POST-MORDIAL.
ESOTERIC EMBODIMENT

by

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Bachelor of Architecture (Architecture + History of Architecture)
Syracuse University, 2012

Submitted to the Department of Architecture
in partial fulfillment of the requirements for the degree of
Master of Science in Architecture Studies (Architectural Design)
at the
Massachusetts Institute of Technology

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ABSTRACT

This thesis speculates that common funerary practices do not reflect a wide enough range of contemporary cultural attitudes towards religion, spirituality, and mortality. As human beings increasingly embrace the paradigms of bioinformatics and digital fabrication, this thesis proposes that alternative funerary practices will arise to reflect these cultural attitudes, with individuals taking on increasing levels of both personal and collaborative agency in the design of their own memorial artifacts, and those of their loved ones.

Through a series of speculative models, this thesis projects a scenario in which a group of humans embrace their corporeal materiality and its internalized information as precious and sacred, to produce memorial artifacts that are constructed from their own biomatter, and that formally encode streams of genetic information. The artifacts become esoteric 'post-mordial' emodiments of human being, existing as totems of their lineage, and 'momento mori' for remaining humans.

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DISCLAIMER

The views expressed in this document are those of the author alone, and should not be interpreted as a reflection of the Thesis Committee, the Department, the Institution, or any other individuals or entities consulted or referenced herein.

DEDICATION

For my Grammy, and all of my progenitors. (And, if it so happens, my potential progeny.)

ACKNOWLEDGEMENTS

No human being does anything alone. Many thanks are in order:

My sincerest and most profound thanks to every organism whose genetic makeup has contributed my own: thank you for managing not only to procreate, but also to produce progeny who would go on to further procreate. I would not be here without you, and I would not be who I am without you.

Thank you:

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To my sister Sophie, the only other human whose chromosomes descend from the same humans as my own.

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To fellow Design students Akshita, Jan, Lucy and Nick, for our enthusiastic preparation discussions.

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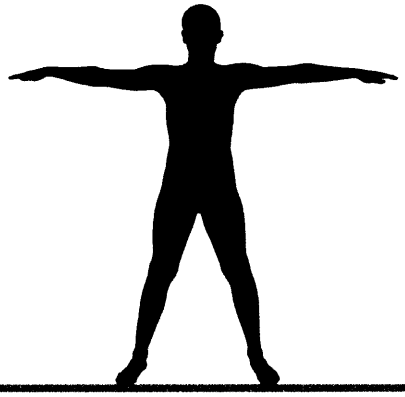


SITUATING ARCHITECTURAL DESIGN

As a component of a Master of Science in Architecture Studies degree in Architectural Design, this thesis takes the form of a design-research project that situates the student (me) as an agent operating within the context of the discipline and its accumulated relevant discourses.

This project positions the discipline of architectural design as a means for negotiating the human relationship between body and environment. This is depicted diagrammatically through architectural conventions, defining the silhouette of a human body, my (the author's) body, and a solid line indicating the edge condition between earth and air.

Human existence on earth is constituted by a constant struggle against death, extinction, and entropy. Human beings are fragile, temporary, and unique creatures. We are delicate bags of blood and flesh and bones somehow managing to continue to function and self-regulate and grow, but for periods of time that are seldom deemed long enough. This is perhaps in part because, each human is a biologically distinct and irreplaceable organism, imbued contemporarily with notions of personal selfhood, individual consciousness, and being—human being. As perhaps the only beings aware of these circumstances (that we know of), it makes sense that we would not only struggle to survive, but that we would also struggle to be remembered.

This project envisions a scenario in which a group of humans have accepted the fragile and transitory nature of their corporeal form, and have embraced the inevitability of their extinction. However, in spite of this, their unique senses of selfhood persist, and in monument to this individuality, these humans wish to posthumously take on another, more lasting form.

HUMAN BEING
NAKED

c. 7,000,000 BCE
(Gibbons xii-xiii)

HUMAN BEING
SHELTERED

c. 1,800,000 BCE
(Jarzombek 3)

HUMAN BEING
CLOTHED

c. 80,000 BCE
(Gilligan 32)

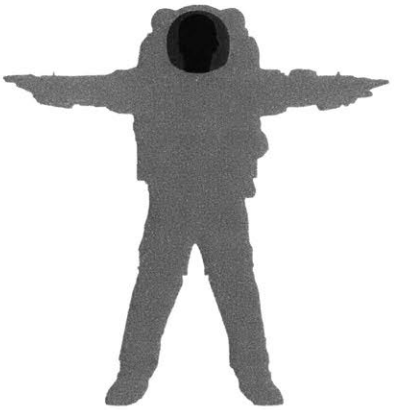
SITUATING HUMAN BEING ARCHITECTURE

This thesis proposes that through new instruments and armatures, the human body serves as an increasingly inadequate description for the extents of human being, and that as an enterprise of plastic experimentation, the discipline of architectural design is equipped to explore and express these extents.

This diagram maps out continuously expanding notions of human corporeality in architectural design discourse, pointing to several moments in the discourse where humans have been enabled to rely decreasingly on the membrane of the human body through the absorption of new apparatuses and methodologies into the discipline.

Contemporary archaeological discourse places the origin of the hominin (previously referred to as 'hominid') to approximately seven million years ago, with Michel Brunet's archeological team's 2002 discovery of "Toumaï," the *Sahelanthropus tchadensis* found in the central African nation of Chad. In *The First Human: The Race to Discover Our Earliest Ancestors*, Ann Gibbons (*Science* magazine correspondent on human evolution) summarizes the rationale for this attribution: "Teeth and skull show 'human' features, and possibly signs of upright walking." (Gibbons xii-xiii) This delineation in evolutionary lineage—however (arguably) arbitrary—marks a potential beginning point for our story, for the story of human being.

Human being walking (maybe). Human being talking (maybe). *Human being naked.*



HUMAN BEING
EXTRA-ATMOSPHERIC

1967
(AD37 cover)

HUMAN BEING
VIRTUALIZED

1997
(Amelar 140)

HUMAN BEING
ARCHITECTURE

?

In *Architecture of First Societies: A Global Perspective*, Mark Jarzombek (Professor of the History and Theory of Architecture at MIT) describes "the earliest evidence so far of a man-made structure," approximately 1.8 million years ago at the Olduvai Gorge in Tanzania: "a circle of lava stones that were the remains of a hut or windbreaker consisting of branches anchored at the base by stones piled into heaps and spaced on the circumference about every .7 meters." (Jarzombek 3) Presumably constructed to supplement the human body's membrane for purposes of climactic comfort and protection, this location symbolically marks the beginning of conscious human intervention with the environment through "social order and spatial differentiation," and the ongoing enterprise of *homo faber* for the purposes of bodily wellbeing and satisfaction. (4) The structure—and its surrounding locale, which is scattered with a wide range of stone tools and other human artifacts—might also be viewed as a signpost for the foundation of cultures of toolmaking technē, design methodology, and ontological construction; the inauguration of architectural design discourse.

Human being cultured. Human being mindful. *Human being sheltered.*

In the *Journal of Archaeological Method & Theory*, Ian Gilligan (Department of Archaeology at the University of Sydney) postulates, through an analysis of Paleolithic tools and human migratory and thermal models, "The Prehistoric Development of Clothing" as beginning approximately one hundred thousand years ago. (Gilligan 32) The author defines 'clothing' to "denot[e] items that act to enclose or cover the body," and situates its

development as a part of the larger technological shifts in human capacity that enabled human populations to expand, and migrate into less climatically temperate geographic regions. (17) The advent of clothing would further decrease the human reliance on the membrane of the body, in order to adapt to relative changes in environmental conditions. The mission of the architectural design discourse took on mobile, nomadic, and increasingly transformative—or 'dominion-ative'—aspirations.

Human being active. Human being capable. *Human being clothed.*

In 1967, the discursive entity of architecture again expanded its role through another shift in paradigm: the cover for the February issue of *Architectural Design* featured an image of a human spacesuit. (*AD*37 cover) The discipline of architecture now encompassed the motivation for the human body to survive not only within the atmosphere of the planet, but also in the vacuum of space outside of it. This new instrumentation almost altogether augmented the body's membrane, adequately simulating the necessary atmospheric conditions under which the human body had previously evolved. As a technological armature for preserving the pre-existing environment of the human body and catering to its 'natural' functions, the spacesuit fit comfortably within the discourse of architectural design, continuing the territorial expansion of humankind into previously impossible domains.

Human being extra-human. Human being otherworldly. *Human being extra-atmospheric.*

In 1997, another sea change quietly occurred. The New York Stock Exchange commissioned Asymptote Architecture to design a "Virtual Trading Floor," a digitally simulated virtual environment. (Amelar 140) Architecture could now exist without being physically inhabited, facilitating human processes without need for the entire human body, but merely its cognitive faculties and interactive appendage(s). Supplanting the direct bodily inhabitation of architecture through simulated spatial experience, the architectural design discourse lost its direct obligation to the human body. This continues to compound through the rise of biomechatronic augmentations for the human body, including synthetic organs and prosthetic limbs, which have effectively reduced matters of mortal concern for the body and its contents.

Human being supplemented. Human being transformed. *Human being virtualized.*

A desire to transcend the human body is a common characteristic in human beings. Whether through biological programming, environmental conditioning, or individual autonomy, humans seek to connect with each other, to connect with a collective, to connect with something greater, to connect with a higher power, to go on living, to see what the future holds, to continue to exist in some way or another, to see what it's like, to escape this form of existence, to have another chance, to find new opportunity, to confront their mortality, to be remembered. In many ways, human beings use architecture to facilitate this desire for transcendence and its diverse manifestations, including houses of worship, funerary constructs, and memorials.

In "Architecture as Membrane," Georges Teyssot (Professor in the School of Architecture at Laval University, Quebec) speculates that a human's being extends beyond the physical extents of their contiguous body, as a continuously fluctuating architectural membrane. The human body itself is not an adequate membrane, or a comprehensive embodiment for human being. Human beings consume and excrete. Human beings produce and deplete. Human beings procreate and expire; grow and decompose. These phenomena extend beyond the boundaries the human body, but are fundamental—perhaps inarguably—to human being. Building from Teyssot's conception of architecture as the membrane for "a continuous, fluid" human, this project positions the discourse of architectural design as an arena to explore, define, and even create expanded notions of human being, corporeality, and selfhood.

This project speculates that the discourse has the opportunity to progress further on this trajectory, to move beyond obligations to the human membrane, to ***human being architecture***, whereby artifacts of human creation can exist as externalized augmentations to an individual's intellective sense of self-identity.

Human being post-corporeal. Human being transcendent. ***Human being architecture.***

Sarah Amelar, "Asymptote's Dual Projects for the NYSE Span Both Real and Virtual Realms," *Architectural Record* 187 (1999): 140-145.

Ann Gibbons, *The First Human: The Race to Discover Our Earliest Ancestors* (New York: Doubleday, 2006).

Ian Gilligan, "The Prehistoric Development of Clothing: Archaeological Implications of a Thermal Model," *Journal of Archaeological Method & Theory* 17.1 (2010): 15-80.

Mark Jarzombek, *Architecture of First Societies: A Global Perspective* (Hoboken: Wiley, 2013).

M.D. Leakey, *Olduvai Gorge Volume 3: Excavations in Beds I and II*, 1960-1963 (Cambridge: Cambridge University Press, 1971).

John McHale, guest ed., *Architectural Design* 37 (1967).

(1991)

(1996)

(2001)

(2006)

(2011)

MARC QUINN'S HUMAN BLOOD SELF-PORTRAITS

Marc Quinn, "Self" series
Human blood (artist's), stainless steel, Perspex, refrigeration equipment
(http://marcquinn.com)

(1991,
full view)

For pre-existing instances of "human being architecture," this project mines contemporary art and design practices, proposing the "Self-Portraits" of Marc Quinn as prime examples. Citing Deleuze and Guattari's writing on the "body without organs," architectural theorist Georges Teyssot framed the human membrane as an architectural system available for input, for organ transplantation, for cybernetic implantation, for internalized augmentation. Conversely, this project treats the human membrane as part of an architectural system with inherent potential for output, as epitomized by Quinn's frozen figurative sculptures, which are cast from the artist's own blood.

The pieces rely on human-made architectural tools, from the needle that punctures the human membrane to draw the blood, to the plastic membrane that temporarily holds it, to the mold of the artist's head, another temporary membrane, and finally to the hermetically sealed acrylic enclosures, with refrigeration equipment requiring continuous streams of energy.

Produced every five years, the resulting artifacts embody chronologically distinct moments of both the artist's corporeal makeup and his continuously aging appearance, as outputs of both material presence and personal identity. The artifacts move beyond obligations to the human membrane, to become *human being architecture*, whereby they can exist as externalized augmentations to the individual's intellective sense of self-identity, and perhaps, their nature of being.

Gilles Deleuze and Félix Guattari, *Anti-Œdipus: Capitalism and Schizophrenia*, tr. Robert Hurley, Mark Seem, and Helen R. Lane (New York: Viking Press, 1977).

Marc Quinn, "Self," Marc Quinn, http://marcquinn.com/artworks/self (accessed October 15, 2016).

Georges Teyssot, "Architecture as Membrane," in *Explorations in Architecture: Teaching Design Research*, ed. Reto Geiser (Basel: Birkhäuser, 2008), 166-175.

HUMAN BEING BIOMATTER

Above text: an alphabetically ordered, non-comprehensive, imprecise, and sometimes overlapping list.

Elucidating the myth of the human body as a contained membrane, the artifacts of this project are intended to be constructed using excess (or unneeded) human biomatter, living or otherwise.

This material formation harvests from the human membrane, surpassing its boundary and subverting architectural preoccupations with sterile cleanliness and personal privacy, and inevitably amplifying a visceral experience of these esoteric artifacts.

"The weight of a honeycomb"
"Pietertje Vos 1942 – 2007 †"

"Dung beetles and Hand Vacuum Cleaner"
"John Steegman 1939 – 1985 †"

"Birds and Toaster"
"Anne Lindeboom 1920 – 1984 †"

STUDIO WIEKI SOMERS' HUMAN CREMAINS STILL LIFES

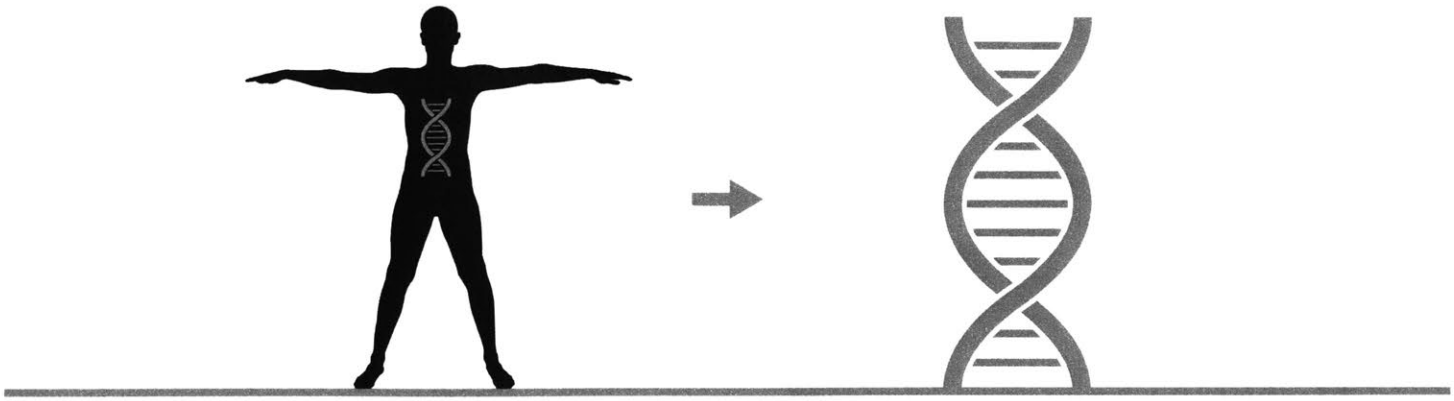
Studio Wieki Somers, "Consume of Conserve?" series (2010)
Human cremains
(http://www.wiekisomers.com)

This materiality is evidenced in the work of Marc Quinn, and among others, the Dutch designers of Studio Wieki Somers, whose "Consume or Conserve?" project 3D printed everyday or recognizable subject matter using human cremains, provoking extraordinarily charged reactions to ordinary or seemingly banal imagery. The human membrane was dissolved, literally incinerated, and reformulated using human design and fabrication tools.

The pieces embodied not only posthumous biomatter, but also the facilities and heat energy required for cremation, the programs and computational processes required for modeling, the 3D printing instruments and materials required for reshaping, and above all, the pieces embodied the design decisions and intentions that drove this process.

Through this posthumous form of human being architecture, the designers proposed that, "we may afford grandpa a new life as a useful rocking chair, or even a vacuum cleaner, a toaster."

