/dept/HPS/Haraway/CyborgManifesto.html>

Allogenes: “xenogenesis from two species that share ancestors,” “sexual reproduction between two gene groups after speciation has divided them.” Novak’s application cites the differentiation of the digital realm from the purely molecular architecture as a genetic speciation, from which future allogenes will occur. See <http://www.centrifuge.org>

[vii] See Mark Dery’s article for *ArtByte* http://www.artbyte.com/mag/nov_dec_00/lynn_content.shtml and Lynn’s forthcoming “Architecture for an Embryologic Housing”, *Birkhauser Architectural*, 2002.

[viii] Quoted from Dery, “At 4:15 A.M., it breathed in. It awoke to the faint burning of a flickering blue light in its gullet and a general feeling of indigestion. It rested fitfully, as if it had eaten a bad meal the night before, with the persistent feeling that an agitated animal was living in its gut. The irritation of a muffled grinding sound from within itself continued, until it was inevitable that the day would begin in the dark. Its surface began glowing as electrical impulses crisscrossed its skin. Warm water began coursing through the capillary tubes beneath its surface and its body walls began to radiate heat. The acrid smell of brewing coffee wafted from its pores as its skin began breathing out the previous

night's stench. Its iridescent skin shone as the morning's coating of dew formed on its metallic curves. It would be several hours before the sun rose and penetrated its scaly protective skin for the first few hours of the day. Until then, squeaking with the sounds of an awakening digestion system, it would twitch and hum in its earthen nest, warming and activating from the inside out."

[ix] Prometheus: Greek mythological hero who stole fire and gave it to the humans. He also, fashioned the first humans out of clay. Pausanias describes the tablets that "smell like human skin." The locals nearby a temple, which may be to Prometheus, claim these are those from which Prometheus fashioned the first humans. Rabbi Loew: According to Judaic legend, the 16th Century Rabbi who constructed the Golem, a hulking manservant, out of clay. In Paul Weggener's 1914 film version, *Der Golem*, it defended the Jews of Prague from a King who would have them expelled. Victor Frankenstein: Mary Shelley's early 19th century doctor-chemist who created a living humanoid from an electric assemblage of cadaver parts. His tumultuous relationship with his Creation, animated variously by fear, jealousy, hatred, admiration, and murderous rage, is itself a persistent metaphor for scientific hubris and avarice. Stan Lee: the mind behind Marvel Comics' multiple mutant-heroes, including Spider-Man and the X-Men.

[x] Partially magic, and also primordially unclean in the sense elaborated by structuralist anthropology; see Mary Douglas, *Purity and Danger: An Analysis of Concepts of Pollution and Danger*, Routledge, New York and London. 1984.

[xi] Brother-doctors Joseph and Charles Vacanti claim several spectacular culture transplantations and are (perhaps) the Beverly and Eliot Mantle of tissue culture engineering. See <http://www.pbs.org/saf/1107/features/body.htm> and also David Cronenberg's 1988 film, *Dead Ringers*.

[xii] Transexuality complicates primary categorical thinking in such a way, that the very generative power of the 'category' as a technology of knowledge is both cast in relief and called into question. Analogous to this the entry that for Foucault "shattered all the familiar landmarks of his thought." We may very well use this list as a new system with which to categorize emergent bio-sexual differentiation! In "The Analytical Language of John Wilkins," "Borges describes 'a certain Chinese Encyclopedia,' the Celestial Emporium of Benevolent Knowledge, in which it is written that animals are divided into: (a) those that belong to the Emperor, (b) embalmed ones, (c) those that are trained, (d) suckling pigs, (e) mermaids, (f) fabulous ones, (g) stray dogs, (h) those included in the present classification, (i) those that tremble as if they were mad, (j) innumerable ones, (k) those drawn with a very fine camelhair brush, (l) others, (m) those that have just broken a flower vase, (n) those that from a long way off look like flies."

[xiii] The momentum toward this postnatural design logic inspires extremely optimistic and pessimistic assessments in the extreme. This split is currently manifested in popular science culture by dueling best-selling books by (optimistic) Gregory Stock, *Redesigning Humans: Our Inevitable Genetic Future*, Houghton-Mifflin, New York, 2002; and (pessimistic) Francis Fukuyama, *Our Posthuman Future: Consequences of the Biotechnology Revolution*, Farrar, Straus & Girpoux, New York, 2002.

[xiv] Ted Krueger makes a similar argument in the paper “Heterotic Architecture” given at Roy Ascott’s Center for Advanced Inquiry into the Interactive Arts, Newport, Wales, UK. 1998 <http://comp.uark.edu/~tkrueger/heterotic/heterotic.html> “This paper argues that an adaptive and responsive architecture may be developed by the incorporation of biological materials in bulk as functioning devices. Techniques of tissue culturing may be used in concert with genetic manipulation to produce functioning biological materials with properties appropriate to architectural media. Hybrid techniques leveraging the capabilities of both organic and inorganic materials will lead to the development of a heterotic architecture. The hybrid develops not through the inorganic augmentation of living material, but vice versa. It is expected that higher-order phenomena such as cognition and consciousness may most readily arise within the hybrid condition.”