Dylan van den Berg, Wieki Somers, and Studio Wieki Somers, "Studio Wieki Somers," Studio Wieki Somers. http://www.wiekisomers.com (accessed June 15, 2016).



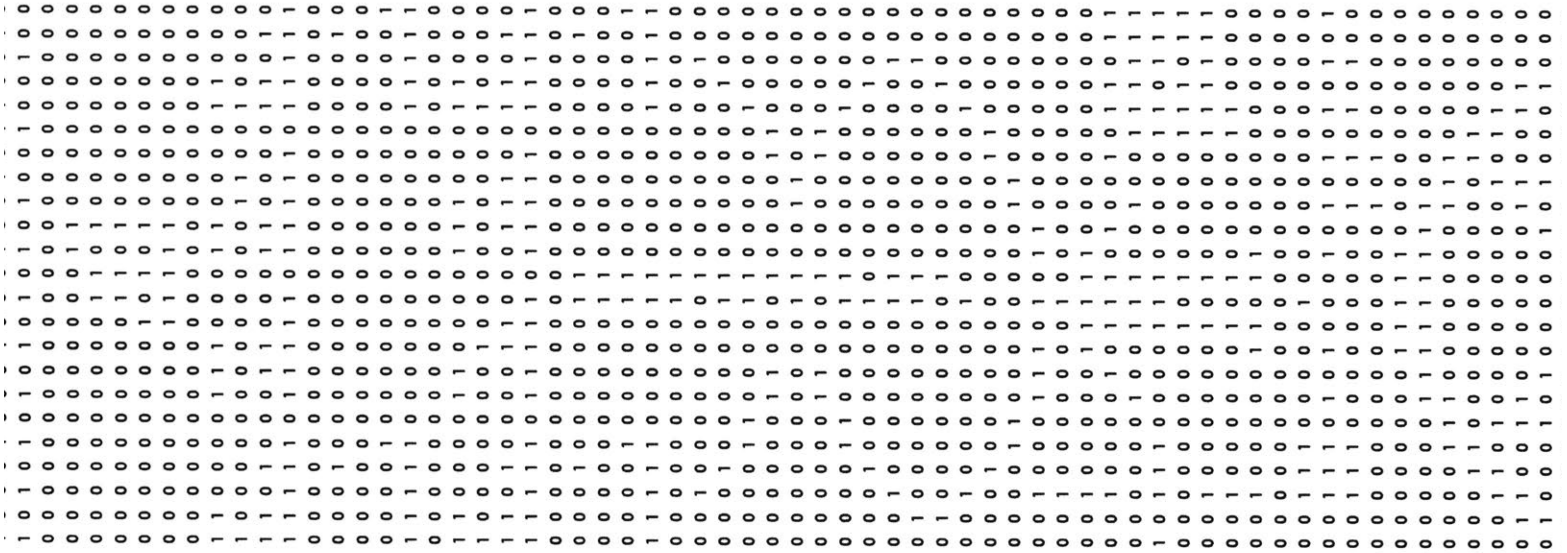
HUMAN BEING GENETIC INFORMATION

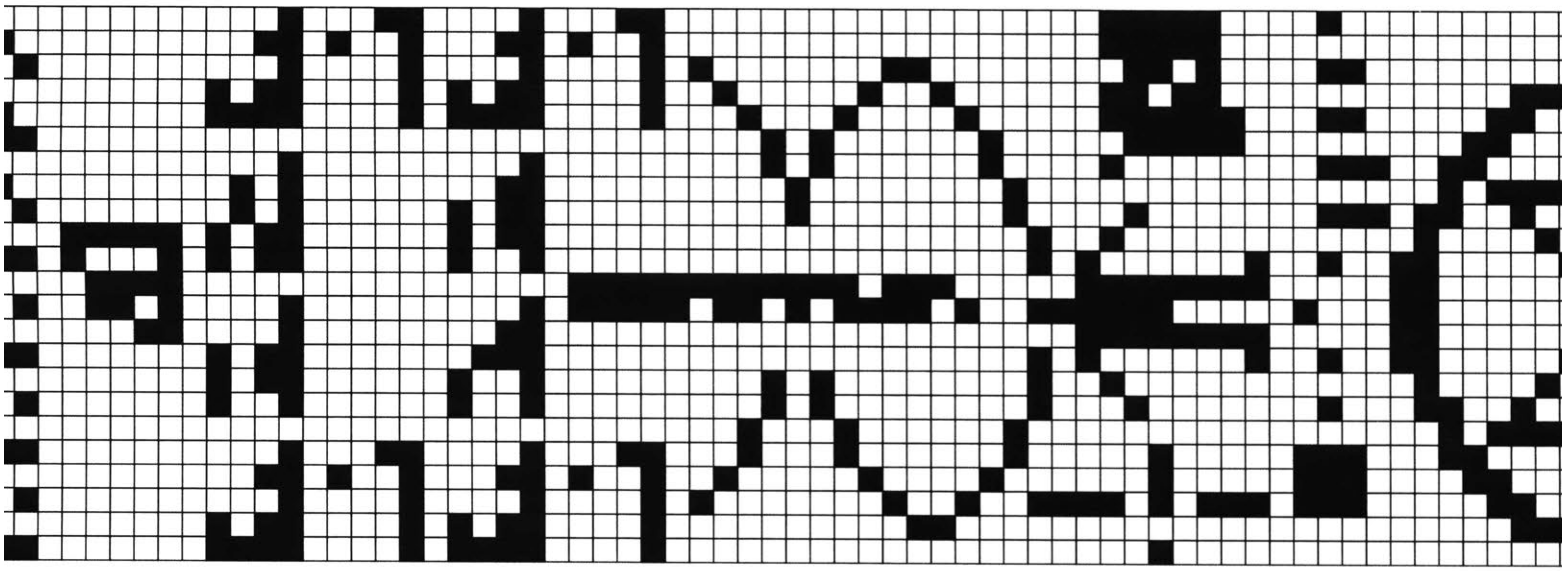
As an architectural system for output and membranous extension,this project builds from Catherine Waldby's "Visible Human Project," which framed the human body as a vehicle for bioinformatic explantation, in the production of an alternative digital embodiment.

This project pushes the "Visible Human Project" project a step further, using architectural design and fabrication tools to reformulate and re-physicalize human bioinformatics back into material corporeality.

This produces artifacts of conventionally intangible or internalized genetic information, in order to puncture, expand, and continue to redefine the human membrane, and engaging in processes of self-exploration, self-expression, and self-actualization.

Catherine Waldby, *The Visible Human Project: Informatic Bodies and Posthuman Medicine* (London; New York: Routledge, 2000).





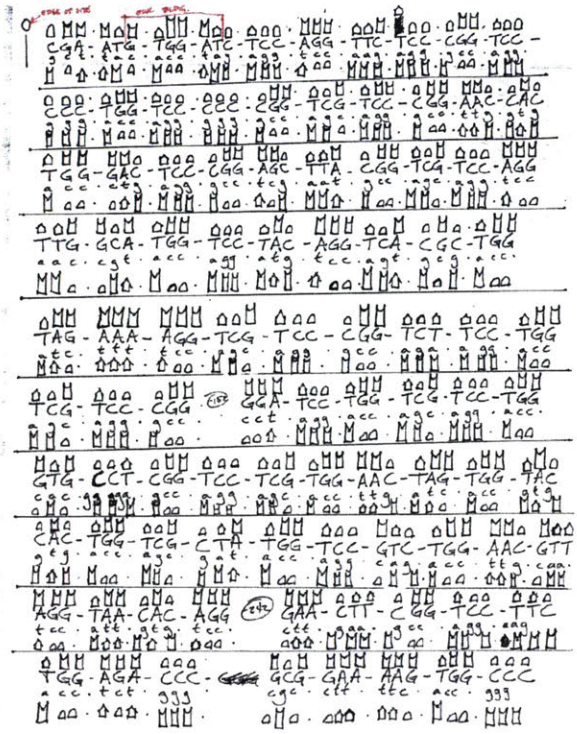
DRAKE AND SAGANS' HUMANIST TRANSMUTATIONS

Frank Drake, Carl Sagan, et al, "Arecibo message" (1974) [previous page]
(Diagrams by the author based on "Arecibo Message" 463-464)

An example of this, the 1972 "Arecibo Message" was a radio communication structured in 1,679 units of binary notation. This figure was chosen as a semiprime number that—aside from being divided into itself—can only be divided into 23 by 73 whole units. Configuring these units into a Cartesian plan yielded a graphic bitmap that could act as a coded transfiguration of basic human conditions, including symbolic representations for the structure of genetic information, and the basic human shape. These notations were then transmitted into the galaxy via the medium of long-range radio wave, hypothetically maintaining viability for forensic translation by any extraterrestrial intelligence that might receive them.

Physicalized as intergalactic radio waves, these transmissions, arguably, took on the form of *human being architecture*. Dependent on the tools of human beings, and embodying information that attempted to encapsulate concepts of human intellection and identity-production, the transmission was materialized from the Arecibo radio dish to become a surrogate for humankind.

Staff at the National Astronomy and Ionosphere Center, "The Arecibo Message of November, 1974," *Icarus* 26 (1975): 462-466.



GUANINE (PURINE) G

ADENINE (PURINE) A

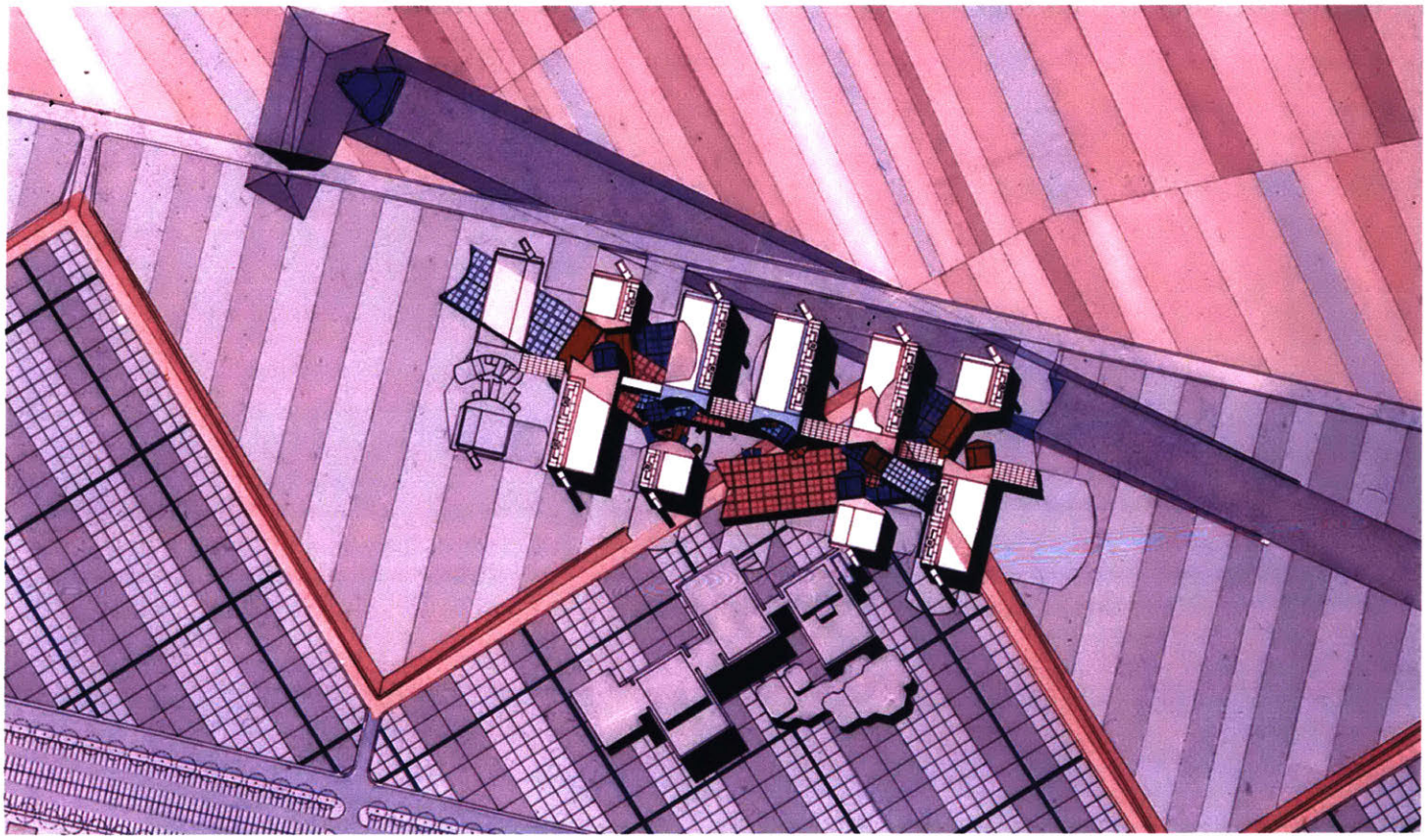
CYTOSINE (PYRAMIDINE) C

THYMINE (PYRAMIDINE) T

G T G G A T

C A C C T A

"Schematic representation of an unidentified DNA sequence"
(Eisenman fonds Collection)



"Drawing" (Site Plan, rotated 180 degrees and cropped)
(http://www.eisenmanarchitects.com)

PETER EISENMAN'S GENETIC REFORMULATIONS

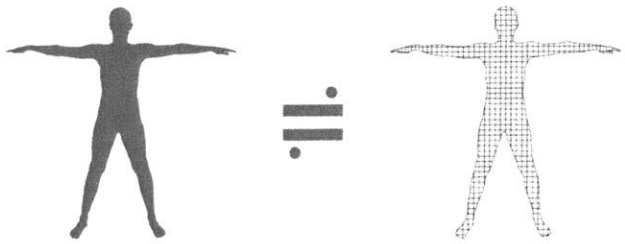
Peter Eisenman (Eisenman/Robertson Architects), Biocentrum (Biozentrum) Biology Center project, J.W. Goethe University (Frankfurt am Main, Germany, 1987) [previous page]
(Diagrams by the author)

In another example of genetic reformulation, for Peter Eisenman's 1987 "Biocentrum" project, the architect designed a system of formal notation for the nucleobases of DNA. This formal system represented the four nucleobases as paired rectangles, utilizing triangular and circular concave-to-convex relationships to represent the bonds between adenine and thymine, and guanine and cytosine, respectively. The architect then took a portion of an anonymous individual's DNA sequence and translated it into this formal notation. From this translation, the architect selected a group of six nucleotide base pairs to generate initial conditions for the design of the Biocentrum's plan, establishing the project's overall volumetric definition and spatial rhythm.

Perhaps the most direct form of *human being architecture*, the design for this university biology center attempted to reformulate the genetic information of an individual human being into a set of architectural membranes that could then enable a community of individuals dedicated to further studying their own biology. Through this act of design, Eisenman concretized the anonymous individual—through their genetic information—as a primary and permanent member of this community. The anonymous individual might thus be enabled to "live vicariously" through the existence of this architecture.

Peter Eisenman, "Biocentrum," Eisenman Architects, http://www.eisenmanarchitects.com/biocenter.html (accessed October 15, 2016).

Peter Eisenman fonds Collection, *Centre Canadien d'Architecture*, Montréal, reference number: DR1999:0646 ©CCA.



HUMAN BEING ARTIFACTS

Symbol above: 'image of or approximately equal to'

Building on these projects, the intention of this thesis project is to produce physical artifacts that can exist as self-actualized transhuman extensions—or vessels—of human being. This project hypothesizes that through the individual act of reformulating one's biomatter and genetic information the artifacts become embodiments of one's physical presence, personal identity, and biological origins, and inevitably express one's creative design methodology, as *human being architecture*. In order to maintain its viability as code, the genetic information must remain composed in a linear fashion. This makes it an apt input for generating spatial projections of formally encoded data streams.

This process produces an almost limitless variance of potential manifestations, restrained only by the boundaries of digital computation and material fabrication tools, and the designer's methodology to creatively engage them.

These are artifacts intended to beg experiential confrontation
and physical interaction, asking one to look at them,
to touch them, feel their texture, their weight,
to hear them, to smell them, to taste them,
to contemplate them, to judge them,
to admire them, to revile them,
to kiss them, to lick them, to fuck them,
to break them, to add to them, to change them,
to redesign them, to remake them,
to become them.

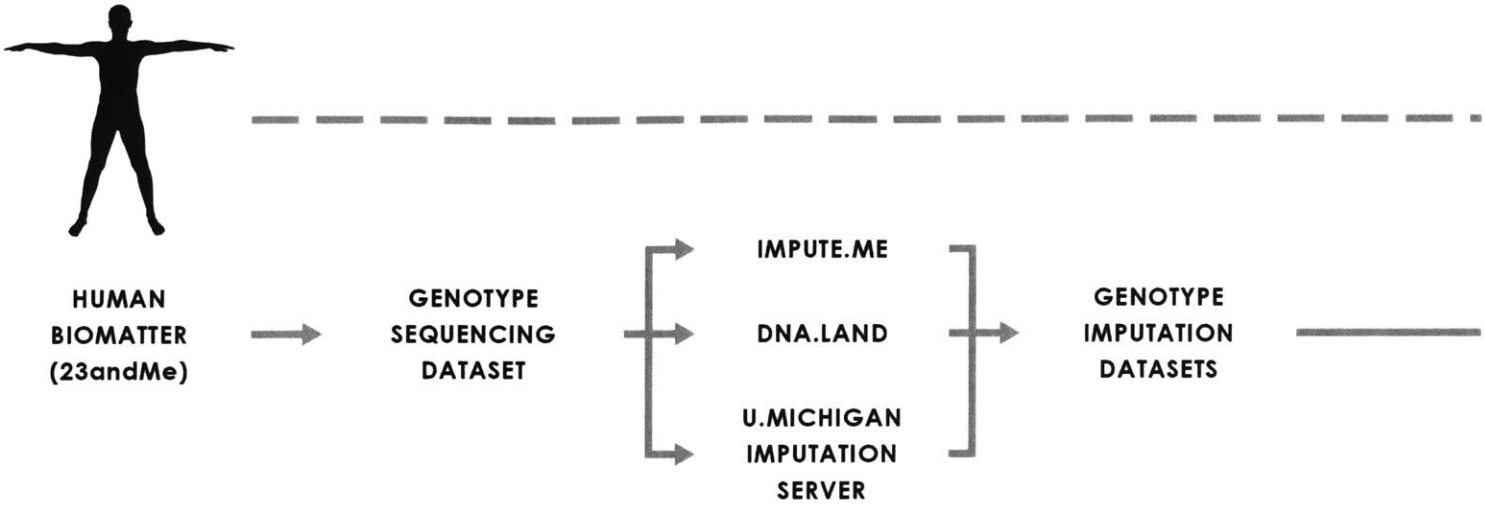
BLUE EYE COLOR GENOTYPE **SUB-SAHARAN AFRICAN GENOTYPE**

Through the aestheticized juxtaposition
of highly culturally charged portions of genetic information,
for example, my (the author's) contrasting markers
for blue eye color and Sub-Saharan African heritage,
these artifacts, when placed in the built environment,
might bear the capacity through their cryptic indifference
to engender and disseminate empathy and awareness
between sentient beings.

Simultaneously, the juxtaposition of two identical streams of genetic information
through differing aesthetic translations might provoke an understanding
of individuality through the design of difference.

SUMMATION

To attempt to situate the wider perspective of this thesis project:
If architecture is an embodiment of humanity,
i.e. an extension of the human membrane,
and design is a human process that facilitates this,
then through the absorption of new paradigms in bioinformatics,
and building on theories of architectural transanimism and posthuman corporeality,
including those addressed by Georges Teyssot, Catherine Waldby, and peripherally, Betti Marenko,
architectural design artifacts bear the inherent opportunity
to act as embodiments of human intellection, identity, and selfhood.



REFORMULATION PROCESSES

The goal of this thesis is
to design systems for using human biomatter
to digitally fabricate
plastic formal configurations
that encode streams of human genotype information
through parametric computation.

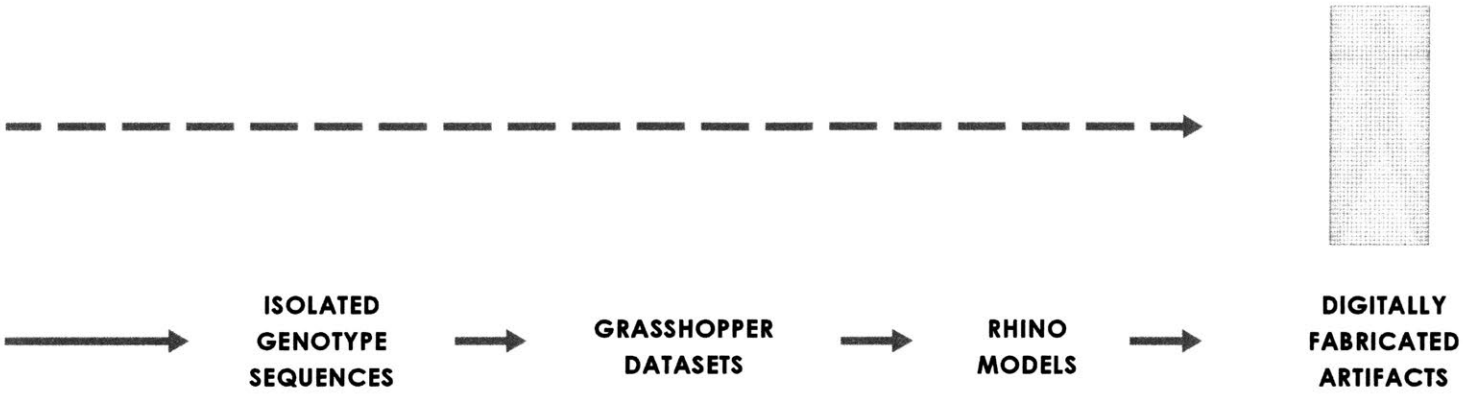
The starting points: In the first steps of this process, I acquired as much of my genetic information as possible through financially feasible means. From submitting a sample of my saliva to commercial genotyping service 23andMe, I received a raw dataset containing approximately 600,000 data points.

Then, through publically available servers, I input this data to run genotype imputations, which extrapolated additional information relative to databases of pre-existing full genome sequences, with a high degree of accuracy.

This produced three sets of data to be aligned and compiled with one another, from which I can then manually isolate specific sets of genetic markers to be reformulated.

The graphical algorithms of Grasshopper provide ideal tools for organizing and manipulating these datasets.

Grasshopper enables the data to be formally encoded, and placed as discrete points in space, to produce NURBS (Non-uniform rational Basis spline) models in Rhinoceros, which exist as coded descriptions of points in space relative to one another, and can easily be output physically, as digitally fabricated artifacts.



MUSICAL METAPHOR

A conversation with composer Paul Steenhuisen metaphorically positioned the project in musical terms, framing genetic information as a sort of divinely-inspired set of molecular musical notes. The act of design lies in the process of translating these notes into systematized notations, or sheet music, and then into the "music" of the artifact, using biomatter as the medium that aids to physicalize these notations.

The design becomes a calibrated coordination of forces, between the potentialities of the genetic information, and the capacities and limitations of computation tools, the potentialities of blood as a material, and the capacities and limitations of fabrication tools, et cetera. Through a calculated control of the processes of translation and formulation from divine note to musical artifact the design will attempt to explore and express the "chicken-or-egg" relationship of mutual interdependency between biomatter and genetic information, in a new corporeal configuration that begs further contemplation.

PRECEDENT

REFORMULATING HUMAN BIOMATTER, GENETIC INFORMATION, AND HUMAN INFORMATION

The design and fabrication of these artifacts is grounded in
a study of the use of human biomatter and its genetic information in art and design,
including select funerary and memorial architecture, as well as contemporary art and design practices.

HUMAN BIOMATTER

Definition: Any matter contained, produced, or emitted by the human body.

(Not necessarily biomass: implies energy source; not necessarily biomaterial: implies artificial synthesis)

Means of material collection:

- Excretion
- Secretion
- Shedding (Molting)
- Epilation/Depilation
- Extraction
- Amputation
- Expiration (Death)

Modes of material preservation

- Decomposition
- Cremation
- Mummification
- Embalming
- Plastination
- Cryopreservation

IN CONTEMPORARY ART AND DESIGN PRACTICES

With the fields of "Bio Art" and "Bio Design" (Myers) burgeoning, and two academic conferences ("Bodily Matters" and "Fluid Physicalities") in London during this past summer of 2016, the use of human biomatter in contemporary art and design practices is being dissected (poor pun) increasingly. Exploring means of disciplinary integration between practices of art, design, and the biological sciences, the "Bodily Matters" conference was convened in order to supplement the "little scholarly attention [that] has been paid to modern and contemporary art practices that use the raw material of the human body itself in the production of artworks." (https://thanatocorpus.com) Approaching bodily fluids via "a broad conception of embodiment that lies at the interface of culture and medical knowledge," the "Fluid Physicalities" conference operated through "analytic modes from literature and humanities, hard and social sciences, art practice and performance and elsewhere." (https://fluidphysicalities.wordpress.com) The conferences attempted to analyze and legitimize material techniques that had previously been neglected as taboo, offensive, and perhaps even forbidden from the academic context. Revisions of this opinion have begun, perhaps in part due to the rise of bioinformatics: for example, in terms of genetic analysis, the use or involvement of human biomatter is practically inevitable (see the "Genetic Information" section) and has thus undergone a period of social normalization. With the common knowledge that such a vast deal of personal information can be gleaned from a small vile of spit—an activity that has become virtually commonplace under the advent of commercial services for DNA testing such as "23andMe" and "AncestryDNA"—the contemporarily informed individual might have a more nuanced, less polarized view of human biomatter than would traditionally be expected. In order to grapple with the complicated and continuous shifting human relationship with human biomatter, these short texts situate this thesis within a lineage of relevant contemporary practices, attempting to identify and analyze specific formal and material processes, techniques, and methodologies to critically drive design decisions from the initial conception to the final articulation of the project.

Gemma Angel, "Bodily Matters: Human Biomatter in Art" Conference,
University College London Institute of Advanced Studies (2016)

Gemma Angel, "Bodily Matters: Human Biomatter in Art,"
Thanatocorpus, https://thanatocorpus.com/bodily-matters (accessed October 15, 2016).

Anthony Bale (Medieval Studies) and Esther Leslie (Political Aesthetics), "Fluid Physicalities" Conference,
Birkbeck University of London (2016)

Anthony Bale and Esther Lesie, "Fluid Physicalities," Fluid Physicalities, https://fluidphysicalities.wordpress.com
(accessed October 15, 2016).

Birkbeck University of London School of Arts, "Fluid Physicalities," Birkbeck University of London,
http://www.bbk.ac.uk/arts/research/current-research-projects/fluid-physicalities (accessed October 15, 2016).

Jewish Museum London, "Blood: Uniting and Dividing," Jewish Museum London,
http://www.jewishmuseum.org.uk/blood (accessed October 15, 2016).

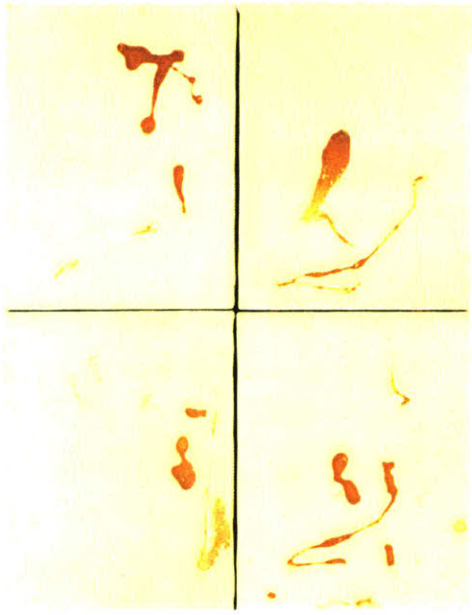
See also:

William Myers, *Bio Art: Altered Realities* (New York: Thames & Hudson, 2015).

William Myers, *Bio Design: Nature, Science, Creativity* (New York: Museum of Modern Art, 2012).

Andy Warhol, "Oxidation" (1978)
Human urine on copper foil
(Warhol 13)

Andy Warhol, "Oxidation Painting" (1978)
Human urine on gessoed canvas
(Warhol 17)



Andy Warhol, "Cum Painting" (c.1978)
Human semen on gessoed canvas
(Warhol 57)

ANDY WARHOL'S HUMAN URINE AND SEMEN PAINTINGS

In 1978, someone in Andy Warhol's studio—perhaps Warhol himself—urinated onto a sheet of copper foil. Using their genitalia as a metaphorical paintbrush, the donating artist's urine splattered the surface of the copper sheet, producing a chemical reaction of oxidation, and altering the color and texture of the splatter locations to create an abstract formal composition. Entitled "Oxidation" [left image], I'd like to imagine, however unlikely, that this piece was born on an occasion of unplanned serendipity, as an artistic, performative experiment using otherwise excess or unwanted materials. Looking at the unfolded creases running across the thin and fragile copper sheet, and its irregularly cut and frayed edges, I'd like to think that this unconventional canvas was just lying around somewhere in Warhol's "Factory," folded up and in a stack of other material that an outsider might have otherwise labeled refuse. Perhaps this was a day when they were organizing materials or doing something mundane. Perhaps they were running low in more conventional art supplies, with an assistant out procuring more paints and canvases (this is definitely the most hopeful detail of this idealized mythology). In an instance of inebriated happenstance, what if someone in Warhol's studio—again, perhaps even Warhol himself—had caught a glimmer of this golden colored material on their way to relieve themselves in the private domain of the restroom? What if instead, they had pulled and unfolded the piece of scrap material, and laying it on the floor of the Warehouse's public space, they exposed their genitals and delightfully and deliriously urinated onto this makeshift canvas? Imagine it: a crowded room of radical, artistic, forward-thinking individuals mingles; suddenly, piss splashes, and dribbles on the floor surrounding the copper sheet; the room quiets; a crowd of people looks on, with mixed expressions of shock, amazement, amusement; after a few

moments, they return to their conversations. On the next occasion the crowd witnesses this act, their reactions diminish; the spectacle has faded, and its worth has exhausted. Does the viewer of "Oxidation," upon realizing the piece's material origins, have a reaction similar to those who witnessed its original creation, and subsequent acclimatization to the spectacle?

Interpreting Warhol's highly iterative process creating his "piss paintings," and the nonchalant mythology that Warhol constructed around them, this kind of adaptive, transformative experience may have been Warhol's underlying intention. As with most of his work, Warhol's artistic production with human biomatter was repetitively prolific. Their production, while likely revelatory for Warhol, was addressed as a dull affair. In an exchange from April 6, 1978, Warhol casually relayed: "'Then Tom Sullivan pissed on some paintings for me and left.'" (Warhol 7) Claiming to have experimented with urine in his art since as early as the 1960s (although none appear to have been found from before 1978), Warhol manufactured an informal and almost normative attitude into the mythos of his "piss paintings," thus intentionally diminishing their weight as objects charged with capitalist or corporate values of Debordian spectacle, while of course re-elevating them within the charged space of art exhibition. (Debord) As an artist working with a hair-thin swath of an industrially-produced material composed atomically from a singular, commercially valued and exploited material (copper), the application of another material commonly understood as a waste byproduct of humans would seem to be a conscious attempt at material depreciation. Through the reaction between the urine and the copper sheet, the purity of the copper was compromised. As none of the pieces appear to be directly attributed to the excretory contributions of any one individual, the relative anonymity of the materials' origins further compounds the purposeful economic devaluation of the pieces. Throughout his career Warhol experimented with processes of horizontalization, both through the devaluation of the artistic realm through the repetitive insertion of common, banal, or unwanted materials and imagery, and conversely through the simultaneous valuation of these common, banal, or unwanted materials and imagery through their elevation into the realm of art. The long-term irony in this would be the inflation of the pieces' worth as part of the artist's larger oeuvre and mythos, which of course would surge after Warhol's body expired and he was no longer able to create—or oversee the creation of—these pieces.