[xv] <http://www.tca.uwa.edu.au>

Another Tissue Culture Project venture of particular interest to Recombinant Architecture is “Oculus Latus.” From their web site: “We (grow) tissue culture over three-dimensional miniaturized replicas of technological artifacts. The results were presented in various media such as: Digital prints, video, web site and three-dimensional artifacts. Oculus Latus “tells the story of transformation of existing technology into the unknown realm of a possible future in which living biological matter will seamlessly interact with constructed systems to create the tool of the future - Semi Living Object. This work explores themes of cutting edge technology, new approaches to surgery and the major developments that would dramatically change ideas and perceptions in regard to surgery and health care in particular and human relationship with living biological matter in general.” <http://www.tca.uwa.edu.au/ol/ol.html>

[xvi] Artificial Frog Eyes. See the Institute of Medical Science at the University of Tokyo <http://www.ims.u-tokyo.ac.jp/imswww/index-e.html> see: http://news.bbc.co.uk/hi/english/sci/tech/newsid_591000/591696.stm for a description of the project.

[xvii] Biosteel. See Nexia Biotechnoloiges at <http://www.nexiabiotech.com/> see:

http://news.bbc.co.uk/1/hi/english/sci/tech/newsid_889000/889951.stm
for a description of the project.

[xviii] See Manuel De Landa, *War in the Age of Intelligent Machines*, Zone Press and MIT Press, New York and Cambridge, 1991; Bruno Latour, *We Have Never Been Modern*, Harvard University Press, Cambridge, 1993; Donna Haraway, *Modest Witness at Second Millennium. FemaleMan_Meets_OncoMouse: Feminism and Technoscience*. Routledge. New York and London, 1997. Octavia Butler, *Dawn*, Warner Books, New York, 1997.

[xix] See Kinki University Faculty of Agriculture at <http://www.nara.kindai.ac.jp/ehp/>

See:

http://news.bbc.co.uk/1/hi/english/world/asia-pacific/newsid_1780000/1780541.stm
for a description of the project.

[xx] On the vegetable house, see Paul Laffoley. <http://www.disinfo.com/pages/dossier/id231/pg1/>

“The use of cultured human skin as an architectural material clearly has unacceptable cultural implications.” From Ted Kreuger, *Heterotic Architecture*. Evidence introduced at the war crimes trial of Ilse Koch, matron of the Buchenwald Nazi death camp. On the right is a lamp she commissioned with a shade made from human skin. Sometime between 1954-57, serial killer Ed Gein of Plainfield, Wisconsin fashioned a full head-to-toe suit of human flesh, complete with mask and breasts. After his arrest for the murder of Bernice Warden, police discovered his house to be full of furniture and toys fashioned from human bodies, including à la Ilse Koch, a lampshade of human skin. Gein’s story inspired in part the films, *Psycho*, *Texas Chainsaw Massacre* and *The Silence of the Lambs*.

[xxi] From publicity material for their forthcoming book, *Cradle to Cradle: Remaking the Way We Make Things*, North Point Press, 2002.

[xxii] Gail Weiss maps this reduction as one that erases temporality, from Obody to organism to genomic assemblage. See “The Durée of the Techno-Body” in Elizabeth Grosz, ed. *Becomings: Explorations in Time, Memory, Futures*, Cornell University Press, Ithaca, 2000. Critical Art Ensemble sees genomic engineering as an internalization of the War Machine. See *The Flesh Machine: Cyborgs, Designer Babies*, and the *New Eugenics*, Autonomedia, New York, 1998.

[xxiii] See Brian Massumi, “The Autonomy of Affect,” in *Parables For the Virtual: Movement, Affect, Simulation*. Duke University Press, Durham, NC. 2002. pp. 23-45.

[xxiv] Anthony Vidler, *The Architectural Uncanny: Essays in the Modern Unhomely*, MIT Press, Cambridge. 1992; and Vidler, *Warped Space: Art, Architecture and Anxiety in Modern Culture*, MIT Press, Cambridge, 2000.

[xxv] “Fuckable design” already, of course, exists. See <http://www.goodvibes.com>. Gilles Deleuze and Félix Guattari ask, “what is the relationship between the bicycle-horn machine and the mother-anus machine?” *Anti-Oedipus: Capitalism and Schizophrenia*, translated by Brian Massumi, University of Minnesota Press, Minneapolis. 1972 (1983). p. 2.

[xxvi] Late, late night conversation.

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