What if, regardless of Warhol's outward rhetoric, the pieces were actually of incredible importance to the artist? Perhaps the application of the worthless urine to the precious copper was meant to stake an equal claim for the preciousness of the urine, as a unique product of a specific moment in time, from a specific individual's body, with a specific genetic and biological makeup, and a specific diet, and metabolism, etc. In his introduction to the Gagosian Gallery's 2002 exhibition publication on Warhol's "Piss & Sex Paintings and Drawings," writer in art theory and criticism Bruce Hainley points out: "Like saliva, sweat, blood, and cum, urine is rich in DNA. The Oxidations and Piss paintings are portraits..." (Warhol 7) In several iterations of the "piss paintings" ["Oxidation Painting," center image], the urine is deposited onto canvases primed with "metallic pigment in acrylic medium." Examining Warhol's offhanded statement that "Tom Sullivan pissed on some paintings for

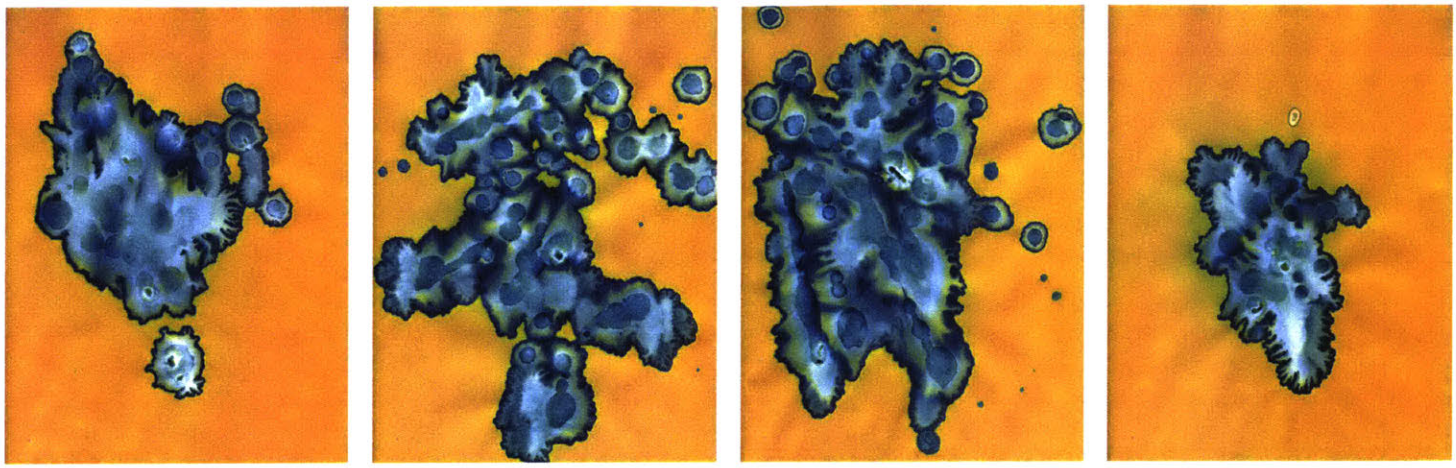
me," the implication embedded in his language was that he already considered the pieces to be paintings prior to the application of urine and the process of oxidation. In the sense of the work of artists like Robert Ryman and Yves Klein, the metallically primed canvases were in fact paintings, but I would like to think that Warhol only felt a kinship with them, only considered them works of art, once they had been pissed on. This aligns with Martin Heidegger's conception of art, design, and technology as "mode[s] of revealing" and acts of "bringing-forth." (Heidegger 6) Only after the unpredictable act of urination, and subsequent chemical reactions, could they become "portraits," embodying more that just the hand that had mixed the metallic paint and used a paint roller to prime the canvas.

In the process of depositing excess biomatter onto canvas, the subjects of Warhol's "portraits" reveal exceedingly private aspects of themselves and their bodies. In the case of the circa 1978 piece made from semen on gessoed canvas, entitled "Cum Painting" [right image], the piece appears to be an aggregation of four individual canvases, each depicting what appear to be distinct events of male ejaculation. Dispensing with notions of sexual piety and politeness, the piece manages to invoke even greater levels of intimacy (and inversely, revulsion) in the viewer than the piss paintings, conjuring interpretive imagery of the subject not just holding their genitals and urinating, but actually masturbating (or being masturbated or in some way stimulated) and coming to orgasm to produce highly personal and unique material outputs with expressive aesthetic compositions. Coming from a group of individuals who would have been labeled as deviant or perhaps even subhuman by arbiters of "polite society," the production of these kinds of pieces was extremely brave, and certainly confrontational. Simultaneously, the pieces also portray profound levels of sensitivity and intimate privilege. The piece is not just a provocation against puritanical cultures, or an intimate portrait of male sexual potency, but it can also be interpreted as a sort of transhumanist artifact. Not only does semen contain the DNA of the subject, which has interesting potentials from the perspective of forensic archaeology, but within a certain period of its excretion, the material also remains viable for the fertilization of life through insemination. In this way, perhaps these pieces "bring-forth" (à la Heidegger) a more "true" and "essential" nature of a subject more than any of the other more figural portraiture techniques that Warhol utilized over his career.

Guy Debord, *The Society of the Spectacle*, tr. Donald Nicholson-Smith (New York: Zone Books, 1995, originally published 1967).

Martin Heidegger, "The Question Concerning Technology" in *The Question Concerning Technology, and Other Essays*, tr. William Lovitt (New York: Harper & Row, 1977), 3-35.

Andy Warhol, *Andy Warhol: Piss & Sex Paintings and Drawings* (New York: Gagosian Gallery, 2002).



Jordan McKenzie, "Spent (Litmus)" series (c.2008-)
Human semen on universal litmus paper
(http://www.jordanmckenzie.co.uk)

JORDAN McKENZIE'S HUMAN SEMEN DRAWINGS

Contemporary British performance and visual artist Jordan McKenzie has pushed forward the legacy of Warhol's "Cum Painting" into a period of time that has been perhaps even more heavily stigmatizing for the homosexual male body, the era of the HIV and AIDS crisis. As previously mentioned, Warhol's work with seminal fluids did not directly attribute each piece to its human source, declaring sexual virility anonymously, with anonymous sexual orientation (although, being that ownership of the work would be ascribed to Warhol, the pieces do potentially take on a charge of gayness). In McKenzie's series entitled "Spent (Litmus)" [images above], the relative pH of a discharge of ejaculation is rendered visible on universal litmus paper in a greenish tint. Shedding Warhol's enigmatic cloak, the artist is open about the fact that he produced the piece himself, additionally putting the time and date of the emission the produced each piece in his "Spent" series. As an openly gay man himself, this is perhaps a result of the artist's existence within a more open social environment to divulge such information, but it might also be a nod to contemporary etiquette within the homosexual male community (and beyond) for disclosure prior to engaging in sexual activity. In this disclosure of time, date, and person, the artist brings forth to the viewer his ethical values. The use of litmus paper, a tool of scientific measurement, is an additional means for divulging the nature of one's self and one's body. Not only does each piece in the "Spent" series embody distinct and unique instances of the tremendously private act of ejaculation, but the pieces also reveal extremely precise information with regard to the levels of acidity inherent to each semen deposit. Revealing one's internally contained matter to another is perhaps the ultimate performance of disclosure: it can be tested, sequenced, and analyzed in any number of ways. McKenzie radicalizes the

colloquialism of 'bearing one's heart' by 'bearing his balls'—pardon the vulgarity. If an appropriate alternative title for Warhol's "Cum Painting" might be "Portrait (Anonymous)," the correlative alternative for McKenzie's "Spent" series might be "Self-Portrait (Time, Date, pH)." Through the disclosure of such information, McKenzie's drawings openly portray his unique nature of being within a unique moment in time. They might exist cognitively for the artist as physicalized extensions of his body, and augmentations to his cognition, and being. As with any artistic creation, are these portraits also McKenzie's transhuman progeny?

By referring to the pieces as "drawings," the artist references Renaissance conceptions of drawing as a bodily act of design, of "disegno."

Jordan McKenzie, "Spent (Litmus)," Jordan McKenzie, http://www.jordanmckenzie.co.uk/spent-litmus (accessed October 15, 2016).

Chrissy Conant, "Chrissy Caviar" (2002)
Human egg(s), hermetic container(s), commerce label(s), website (http://www.chrissycaviar.com)

CHRISSY CONANT'S HUMAN "CAVIAR" EGGS

Chrissy Conant's "Chrissy Caviar" is a feminist declaration of self-ownership and self-agency, exploring the commercialization of fertility and the commodification of human biomatter. For this project, the American-born artist consumed hormones and fertility drugs normally taken for In Vitro Fertilization. Then, with the help of an endocrinologist and embryologist, Conant had approximately twelve eggs harvested from her, preserving each egg individually in anaerobically sealed containers. On the satirically commercial website for the "Chrissy Caviar" product (which exists independently from the artist's personal website), Conant remarks:

> The procedure is the same used when a woman "donates" (usually for a fee) her eggs to another couple, an older woman, or an infertile woman who has attempted to conceive the natural way. The difference is, my eggs were gathered and used to make art, not embryos. (http://www.chrissycaviar.com)

This art takes the form of a decadently advertised rare food product: "Chrissy Caviar® The World's Most Expensive Luxury Consumable Item." Although the nature of consumption— edible or inseminative—is not specified directly (perhaps owing to FDA or health code regulations), the intention is well implied: with purchase, each jar comes equipped with a mother-of-pearl spoon. Inherent to the artist's juxtaposition between the human treatment of animal versus human ovum, "Chrissy Caviar" voraciously carnivorous assertions to subvert stigmas of cannibalism, while simultaneously raising altruist vegan questions with respect to the use and consumption of animal products: Why do we eat animal eggs and not human eggs? If we don't feel comfortable eating human eggs, why should we feel comfortable eating animal eggs? The artist toys with the fundamental sense of empathy that humans assign toward various living organisms.

Conant magnifies notions of attribution and 'personal disclosure' in art and design into a commercialized methodology of 'personal promotion': featured on the jar's label [image previous], an image of the smiling artist wearing a black dress and pointing to an iconographic glowing egg. The label also defines the genetic disposition of the caviar as "Caucasian," and containing "one egg" with a weight of "0.00000006 ounces," to be kept refrigerated at a temperature below 38 degrees Fahrenheit. Conant refers to her eggs as not just 'roe' but the more socially dignified and economically desired title 'caviar', which is actually traditionally salt-cured. In mining the biomatter of her own body as a source of privileged and exclusive gastronomic material, Conant appropriates pre-established liberties for ethically divergent purposes, and produces a critical discourse with debates about the female right to make choices about the reproductive materials of their body, and the presupposed purposes of eggs across a range of differing species. Playing off of modes of self-commodification contemporaneously occurring in the fields of scientifically-assisted fertility and reproduction, the artist elaborates on her pedigree on the "Chrissy Caviar" website, with tabs listing profiles of her education and intelligence, as well as her family and reproductive history. Extending into satirical hyperbolism, the lower left corner of the site advertises a tongue-in-cheek commercial: "Limited Edition of THE CHRISSY CAVIAR FLOATY PEN (only 1,000 produced)" with a jagged pink polygon flashing, "BUY NOW! click here" over top of this bolded text. The body of the site is consistently flanked by online promotional ads for other products. Conant's infomercialized self-promotional rhetoric for the project modernizes primal and religious human rituals of cannibalism, but it might also overshadow the gravity of the project. With "Chrissy Caviar," the artist presents one dozen items with reproductive potential—in effect her potential progeny—to be eaten, in a commercialized ritual offering of Communion. Comparable to the visceral and religiously charged work of Andres Serrano, "Chrissy Caviar" also addresses questions of the Catholic commodification of bodily matter, alluding to obligatory customs of tithing and charity to the Church. Conant offers her body for commercial consumption, akin to the Catholic Church with the body and blood of Christ:

So Jesus said to them, "Truly, truly, I say to you, unless you eat the flesh of the Son of Man and drink his blood, you have no life in you. / Whoever feeds on my flesh and drinks my blood has eternal life, and I will raise him up on the last day. / For my flesh is true food, and my blood is true drink. / Whoever feeds on my flesh and drinks my blood abides in me, and I in him. / As the living Father sent me, and I live because of the Father, so whoever feeds on me, he also will live because of me." (John 6:53-57)

In privileged quantities for an elite few, the artist offers her self as a freshly transubstantiated Daughter of a new New Testament.

Chrissy Conant, "Chrissy Caviar," Chrissy Caviar, http://www.chrissycaviar.com (accessed October 15, 2016).

Chrissy Conant, "Chrissy Conant," Chrissy Conant, http://www.chrissyconant.com (accessed October 15, 2016).

See also: Miriam Simun, "Human Cheese" (2011-)
Human milk, rennet, audience, international media
(http://www.miriamsimun.com)

Miriam Simun's Human Cheese uses ancient human technē to produce cheese from donated human breast milk, which the artist calls "the original natural food."

Miriam Simun, "Human Cheese," in *The Multispecies Salon*, ed. Eben Kirksey (Durham, NC; London: Duke University Press, 2014), 135-144, plate 4.

Miriam Simun, "Human Cheese," Miriam Simun, http://www.miriamsimun.com/project/598 (accessed October 15, 2016).

Raoul Bretzel and Anna Citelli, "Capsula Mundi" (2003-)
(http://www.capsulamundi.it)

The designers with their burial prototype
(http://www.capsulamundi.it)

BRETZEL AND CITELLI'S HUMAN-TO-TREE BURIAL POD

Raoul Bretzel and Anna Citelli, "Capsula Mundi" (2003-)
Human corpse in tree burial pod [previous page]
(http://www.capsulamundi.it)

Raoul Bretzel and Anna Citelli's "human-to-tree burial pod" proposes a form a transanimative reincarnation into plant biomatter [left image previous]. Buried as a fertilizing agent under a newly forming sapling, the human body is repurposed into fuel for another organism, to contribute its matter to another life, living again through an atomic reincarnation. By posing next to their burial module, the designers not only give relative scale to the prototype, but the image also summons an awareness of the transience of their bodies, and their own (presumed) future as trees [right image previous].

Raoul Bretzel and Anna Citelli, "Capsula Mundi," Capsula Mundi, http://www.capsulamundi.it (accessed October 15, 2016).

Jen Fela, "Italian designers create human-to-tree burial pod," *Frontiers in Ecology and the Environment* 13.3 (2015): 127.

See also: Auger Loizeau, "Afterlife" (2009) Human corpse, grave, microbial fuel cell (Antonelli 185)

Auger Loizeau's human corpse-powered battery repurposes the gaseous output of a deceased individual as a meaningful form of potential energy

Paola Antonelli et al, *Design and the Elastic Mind* (New York: Museum of Modern Art, 2008), 44 (Smell), 185 (Afterlife).

James Auger and Jimmy Loizeau, "Afterlife," Auger Loizeau, http://www.auger-loizeau.com/projects/afterlife (accessed October 15, 2016).

See also: "Smell+" (2009) Human bodies, human odors, tubes

James Auger and Jimmy Loizeau, "Smell," Auger Loizeau, http://www.auger-loizeau.com/projects/smell (accessed October 15, 2016).

Studio Wieki Somers, "High Tea Pot" (2003)
Pig skull original, bone china porcelain, stainless steel chain,
muskrat leather and fur cover (http://www.wiekisomers.com)

Studio Wieki Somers, "Faded Glory" (2007)
Tulips, porcelain
(http://www.wiekisomers.com)

"The weight of a honeycomb"
"Pietertje Vos 1942 – 2007 †"

"Dung beetles and Hand Vacuum Cleaner"
"John Steegman 1939 – 1985 †"

"Birds and Toaster"
"Anne Lindeboom 1920 – 1984 †"

STUDIO WIEKI SOMERS' PIG BONE CHINA AND PORCELAIN TULIPS AND HUMAN CREMAINS STILL LIFES (CONT'D)

Studio Wieki Somers, "Consume of Conserve?" series (2010)
Human cremains
(http://www.wiekisomers.com)

Studio Wieki Somers is a Rotterdam-based art and design studio established in 2003 by Wieki Somers and Dylan van den Berg. The two studied during the late 90s at the Design Academy Eindhoven, an interdisciplinary school in the Netherlands that touts their graduating designers as "particularly gifted conceptualists." (https://www.designacademy.nl) The studio produces work for "international manufacturers, museums, and galleries," with a wide range of projects, such as chairs and stools, lamps and light fixtures, crystal glassware, ceramic vases, teapots and tableware, table and floor textiles, perfume bottles, jewelry, and much more. Many of these are available as products from small-scale manufacturers, however some of their projects are singular commissions, or non-replicable pieces. The studio doesn't publish or write extensively about their work, and currently has two primary sources: the studio's website, and a publication produced for their solo exhibition entitled "Out of the Ordinary," at the Museum Boijmans Van Beuningen Rotterdam from October 11, 2014 to January 11, 2015. (http://www.boijmans.nl) In both sources, the amount of words attributable directly to the designers is sparse. The text for the studio's website is attributed to Louise Schouwenberg, and consists of little more than a paragraph of text about the designers, and for each project. The essays for the *Out of the Ordinary* publication are also written by Schouwenberg, as well as other authors from outside of the studio (the museum's design curator, the museum's director, who was also past client of the studio, and a small group of design theorists). A transcription of a conversation with the designers is the only place in the publication (or website for that matter) where Somers and van den Berg's words are quoted directly. And even in this conversation, the designers discuss more generally their approaches and everyday process of working, rather than addressing their past projects specifically. Contrary to the studio's name being eponymous to one of its founding partners, the designers themselves are fairly oblique in conversation and seem to purposefully obscure their voice in written form, with surrogates (primarily Schouwenberg) straddling an ambiguous line between writing about the studio and writing on behalf of the studio. This obscuration carries through to the studio's visual identity. In a photographic portrait of the duo published in *Out of the Ordinary*, the designers' faces are obscured in a small cloud of indiscernible gaseous matter. The designers seem to derive pleasure from these ironic and sometime startlingly unintuitive contrasts: ordinary and extraordinary, everyday and fantastic, expected and unexpected, etc. In her introduction to the exhibition's publication, design curator Annemartine van Kesteren refers to this tendency in metaphysical terms:

> Our everyday environments are full of consumer goods, disposable items, and meaningless objects that we use without due consideration. This inattentiveness prevents us from appreciating the extraordinary qualities of the ordinary things around us. The designers break through this inattentiveness and restore the soul of everyday objects. (9)

This description is exemplified by their first renowned project, the "High Tea Pot" [top left image previous], which was produced remarkably early, in the year of the studio's inception. A delicate bone china teapot has been sculpted from the skull of a pig, with the teapot's spout molded from the animal's snout. The teapot's top has been opened by a circular incision to the animal's skull. The remaining cranial bone is used to create the teapot's lid, which is affixed with a stainless steel chain as a grip (akin to a conventional industrial rubber drain plug). A formally fluid handle has been cast to the back of the skull. In their creative process, the designers have transmogrified the expected form of the teapot into the unexpected figuration of the pig skull, restoring "restor[ing] the soul of everyday objects" through formal and material spectacle. An early iteration was sculpted using an actual pig's skull as a base, with a clay-like substance enclosing the skull's orifices and fashioning the teapot's spout and handle. The final piece is not produced using solid bone, but from china made from the ashes of pig bone. (*Out of the Ordinary* 99) The biomatter is reanimated in its original image. Creating the opportunity for a startling reveal, the "High Tea Pot" is stored in a tightly fitting muskrat fur cover. The piece is not only held in the collection of numerous museums and fine art institutions, but it is also currently available for sale to the public through the online design dealer "Pamono," albeit at the significant price of $1,487 US dollars plus shipping (for a teapot). (http://www.pamono.com) Perhaps the persons who can afford to purchase such an item are the same persons in need of confronting such a stark and arousing spectacle.

In 2007, the studio produced "Faded Glory" [top right image previous], an updated take on the traditional Dutch tulip vase. Referencing the 17th Century period of 'tulipomania'—whereby the highly sensitive and transient flower had gained an exponentially inflated value in Dutch culture, creating an unsustainable economic bubble—"Faded Glory" addresses the flower's ephemerality: the "tulips dipped in porcelain, pulverized by the heat of the firing." (100) The tulips undergo a material metamorphosis, transformed by creative alchemy into the same prized substance as the expensive vases in which the flowers' 'living' counterparts are commonly displayed.

Perhaps their most controversial project, "Consume or Conserve?" consists of "three still lives, made of 3D-printed human ashes," and were made in 2010 for the Grand-Hornu Images in Belgium, which invited "designers to rethink the notion of progress." (http://www.wiekisomers.com) Illuminating the influence of progress on everyday life, the studio utilized extraordinary materials to represent ordinary things usually taken for granted but nonetheless weighted with complex symbolism. The designers have analogized their pieces to Dutch and Flemish "16th and 17th Century still life vanitas paintings," which were a kind of household funerary art that thrived in the predominantly conservative Calvinist culture of the region. 'Vanitas' was derived from the Old Testament verse "Vanity of vanities, all is vanity" (Ecclesiastes 1:2), and this period of paintings used recognizable objects to symbolically memorialize humans, and represent "the inevitability of death and the transience and vanity of earthly achievements and pleasures," to encourage "the viewer to consider mortality and to repent"—following the lineage of the *memento mori*, the reminder of one's mortality. (https://www.britannica.com) An archetype for this period is Dutch artist Harmen Steenwyck's circa 1640

`painting entitled "Still Life: An Allegory of the Vanities of Human Life" at the National Gallery in London:

> The books symbolise human knowledge, the musical instruments (a recorder, part of a shawm, a lute) the pleasures of the senses. The Japanese sword and the shell, both collectors' rarities, symbolise wealth. The chronometer and expiring lamp allude to the transience and frailty of human life. All are dominated by the skull, the symbol of death. (https://www.nationalgallery.org.uk)

Somers and van den Berg conceptually transubstantiate the skull motif usually found in the traditional 'vanitas' painting into the materiality of the "Consume of Conserve?" pieces. Each of the three still lifes is ascribed with two different names: a textual description of the imagery depicted in each piece, and a textual inscription on each piece's base designating the name, date of birth, date of death, and religious orientation of the human being who contributed their biomatter (in the form of cremains) to each of the pieces. Unlike the "High Tea Pot," composed of anonymous pig's bones and rat fur, and small-scale mass-produced for commercial distribution, the cremains of "Consume or Consume?" pieces are not only identified as human biomatter, but each piece has also been attributed directly to the bodies of specific human beings.

(1) "The weight of a honeycomb" is alternatively named "Pietertje Vos 1942 – 2007 †" [bottom left image previous]. One bee, and two pieces of honeycomb, on a mechanical scale: a creature and pieces of its nest—producer and produced—used here by the designers as an allegory to attributes of diligence and labor, being weighed on a scale in a reference to the Vanitas style.

(2) "Dung beetles and Hand Vacuum Cleaner" is alternatively named "John Steegman 1939 – 1985 †" [bottom center image previous]. Two dung beetles, one rolling a dung-ball onto a handheld electric vacuum: creatures who industriously find life by recycling the waste of others, and an object that depicts the repetitive nature of human waste, and its inefficient disuse.

(3) "Birds and Toaster" is alternatively named "Anne Lindeboom 1920 – 1984 †" [bottom right image previous]. Birds and an electric toaster: creatures admired for their delicacy, one live and one dead, relating to mortality, and an object of extreme radiant heat, representing, for the designers, "incineration."
Who were (or, who are) these people? What stories do these pieces tell about them? The sentient human viewer of the pieces viscerally empathizes with the material as an extension of a unique and identifiable human, and as a memorialization (or physicalization?) of their being. The material origins of the pieces provoke thoughtful consideration for the figural enigmas that confront them. The pieces become esoteric puzzles of existence, symbolic representations of character, artifacts of human being.

As objects bound within systems of capital and economy, the "Consumer or Conserve?" pieces take on additional dimensions. Deleuze and Guattari's conception of the "Body without Organs" refers not to an individual's physical body, but to a virtual dimension of untapped potentialities that they believe each individual possesses. The "body without organs" exists relative to a capitalist framework between producer and

consumer, where "the full body without organs is the unproductive, the sterile, the unengendered, the unconsumable." (Deleuze and Guattari, 9) The duo of philosopher and psychiatrist situated the "body without organs" as counter to systems of capitalist production, and the ultimate form of anti-production (epitomized by the "clinical entity" of Schizophrenia). For Studio Wieki Somers, the cremated remains of an individual might qualify as a "full body without organs," as a fulfillment of an individual's potentiality, and rendered "unproductive, sterile, unengendered, and unconsumable" within contemporary capitalist system. By framing the 'ordinary' as 'extraordinary' and vice versa the 'extraordinary' as 'ordinary,' the "Consume of Conserve?" pieces synthesize the "productive" with the "anti-productive." The "productive" object is materialized with "anti-productive" matter, and thus rendered "unproductive" through the material nature of its existence, but contrarily highly "productive" (i.e. valuable, consumable) through the unique physical nature of its existence (i.e. one of a kind, priceless): the pieces are irreplaceable and currently unattainable, in the collection of the Grand-Hornu Images. This conceptual cross-pollination provokes conflicting and stimulating reactions in the viewer, experiencing simultaneously: is the object priceless due to its materiality? Or is the significance of the material diminished by its nonhuman figural formalization?

> One day, we might find ourselves turned into the very products we assemble...we may afford grandpa a second life as a useful rocking chair, or even as a vacuum cleaner, a toaster. Would we become more attached to the vacuum cleaner, the toaster? (http://www.wiekisomers.com)

Conversely, would our attachment to grandpa—and our potential inability to let him go—diminish? The viewer's interpretation of the still lives' familiar content is augmented by its unexpected and fantastical materiality, and in turn the viewer's interpretation of the material is tempered by the familiar and approachable form that it takes. The still lives and their content take on an elevated meaning, and the unfamiliar material is normalized. The sacred becomes the regular, and the unholy becomes the holy.

See section 1.1.

Dylan van den Berg, Wieki Somers, and Studio Wieki Somers, *Out of the Ordinary* in Museum Boijmans Van Beuningen, Rotterdam (Zürich: JRP/Ringier, 2014).

Dylan van den Berg, Wieki Somers, and Studio Wieki Somers, "Studio Wieki Somers," Studio Wieki Somers. http://www.wiekisomers.com (accessed June 15, 2016).

Gilles Deleuze and Félix Guattari, *Anti-Œdipus: Capitalism and Schizophrenia*, tr. Robert Hurley, Mark Seem, and Helen R. Lane (New York: Viking Press, 1977).

Design Academy Eindhoven, "Identity and Mission," Design Academy Eindhoven, https://www.designacademy.nl/About/DAE/IdentityandMission.aspx (accessed October 15, 2016).

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Pamono, "High Tea Pot from Studio Wieki Somers, 2003," Pamono, http://www.pamono.com/high-tea-pot-from-studio-wieki-somers-2003-1 (accessed October 15, 2016).

See also: Harmen Brethouwer, with Michael Young and Kutan Ayata (Young & Ayata), "Exquisite Corpse Cone (Cône de Cadavre Exquis)" (2016) Sandstone

Harmen Brethouwer, "Antiques," Harmen Brethouwer, http://www.harmenbrethouwer.nl/Home/page-02/work/antiques (accessed October 15, 2016).

Michael Young and Kutan Ayata, "Exquisite Corpse Cone," Young & Ayata, http://www.young-ayata.com/exquisite-corpse-cone (accessed October 15, 2016).

Lee Wagstaff, "Shroud" (2000)
Human blood, linen
(http://www.leewagstaff.com)

Lee Wagstaff, "The Last Adam" (c.2013-)
Human skull bone, 3D scanner, 3D printer
(http://www.leewagstaff.com)

LEE WAGSTAFF'S HUMAN BLOOD AND BONE SELF-PORTRAITS

Lee Wagstaff's self-portraits explore the artist's complicated relationship with his family and his self. Recalling the Shroud of Turin, "Shroud" is a full-scale screenprint of the artist's body, depicting his tattoos in a figure-ground pattern of his blood [above left image] "The Last Adam" is an ongoing project that seeks to use the skull of Wagstaff's deceased father as a material to 3D print a full scale scan of the artist's own skull, with indentations added digitally based on his tattoo patterns [above right image]. Dealing with familial issues, the artist has stated that he will grind his father's skull into a powder to be printed with additional adhesives into an exact copy of the form of his own skull, taking on his German father's unstated misdeeds in an expression of the artist's own self-imposed burden and self-loathing.

Jack Mills, "This Artist Is Crushing His Dead Father's Skull to Work Through Their 'Weird Relationship'" (December 5, 2014), *Vice Media*, http://www.vice.com/en_uk/read/this-artist-is-crushing-his-dead-fathers-skull-to-help-him-work-through-their-relationship-956 (accessed October 15, 2016).

Lee Wagstaff, "I Am The Weapon," Lee Wagstaff, http://www.leewagstaff.com/artwork/i-am-the-weapon/content/mighty-in-sorrow-1 (accessed October 15, 2016).

Lee Wagstaff, "Lee Wagstaff," Tumblr, http://leewagstaff.tumblr.com/image/146797181198 (accessed October 15, 2016).

Lee Wagstaff, "Baptism, Shroud," Lee Wagstaff, http://www.leewagstaff.com/artwork/baptism/content/sch, alt: http://www.leewagstaff.com/artwork/baptism/content/sch/lightbox (accessed October 15, 2016).

Victoria and Albert Museum, "Shroud," Victoria and Albert Museum, http://collections.vam.ac.uk/item/O71401/shroud-print-wagstaff-lee (accessed October 15, 2016).

See also: Lee Wagstaff, "One Hundred Nights of Solitude" (2014)
Human semen, "The Sisters of Mercy" t-shirt
(http://www.leewagstaff.com "One Hundred Nights of Solitude")

Lee Wagstaff, "One Hundred Nights of Solitude," Lee Wagstaff, http://www.leewagstaff.com/artwork/turn-the-heater-on/content/1-1, alt: http://www.leewagstaff.com/artwork/turn-the-heater-on/content/1-1/lightbox (accessed October 15, 2016).

See also: Damien Hirst, "For The Love of God" (2007)
Human teeth, platinum, diamonds
(http://www.damienhirst.com)

Damien Hirst's Diamond-Set Platinum Skull with Human Teeth was produced from an 18th Century skull bought from a London taxidermist, and draws from traditions of memento mori, but also the lovingly decorative funerary traditions of Mexican and South American culture, to create an artifact that symbolizes the transience of life on earth.

> 'For the Love of God', a platinum skull set with diamonds, is one of Hirst's most important and widely recognised works. Its raw materials define it as an artwork of unprecedented scale. The 32 platinum plates making up 'For the Love of God' are set with 8,601 VVS to flawless pavé-set diamonds, weighing a massive 1,106.18 carats. The teeth inserted into the jaw are real and belong to the original skull. The skull from which 'For the Love of God' was cast, was purchased from a London taxidermist and subsequently subjected to intensive bioarchaeological analysis and radiocarbon dating. This research revealed it dated from around 1720 - 1810, and was likely to be that of a 35-year-old man of European/Mediterranean ancestry...'For the Love of God' acts as a reminder that our existence on earth is transient. Hirst combined the imagery of classic memento mori with inspiration drawn from Aztec skulls and the Mexican love of decoration and attitude towards death. He explains of death: "You don't like it, so you disguise it or you decorate it to make it look like something bearable – to such an extent that it becomes something else. (http://www.damienhirst.com)

Damien Hirst, "For The Love of God," Damien Hirst, http://www.damienhirst.com/for-the-love-of-god (accessed October 15, 2016).

Andres Serrano, "Blood Cross" (1985)
Bovine blood, Plexigas, photographic prints
(Serrano 50)

Andres Serrano, "Piss Christ" (1987)
Human urine, Jesus statuette, Plexiglas,
photographic prints (Serrano 62)

ANDRES SERRANO'S BLOOD AND HUMAN URINE PHOTOGRAPHS

Andres Serrano's work with biomatter—particularly fluids—almost inevitably invokes (or provokes) a visceral experience in the viewer. In her introduction to an exhibition catalog of Andres Serrano's work at the Institute of Contemporary Art in Philadelphia, critical theorist Wendy Steiner emphasizes this point:

> When Serrano claimed—however candidly—that he started using urine because it introduced yellow into his photographic palette, he revealed the laughable inadequacy of formalism to control meaning and the body. Blood and urine are hypersemantic, impossible to tame by abstraction or containment. (Serrano 13)

Serrano considers himself an installation artist with regard to these works, however the majority of his final pieces are shown in the form of photographic prints, perhaps owing to the highly sensitive and possibly unsanitary material nature of his installations. Some of his photographs capture the dynamic and liquid temporal nature of these materials, including images of blood flowing into water, urine and blood mixing, and "ejaculate in trajectory." (58-59) Other images show the materials as static and lifeless, juxtaposing the color and texture of still urine, blood, and milk. (It should be noted that the milk's mammal of origin appears to be unattributed, and so it may not be of human provenance.) Steiner analogizes the artist's acrylic vessels containing these human fluids to the membrane of the human body. (13) This analogy is further strengthened in pieces that juxtapose sacred religious iconography with these different bodily materials.

On Good Friday of 1985, the artist photographed "Blood Cross" [left image previous], which depicts a three-dimensional Plexiglas cross that has been filled with blood. A substance scripturally referred to as "the life of a creature" (Leviticus 17:11) materially embodies the Christian symbol of the cross. The artifact becomes a transhuman manifestation of this religious ideology, as a metonymic conflation of 'Cross' and 'Christ:' a physicalized literalization—not just representation—of the Crucifixion. A sizable amount of fluid was required to fill the cross, and so cow's blood was used (presumably in place of the artist's self-donation, as in the following piece discussed). Conjuring sacrilegious notions of transanimation (from animal to human deity), Serrano further compounds his complicated love-hate relationship with the institutions of Christianity.

As a result of experimental artistic processes, the "Blood Cross" is a triumph of happenstance. A relatively young artist at the time (in his mid 30s), Serrano was just beginning to work with Plexiglas. As the cow's blood filled the Plexigas cross, its acrylic seems began to slowly leak. Serrano found this interesting, and quickly filled it to the top and began photographing. The artifact was staged in front of a graffiti-like spray-painted background of sky, meant to "suggest an ersatz apocalypse." (24-25) The resulting photograph documents the slick and impermeable surface of the Plexiglas with an abundance of blood dripping down, causing it to appear contrarily (and perhaps ironically) porous. This aesthetic contradiction resonates with the fragile and porous, yet confining and membranous skin of the human body, and supports a transhumanist reading of the artifact as literalized Crucifixion (i.e. both the physical construct of the cross itself, and the body of Christ). In spite of Steiner's claims to the "hypersemantic" properties of biomatter, Serrano prefers not to prescribe value systems to these materials: "'I think this aversion to piss probably has more to do with the aversion that we have to our own bodies than it does to do with piss...'" (30) Through this neutral lens, the artist asserts that the "'use of bodily fluids, especially in connection with Christianity, has been a way of trying to personalize and redefine [his] relationship with Christ.'" (31)

In "Piss Christ" [right image previous], perhaps the artist's most controversial piece, Serrano has immersed a small commercially produced representational crucifix sculpture in a Plexigas tank filled with his own urine. The final photograph of the installation depicts a close-up of the crucifix in the oblique, without the edges and vertices of the tank visible. The urine is deep yellow in color, and its foggy translucence obstructs the visibility of the object. A random pattern of small bubbles appears arrayed across the surface of the inside of the tank. In order to create this piece, Serrano would have had to make a concerted effort to save his urine over several weeks in order to obtain the quantity of urine required to encase the object. He would have expended funds to purchase the object, and he would have taken time to carefully construct and properly seal a tank for it. He would have set up a space with proper lighting and photography equipment to document the artifact, and perhaps its process of assembly. The artist clearly expended a fair amount of effort in producing the piece, but what does it mean? In situating his work as critically neutral to "hypersemantic" materials, Serrano produces inevitably ambiguous and uncertain meaning. Is the object being embalmed and preserved, or is it being putrefied and decomposed? Is it a sacred artifact encased in a precious and personal material, or a vulgar

corruption drowning in contemptuous waste? Perhaps the artist bears these conflicting perspectives in simultaneity, and his neutral rhetoric serves to best enable the viewer to grasp this personal ambiguity.

Reactions to the "Piss Christ" were not ambiguous, but intense and polarized. After initially positive responses at the Stux Gallery in New York, the Los Angeles County Museum of Art, and the Carnegie-Mellon University Art Gallery in Pittsburgh, the photograph incited controversy at the Virginia Museum of Fine Arts in Richmond. (31) Then, a letter of dismay was published in a local newspaper, and the story became a national issue. Perhaps due to the exhibition's proximity to Washington, D.C., or perhaps its location in a conservative region of the country (and state), US Senators and leaders of the Christian Evangelical community of America turned the piece into a political issue, challenging the First Amendment right to freedom of speech and press with respect to the public funding of "art that is obscene, indecent, or offensive to any religion or nonreligion." (33) The NEA received threats of fines and defunding, and Serrano received threats of maiming and death. The artist was forced to stop posing for photographs, or publicizing his likeness. Serrano's career faltered, and his other, arguably less religiously provocative work remains lesser known. It seems likely that Serrano could never have anticipated the potency of the response to the "Piss Christ." Within the context this thesis, it makes no difference whether this potency was inherent to the piece and its material properties, or produced by the audience receiving it: both entities are composed of biomatter, of being.

Andres Serrano, Patrick T. Murphy, Robert Carleton Hobbs, Wendy Steiner, and Marcia Tucker, *Andres Serrano, Works 1983-1993* (Philadelphia: Institute of Contemporary Art, University of Pennsylvania, 1995).

(1991) (1996) (2001) (2006) (2011)

MARC QUINN'S HUMAN BLOOD SELF-PORTRAITS (CONT'D)

Marc Quinn, "Self" series
Human blood (artist's), stainless steel, Perspex, refrigeration equipment
(http://marcquinn.com)

Marc Quinn's self-portraits document and embody the artist's corporeality. Negotiating the transience of the human body, the artifacts document not only the artist's continuous aging, but they also personift his ongoing processes of self-exploration and self-definition relative to the larger cultural, social, technology condition.

See section 1.1.

Marc Quinn, "Self," Marc Quinn, http://marcquinn.com/artworks/self (accessed October 15, 2016).

Marc Quinn, Marc Quinn: Incarnate (London: Booth-Clibborn, 1998).

See also: "At Last I'm Perfect" (2002) Human hair (artist's) into 1.2 carat yellow diamond
(http://marcquinn.com "At Last I'm Perfect")

Marc Quinn, "At Last I'm Perfect," Marc Quinn, http://marcquinn.com/artworks/single/at-last-im-perfect (accessed October 15, 2016).

See also: "Cloned DNA Self Portrait 26.09.01 (2nd perspective)" (2001) Human DNA (cloned), stainless steel, polycarbonate agar jelly, bacteria colonies (http://marcquinn.com "Cloned DNA Self Portrait")

Marc Quinn, "Cloned DNA Self Portrait 26.09.01 (2nd perspective)," Marc Quinn, http://marcquinn.com/artworks/single/dna-portrait-of-sir-john-sulston (accessed October 15, 2016).

See also: "Origin of Species" (1993) Coconut milk, stainless steel, glass, refrigeration equipment
(http://marcquinn.com "Origin of Species")

Marc Quinn, "Origin of Species," Marc Quinn, http://marcquinn.com/artworks/single/origin-of-species (accessed October 15, 2016).

See also: "Shit Head" (1997) Human feces (artist's), stainless steel, Perspex, refrigeration equipment
(http://marcquinn.com "Shit Head")

Marc Quinn, "Shit Head," Marc Quinn, http://marcquinn.com/artworks/single/shit-head-march-1997 (accessed October 15, 2016).

See also: "Lucas" (2001) Human placenta and umbilical cord, stainless steel, Perspex, refrigeration equipment

Marc Quinn, "Lucas," Marc Quinn, http://marcquinn.com/artworks/single/lucas (accessed October 15, 2016).

See also: "A Genomic Portrait: Sir John Sulston" (2001) Human DNA (cloned), stainless steel, polycarbonate agar jelly, bacteria colonies

Marc Quinn, "A Genomic Portrait: Sir John Sulston," Marc Quinn, http://marcquinn.com/artworks/single/cloned-d.n.a.-self-portrait-26.09.01-2nd-perspective (accessed October 15, 2016).

Patricia Piccinini, "The Young Family" (2002)
Human hair, leather, silicone, fiberglass, plywood
(http://www.patriciapiccinini.net)

PATRICIA PICCININI'S SCULPTURAL TRANSANIMATIONS WITH HUMAN HAIR

Patricia Piccinini's sculptural figures use recognizably human features, textures, and materials to envision future human species, engendering empathy for the other, the unlike, and the evolved. "The Young Family" [image previous] re-contextualizes the familiar texture of human hair on the vaguely human-pig-like skin of an engrossing group of fictional organisms. Regariding Piccinini's work, Donna Haraway has remarked:

> Her visual and sculptural art is about worlding—that is, "naturaltechnical" worlds at stake, worlds needy for care and response, worlds full of unsettling but oddly familiar critters who turn out to be simultaneously near-kin and alien colonists. Piccinini's worlds require curiosity, emotional engagement, and investigation, and they do not yield to clean judgment or bottom lines—especially not about what is living and nonliving, organic or technological, promising or threatening. (Haraway 242)

The artist proposes a future human species, aesthetically articulated using current human biomatter, in an effort to produce empathy for the other, and for the future of human evolution. As the mother of the family nurses her young—a familiar and endearing scene to many intelligent mammals—her facial expression is elusively human, her eyes piercingly thoughtful. While Piccinini is an artist who doesn't directly use genetic information, her work is very much about genetics, mutation, and the evolution of the human species (particularly of the self-catalyzed variety), and she uses human biomatter very carefully and intelligently in order to reinforce these larger ideas.

Donna J. Haraway, "Speculative Fabulations for Technoculture's Generations: Taking Care of Unexpected Country," in *The Multispecies Salon*, ed. Eben Kirksley (Durham, NC; London: Duke University Press, 2014), 242-261.

Patricia Piccinini, 'The Young Family," Patricia Piccinini, http://www.patriciapiccinini.net/144/32 (accessed October 15, 2016).

GENETIC INFORMATION

1. Take 500 milligrams of flesh.

2. Cut the flesh into smaller pieces and place them into a mortar. Add 2000 microlitres of extraction buffer and grind with pestle thoroughly to crush the cells and release the DNA.

3. Transfer the resulting paste and buffer to a 1.5 ml microtube.

4. Centrifuge the tube for 5 min at high speed in a micro-centrifuge to sediment the debris.

5. Transfer 300 microlitres of the supernatant to a fresh micro tube.

6. Add 800 microlitres of cold ethanol by carefully layering it on top of the supernatant.

7. Dip the glass pipette up and down in the microtube, gently mixing alcohol with the supernatant.
The DNA will precipitate as a white stringy mass which adheres to the glass rod.
One base pair, the basic unit, of the DNA molecule that you see, is only 3.34 x 10-4 microns long.

(Chapple 130)

Boo Chapple, "Journeys to the Other Side of the Navel," in *Art in the Biotech Era*, ed. Melentie Pandilovski, (Adelaide: Experimental Art Foundation, 2008). 130-138.

See also:

Steven Henry Madoff, "Art/Architecture; The Wonders of Genetics Breed a New Art," *New York Times* (May 26, 2002).

Robert Mitchell and Phillip Thurtle, ed., *Data Made Flesh: Embodying Information* (New York; London: Routledge, 2004).

Eugene Thacker, *After Life* (Chicago; London: University of Chicago Press, 2010).

Eugene Thacker, "Open Source DNA and Bioinformatic Bodies," in *Signs of Life: Bio Art and Beyond*, ed. Eduardo Kac (Cambridge, MA; London: MIT Press, 2007), 31-42.

Eugene Thacker, "Life-Resistance and Tactical Media," in *Art in the Biotech Era*, Melentie Pandilovski, ed. (Adelaide: Experimental Art Foundation, 2008), 22-30.

Catherine Waldby, *The Visible Human Project: Informatic Bodies and Posthuman Medicine* (London; New York: Routledge, 2000).

IN CONTEMPORARY ART AND DESIGN PRACTICES

> The emerging biological ability to render human forms in text will carry the process of dissection to an extreme, but also produce a new vantage for artistic exploration of the human condition. (Shapiro 77)

With the use of living organisms and their biomatter, artists and designers are unavoidably tied to the ethical concerns surrounding the organisms' livelihood (and that of its genetic information), and issues of intervention and modification, safeguarding and preservation, abstention and neutrality, etc. In defining the field of "Bioart," a writing team of artists and scientists (including seminal "bioartist" Joe Davis and foundational geneticist George Church) outlined the grave stakes of even the most altruistic artistic intervention:

> Artist Hans Haacke purchased ten endangered Hermann's tortoises (*Testudo hermanni*) and subsequently released them at St. Paul-de-Vence, France, a region where one of two subspecies of the endangered tortoise is endemic. The work, 'Ten Turtles Set Free' (1970), was intended to draw public attention to excesses of the pet trade and the destructive effects that humanity has on the delicate balance of nature. However, Haacke released the wrong tortoise subspecies. The two subspecies are *T. hermanni boettgeri/hermanni* and only the latter traditionally occupied a range in France. Photographs of Haacke's emancipated tortoises reveal that at least six of ten animals were *T. hermanni boettgeri*. Haacke's *T. h. boettgeri* are likely to have hybridized with local T. *hermanni hermanni*. Later studies of captive *hermanni/boettgeri* hybrids have shown decreased reproductivity. Despite honorable intentions, Haacke's introduction of non-native *T. h. boettgeri* was likely to have compromised genetically distinct lineages of both tortoises and threatened the biodiversity of Hermann's tortoises. (Yetisen 727)

In the act of "Ten Turtles Set Free" (Flügge 103) the artist's intentions were noble, but his methodology was flawed, and its long-term affects were essentially inverse to the action's intent. Haacke not only made this mistake without knowing, but he also thoroughly documented and publicized it. Had he merely consulted with a veterinarian or reptile expert before their release, the specialist would have pointed out differentiating details on the tortoises that were clear enough to discern even in the artist's black and white photography of the emancipated creatures. This simple discovery would have altered the ethos of the project: upon realizing that more than half of the tortoises that he had purchased were not native to the local region, Haacke would have faced a decision. Would he make return the non-natives to their enslavement at the pet store? Would he endorse an alternative form of subspecies discrimination, and segregate the different groups by placing them in their own separate, "native" ecosystems? Upon recognition of the overlooked processes in Haacke's eco-genetic experiment, the project loses both its claim to righteousness, and much of its potency (relative to the work's original intentions).

See: Hans Haacke, "Ten Turtles Set Free" (1970) Tortoises

Matthias Flügge and Robert Fleck, *Hans Haacke: For Real: Works 1959-2006* (Düsseldorf: Richter, 2006).

Ali K. Yetisen, Joe Davis, Ahmet F. Coskun, George M. Church, and Seok Hyun Yun, "Bioart," *Trends in Biotechnology* 33.12 (December 2015): 724-734.

The Svalbard Global Seed Vault (SGSV) "offers 'fail-safe' protection" against seed extinction, "provid[ing] insurance against both incremental and catastrophic loss of crop diversity in traditional seed banks around the world." (Fowler 5) Svalbard is a sparsely populated Norwegian archipelago located at the confluence of the Greenland, Norwegian, and Barents Seas with the Arctic Ocean. The Seed Vault is built into the subterranean permafrost of a small mountain, tunneled to a depth whereby the storage vaults can be passively maintained within the desired temperature range between minus four and minus six degrees Celsius. Accounting for the most extreme scenarios of climate change, the Vault has been projected to maintain this temperature range naturally (and without artificial insulation) for at least the next 200 years. (Fowler 17) In spite of the lofty goals of the project, the Vault has established a disputable set of parameters for the collection's standard sample acceptance protocol. The collection is focused strictly on "crops" for human consumption (or in the case of animal feed, part of the ecosystem of human consumption). The vault is geared toward human extinction, by preventing the extinction of seed strains that humans eat, and not other strains less 'valuable' to our subsistence. However, this discounts the complexity of the enclosed and interconnected planetary ecosystem of "Spaceship Earth" (Fuller) and the necessity for a well-rounded diversity of species beyond those with nutritional value for our own (species). The Vault will only receive samples as "backups" from other genebanks and established "seed breeders." This creates an exclusive technocracy of intermingling agencies, with shared motivations for their continued authority within the hierarchy of the SGSV's systemic structure, and questions of agency, rights, and discrimination. Under what conditions does a party have the right to request the return of their seed backup? What party even has the right to make the request? The hungry people in need of the unique crop, or the entity of the genebank or "seed breeder" who provided the sample?

From the long-term perspective, the Svalbard Global Seed Vault's ability to function in perpetuity is subject to change. "The Nordic Gene Bank, the Norwegian Ministry of Agriculture and Food, and the Global Crop Diversity Trust" are the partners charged with overseeing the Vault. (Fowler 5) Although military activity is prohibited on the islands "under the terms of an International Treaty," the globally operating facility is predominantly dependent on the stability of the Norwegian government (and by extension the European Economic Area (EEA) as a member of the European Free Trade Association (EFTA)). (Fowler 16) As an entity subject to Norwegian law, the Vault's intake and storage practices are additionally imposed with limitations beyond the organization's own internal bureaucracy. For example, the import of certain Genetically Modified Organisms (GMOs) is restricted under current Norwegian legislation, forcing the Seed Vault to exclude genetically modified seed strains from their collection. (Fowler 23) This despite the widespread use of the term "seed breeder," which acknowledges the human intervention on the genetic makeup of seed strains through processes of selection. Needless to say, regardless of intentions or initial goals, dealing with genetic information and its material formation is rife with inevitable concerns, conflicts, and controversy, which are always important factors to negotiate in the process of design and creation. For every intervention enacted with genetic information, the life of the organism(s) will be affected, the organism(s)'s offspring will be affected, and the environment that they inhabit will also be influenced.

See: Peter W. Søderman (Barlindhaug Consult), "Svalbard Global Seed Vault" (2008)
Seeds (Fowler)

Cary Fowler, *The Svalbard Global Seed Vault: Securing the Future of Agriculture* (The Global Crop Diversity Trust, February 26, 2008).

R. Buckminster Fuller, *Operating Manual for Spaceship Earth* (New York: Simon and Schuster, 1969).

Michael Hopkin, "Frozen Futures," *Nature* 452.27 (March 2008): 404-405.

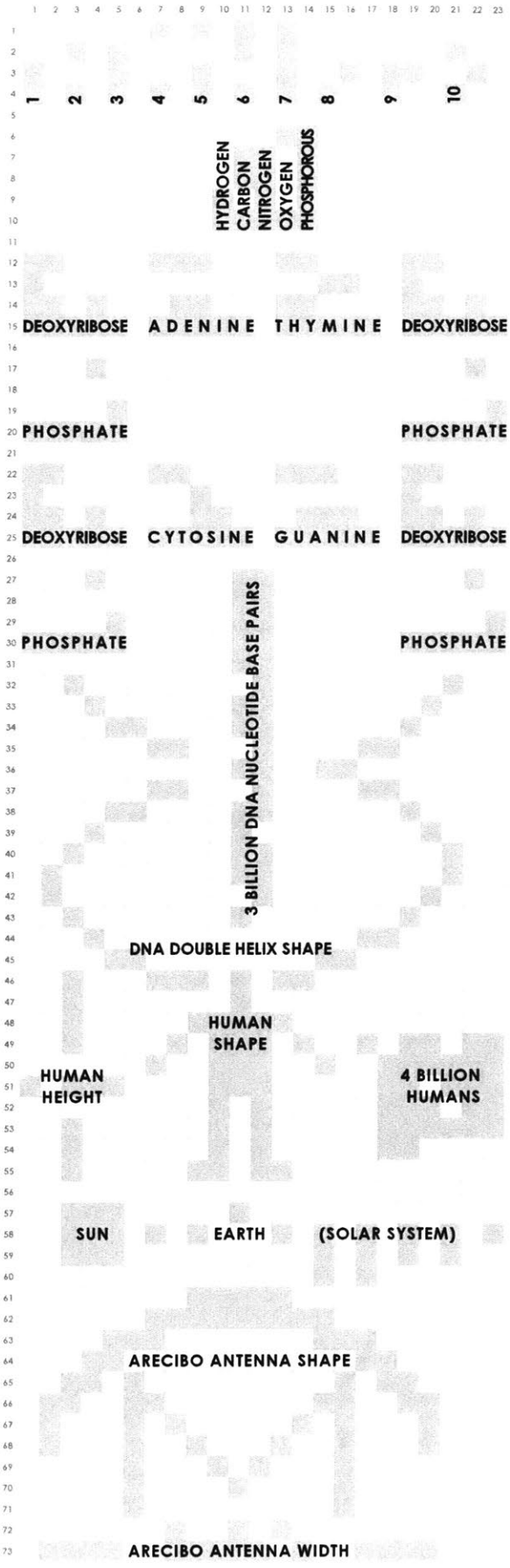
Robert Shapiro, "DNA, Art, and the Hereafter," *Art Journal* 55.1 (April 1996): 75-78.

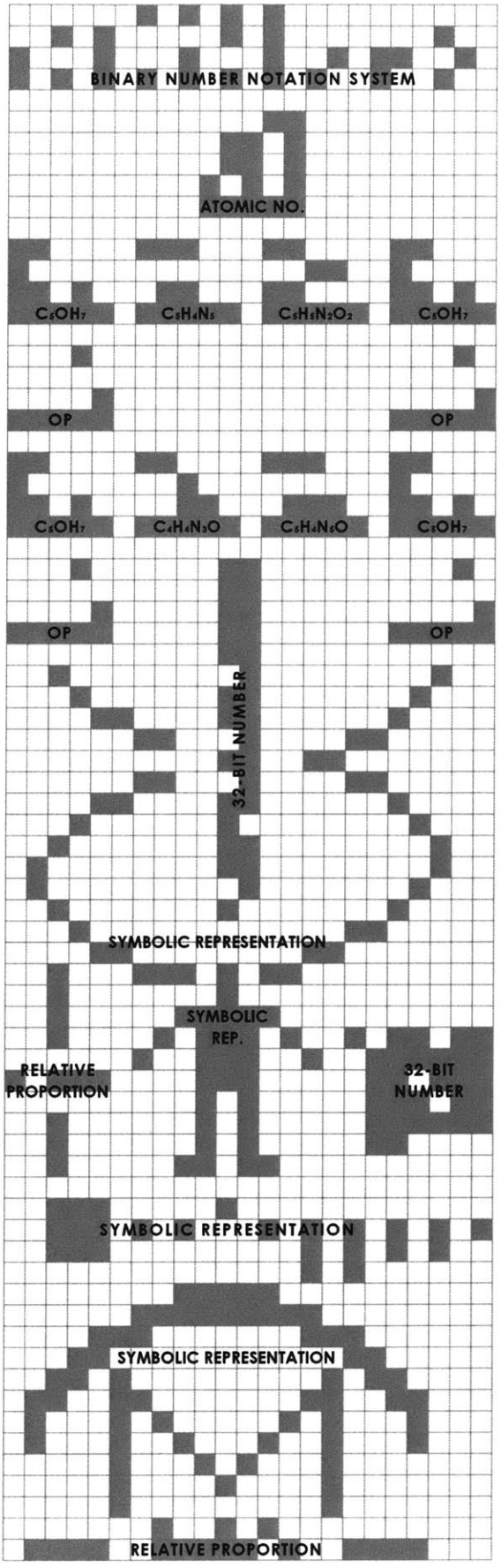
See also: Dyveke Sanne, "SGSV" art installation (2008)
Light and reflective materials (Public Art Norway)

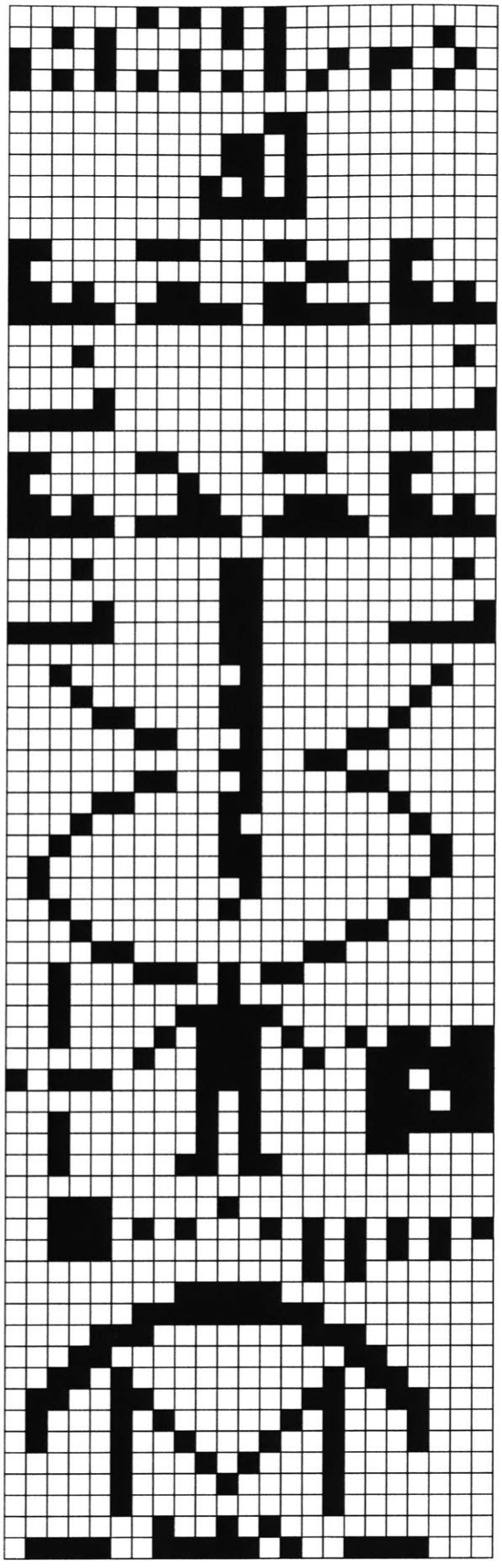
Public Art Norway, "Svalbard Global Seed Vault," KORO/Public Art Norway, http://publicartnorway.org/prosjekter/svalbard-global-seed-vault (accessed October 15, 2016).

See also: Thomas Heatherwick (Heatherwick Studio), "UK Pavilion, Shanghai Expo 2010 (Seed Cathedral)" (2010)
Seeds (http://www.heatherwick.com)

Heatherwick Studio, "UK Pavilion," Heatherwick Studio, http://www.heatherwick.com/uk-pavilion (accessed October 15, 2016).


1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
1 2 3 4 5 6 7 8 9 10
HYDROGEN
CARBON
NITROGEN
OXYGEN
PHOSPHORUS
DEOXYRIBOSE ADENINE THYMINE DEOXYRIBOSE
PHOSPHATE PHOSPHATE
DEOXYRIBOSE CYTOSINE GUANINE DEOXYRIBOSE
PHOSPHATE PHOSPHATE
3 BILLION DNA NUCLEOTIDE BASE PAIRS
DNA DOUBLE HELIX SHAPE
HUMAN SHAPE
HUMAN HEIGHT
4 BILLION HUMANS
SUN
EARTH
(SOLAR SYSTEM)
ARECIBO ANTENNA SHAPE
ARECIBO ANTENNA WIDTH


BINARY NUMBER NOTATION SYSTEM
ATOMIC NO.
C5OH7
C5H4N5
C5H5N2O2
C5OH7
OP
OP
C5OH7
C4H4N3O
C5H4N5O
C5OH7
OP
OP
32-BIT NUMBER
SYMBOLIC REPRESENTATION
SYMBOLIC REP.
RELATIVE PROPORTION
32-BIT NUMBER
SYMBOLIC REPRESENTATION
SYMBOLIC REPRESENTATION
RELATIVE PROPORTION



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DRAKE AND SAGANS' HUMANIST TRANSMUTATIONS (CONT'D)

Frank Drake, Carl Sagan, et al, "Arecibo message" (1974)
Human conditions radio transmitted [previous spread]
(images by the author based on "Arecibo Message" 463-464)

Frank Drake and the Sagans' project transmitted abstract human conditions, including our basic genetic makeup and physical shape in the form of radio wave.

> Numbers 1 – 10
> Labels
> Atomic numbers for H, C, O, and P
> Formulas for Bases and Sugars in the Nucleotides of DNA
> (center) Number of Nucleotides in the Human Genome
> Graphic Representation of DNA Double Helix
> (left) 1974 Human Population of Earth
> (right) Height of Human
> Solar System (Earth is displace toward human)
> Parabolic Radar Dish
> Diameter of Arecibo Antenna.
>
> (Davis 72)

This is a list of the information embedded within a geometric image [see image X] that was broadcast from the Arecibo Observatory, a radio transmission (at 2380Mhz radio frequency and 10Hz bandwidth) of an abstracted binary translation that was "directed at a globular cluster of stars, the Great Cluster in Hercules, Messier 13, a group of some 300,000 stars and 25,000 lights years distant whose apparent size closely matches the beamwidth of the transmission." ("Arecibo Message" 462)

See section 1.1.

Joe Davis, "Microvenus," *Art Journal* 55.1 (April 1996): 70-74. Stable URL: http://www.jstor.org/stable/777811 (accessed October 15, 2016).

Carl Sagan et al, "A Message from Earth," *Science* 175 (1972): 881-884.

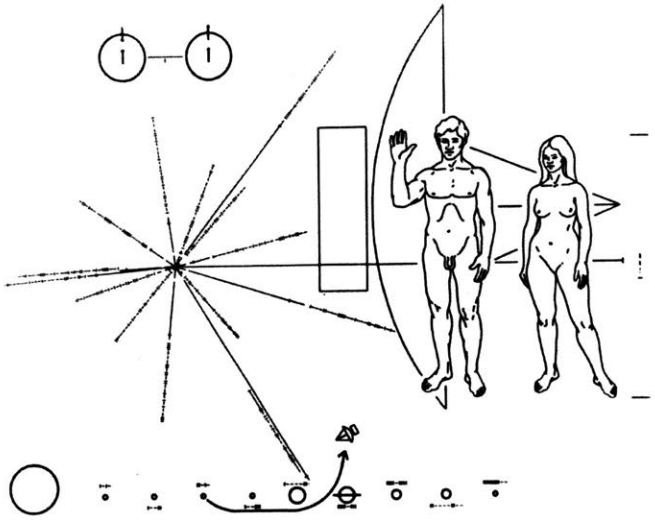
See also: Frank Drake, Carl Sagan, and Linda Salzman Sagan, "Pioneer Plaques" (1972, 1973)
Human conditions transmitted via artifact
(Sagan 883)

Mark Garcia, ed., The Diagrams of Architecture (Chichester, UK: Wiley, 2010).

NASA, "Galleries: Pioneer Plaque," NASA, http://solarsystem.nasa.gov/galleries/pioneer-plaque (accessed October 15, 2016).

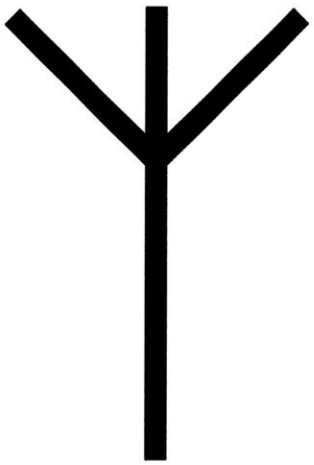
Staff at the National Astronomy and Ionosphere Center, "The Arecibo Message of November, 1974," *Icarus* 26 (1975): 462-466.

DRAKE AND SAGANS' PIONEER PLAQUE



Frank Drake, Carl Sagan, Linda Salzman Sagan,
"Pioneer Plaques" (1972, 1973)
Human conditions transmitted via artifact
(Sagan 883)

JOE DAVIS' GRAPHIC SYMBOL



BINARY NOTATION

1	0	1	0	1
0	1	1	1	0
0	0	1	0	0
0	0	1	0	0
0	0	1	0	0
0	0	1	0	0
0	0	1	0	0

DNA NUCLEOTIDES

CYTOSINE
C = 1 = X

THYMINE
T = 2 = XX

ADENINE
A = 3 = XXX

GUANINE
G = 4 = XXXX

[KEY] **CTTAAAGGGG**

NUCLEOTIDE NOTATION

C	C	C	C	C
C	A	A	A	A
A	A	C	G	G
G	G	C	G	G
G	G	C	G	G
G	G	C	G	G
G	G	C	T	T

DNA NOTATION

[5'] C–G [3']
T–A
T–A
A–T
A–T
A–T
G–C
G–C
G–C
G–C
C–G
C–G
C–G
C–G
C–G
C–G
A–T
A–T
C–G
G–C
C–G
G–C
C–G
G–C
C–G
G–C
C–G
[3'] T–A [5']

DNA SYNTHESIS

JOE DAVIS' HUMANIST TRANSANIMATIONS

Joe Davis, "Microvenus" (c.1986-)
Human iconography translated into genetic notation and synthesized into bacterial plasmid DNA [previous page]
(images by the author, based on https://blogs.scientificamerican.com)

Joe Davis' transanimations critique the absence of female genitalia of Drake and Sagans' "Pioneer Plaque" by translating the "Microvenus" symbol into a genetic notation, which was then synthesized into the plasmidic DNA of the bacteria E. coli. According to Christina Agapakis of Scientific American, it was "the first non-biological message encoded in DNA" (Agapakis) Davis states that the "Microvenus" symbol is also "identical with an ancient Germanic rune and other iconography originally used to represent life and the female earth." ("Microvenus" 74) The graphic image was then converted to a "thirty-five-bit binary sequence" that is "only divisible by two prime numbers" and "can be converted back to only one two-dimensional figure (namely the five-by-seven or seven-by-five Microvenus)." (70) This binary sequence was again converted into a corresponding "scientific notation used to describe DNA...as a varying set of alphabetical characters that correspond to the first letter of each of the four nucleotide bases in DNA." (70) This sequence was then chemically synthesized into the plasmid DNA of the bacterium E. coli, which exists as a parasitic "vector" autonomous of the E. coli cell, but continues to live and reproduce inside of it. Existing in laboratory petri dishes and hermetic containers, the bacterium is "a delicate 'living carriage'...that could easily be destroyed," but if left alone in its current state could last for exponentially longer than the remaining span of a human. (72)

Christina Agapakis, "Communicating with Aliens through DNA" (August 18, 2012), *Scientific American*, Oscillator blog https://blogs.scientificamerican.com/oscillator/dna-code (accessed October 15, 2016).

Joe Davis, "Microvenus," *Art Journal* 55.1 (April 1996): 70-74. Stable URL: http://www.jstor.org/stable/777811 (accessed October 15, 2016).

See also: "Poetica Vaginal" (1986)
Human muscle contractions recorded and radio transmitted

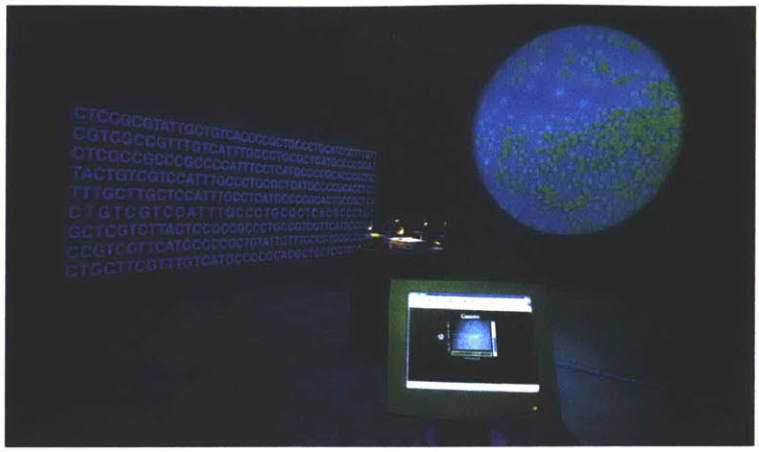
Joe Davis, "Cases for Genetic Art," in *Signs of Life: Bio Art and Beyond*, ed. Eduardo Kac (Cambridge, MA; London: MIT Press, 2007), 249-266.

Joe Davis, "Joe Davis on Art, Biology, and the Body Politic," in *Art in the Biotech Era*, ed. Melentie Pandilovski (Adelaide: Experimental Art Foundation, 2008), 110-113.

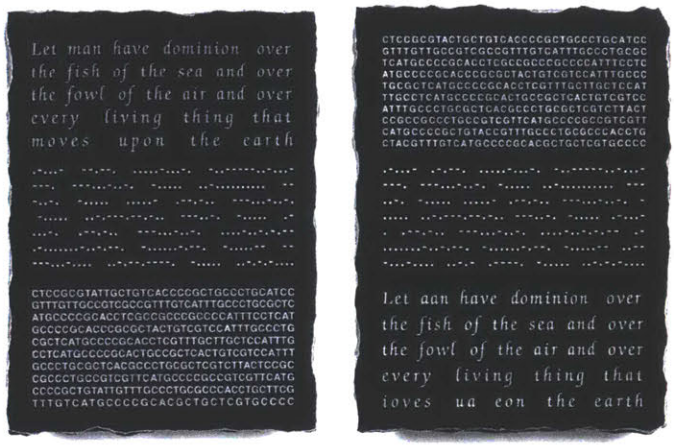
Joe Davis, "Mnemosyne's Paradox," in *Molecular Aesthetics*, ed. Peter Weibel and Ljiljana Fruk (Cambridge, MA: MIT Press, 2013), 453-456.

Joe Davis, "Romance, Supercodes, and the Milky Way DNA" symposium paper, in *Ars Electronica 2000 Catalog: Next Sex*, ed. Gerfried Stocker and Christine Schöpf (Vienna: Springer Verlag, 2000), 217-235.

Ali K. Yetisen, Joe Davis, Ahmet F. Coskun, George M. Church, and Seok Hyun Yun, "Bioart," in *Trends in Biotechnology* 33.12 (December 2015): 724-734.



Eduardo Kac, "Genesis" (1999)
Human scripture translated into genetic notation and synthesized into bacterial plasmid DNA (http://www.ekac.org)



Eduardo Kac, "Encryption Stones" (2001)
Human language translation device between Latin alphabet, Morse code, and genetic notation in Latin alphabet (*Eighth Day* 64-65)

EDUARDO KAC'S TRANSGENIC BEINGS

> Let man have dominion over the fish of the sea, and over the fowl of the air, and over every living thing that moves upon the earth. (Genesis 1:26, http://www.ekac.org)
>
> The triadic configuration of the "Encryption Stones" critically reveals the intersemiotic operations that lie at the heart of our current understanding of life processes. (http://www.ekac.org)

Eduardo Kac's 1999 "Genesis" project (left image) synthesized human scripture from the Book of Genesis into bacterial plasmid DNA via morse code encryption (right image).

See also: "GFP Bunny (Alba)" (born April 2000)
Rabbit with biofluorescent fur, genetically modified and spliced with jellyfish DNA (veracity questioned)

Sheilah Britton and Dan Collins, ed., *The Eighth Day: The Transgenic Art of Eduardo Kac* (Tempe, AZ: Institute for Studies in the Arts, Arizona State University, 2003).

Eduardo Kac, "Life Transformation—Art Mutation," in *Art in the Biotech Era*, ed. Melentie Pandilovski (Adelaide: Experimental Art Foundation, 2008), 122-128.

Eduardo Kac, ed., *Signs of Life: Bio Art and Beyond* (Cambridge, MA; London: MIT Press, 2007).

Eduardo Kac, "Transgenic Index," Eduardo Kac, http://www.ekac.org/transgenicindex.html (accessed October 15, 2016).

William Myers, *Bio Design: Nature, Science, Creativity* (New York: Museum of Modern Art, 2012), 268-269.

William Myers, *Bio Art: Altered Realities* (New York: Thames & Hudson, 2015), 64-67.

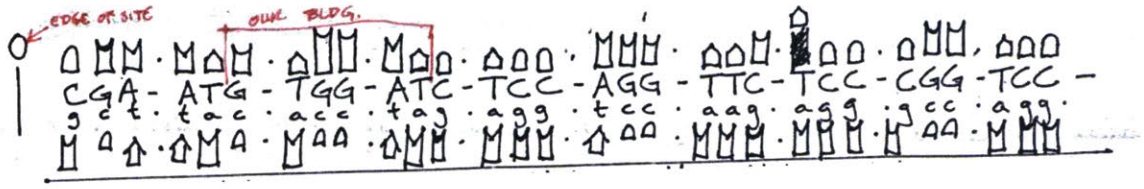
Steve Tomasula, "Gene(sis)," in *Data Made Flesh: Embodying Information*, ed. Robert Mitchell and Phillip Thurtle (New York; London: Routledge, 2004), 249-257.

GUANINE (PURINE) **G**

ADENINE (PURINE) **A**

CYTOSINE (PYRAMIDINE) **C**

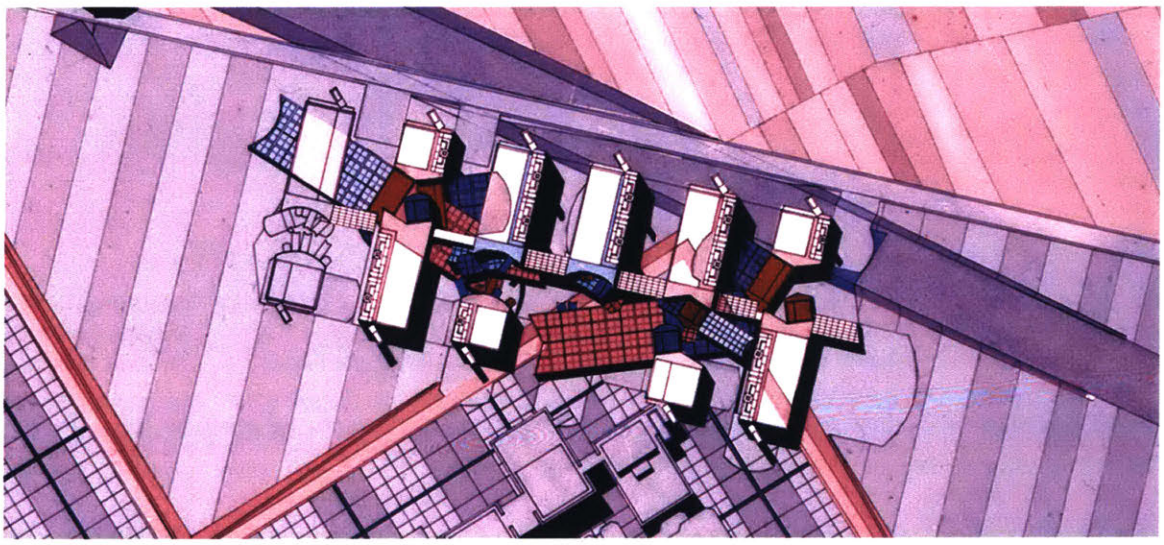
THYMINE (PYRAMIDINE) **T**



"Schematic representation of an unidentified DNA sequence" (cropped)
Human translation of genetic notation into architectonic notation
(Eisenman fonds Collection)

G T G G A T

C A C C T A



"Drawing" (Site Plan, rotated 180 degrees and cropped)
Human reformulation of genetic notation into architectural form
(http://www.eisenmanarchitects.com)

PETER EISENMAN'S GENETIC REFORMULATIONS (CONT'D)

Peter Eisenman (Eisenman/Robertson Architects), Biocentrum (Biozentrum) Biology Center project, J.W. Goethe University (Frankfurt am Main, Germany, 1987) [previous page]
(Diagrams by the author)

Peter Eisenman's project for an academic campus attempted to reformulate genetic notation into architectural form. Although "unbuilt," the project pushed forward the integration of new capabilities into architectural design discourse, both conceptually and practically. The project incorporated not only genetic information, but also cutting edge computational modeling processes.

See section 1.1.

Peter Eisenman, "Biocentrum," Eisenman Architects, http://www.eisenmanarchitects.com/biocenter.html (accessed October 15, 2016).

Peter Eisenman fonds Collection, *Centre Canadien d'Architecture*, Montréal, reference number: DR1999:0646 ©CCA.

PHYSICALIZATION vs. VISUALIZATION

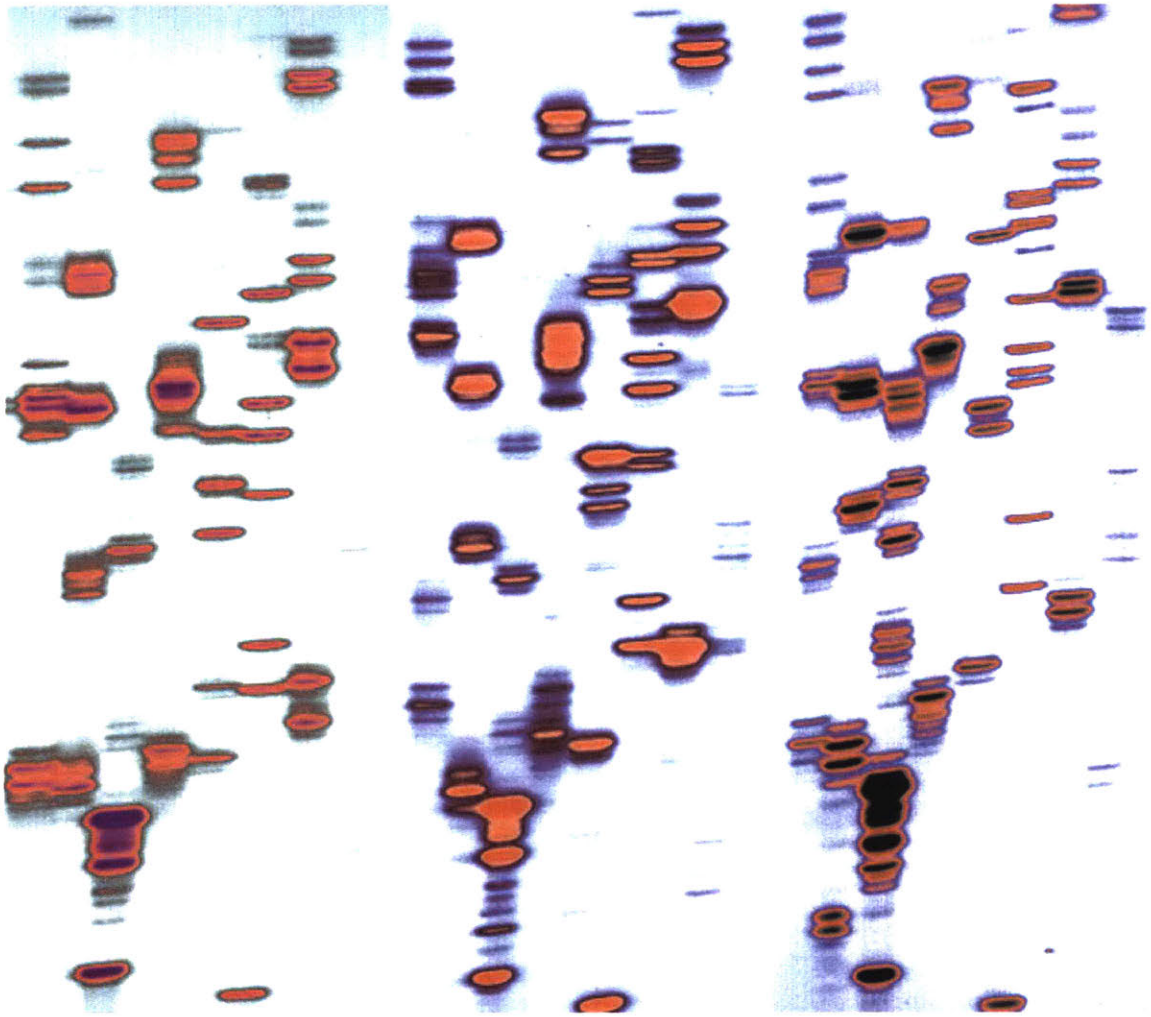
This section positions design artifacts that embody human information on a sliding scale between representational *visualization* and architectural *physicalization*. This is framed through the lens of the four classical causes of an instrument's "becoming" as discussed by Martin Heidegger in "The Question Concerning Technology."

> [1] the *causa materialis*, the material, out of which, for example, a silver chalice is made;
>
> [2] the *causa formalis*, the form, the shape into which the material enters;
>
> [3] the *causa finalis*, the end, for example, the sacrificial rite in relation to which the chalice required is determined as to its form and matter;
>
> [4] the *causa efficiens*, which brings about the effect that is the finished, actual chalice, in this instance, the silversmith.
>
> (Heidegger 4-5)

Heidegger proposed that the interrelational combination between these four causes—material, form, program (or purpose), and maker—constituted a technological mode of "revealing" of a greater, perhaps latent essence or nature. (7)

This thesis speculates that this essence can be evaluated in an artifact of design through a careful examination of these components and their interrelationship through the visceral experience of the artifact, and cognitive reflection on its characteristics, experiential qualities, and affects, which can be further calibrated toward heightening the potential impact of this latent energy. Therefore, the delineation between an artifact that remains a visualization of human information versus an artifact that can serve as a physicalization of it would lie in this relatively arbitrary and highly subjective system of evaluation. The primary objective of a physicalization is not to convey information, but to produce affect, and to exist to do so. In order to do this, the four causes (material, form, program, maker) of the artifact must come into an indefinable (and perhaps unattainable) alignment with one another, in esoteric (and possibly indescribable) conditions. Discussions of the following artifacts attempt to establish a framework of design opportunities to traverse the blurry line between visualization and physicalization.

Martin Heidegger, "The Question Concerning Technology" in *The Question Concerning Technology, and Other Essays*, tr. William Lovitt (New York: Harper & Row, 1977), 3-35.



Iñigo Manglano-Ovalle, "Byron, Lisa, Emmett" from the series "The Garden of Delights" (1998)
Human DNA analysis visualization "portraits" of chromogenic prints, Plexiglas
(Goodyear 224)

IÑIGO MANGLANO-OVALLE'S AUTORADIOGRAPHIC DNA VISUALIZATION TRIPTYCHS

Spanish artist Iñigo Manglano-Ovalle appropriated standard forensic techniques to create "The Garden of Delights," a series of portraits in triptych form. For each triptych, the artist invited one human subject to the then invite two other human subjects of their own choice to comprise the three portraits. Relative questions of friendship, family, and kinship arise. The portraits were produced through the process of DNA autoradiograph, a forensic techniques which depict portions of each human's unique patterns of genetic nucleotides. Subjects were given the opportunity to determine the relative hues of the visualization, which "discloses nothing directly about…physical appearance or skin tone," but rather "personal choices about pigmentation" to generate what the artist referred to as "'a post-racial view of identity'" (Goodyear 224) The portraits were then printed two-dimensionally almost five feet in height, "nearly life-size" in scale—emphasis on "nearly." (224) In "Byron,

Lisa, Emmett" [images previous], the artist Byron Kim chose to compose the triptych with his wife and son. The triptych's title aptly provides only the first names of the subjects and not their familial or genetic relation (although nonetheless, the viewer might still be able to discern this connection through basic means of pattern recognition between the individual 'tychs,' and a basic understanding of genetic biology). The omission of the Kim surname also reinforces Manglano-Ovalle's "post-racial" intentions, by obfuscating the subject's identities through the aesthetics of the autoradiograph, and the personal selection of its hue of representation. Perhaps akin to the relative anonymity of the donors for Warhol's urine and semen paintings, this controlled non-attribution might be interpreted as an act of humanization and equalization for under-represented persons through indiscriminate, universalizing processes of abstraction. For this purpose, Manglano-Ovalle selected an appropriately subversive medium, commandeering forensic techniques that are conventionally used to ascribe guilt or innocence to an individual, as well as relevant identifying information concerning their aesthetic appearance. In effect, in certain situations these images bear the potential to carry more weight in deciding a person's life than any words that could come out of a person's mouth, or otherwise be produced by their body.

These pieces are arguably visualizations, and not physicalizations. While extremely potent as visualizations, the artifact's material properties don't necessarily carry the same visceral weight or inherent potential as a material originating from the corporeal body that the provided information. While their final plotted size seems to mimic the relative size of the human body, each individual is unique in this respect, and the uniformly sized pieces of the triptych do not reflect this relative difference. As telling and powerful as Manglano-Ovalle's portraits are, the artist does not appear to have publicly displayed (or perhaps even produced) a triptych for his own 'family' of three, and while this may have been an act of generosity, it might also be an obfuscation. Who would the artist have selected to participate with him, and what scheme of color hues would they have decided upon?

Anne Collins Goodyear, Jonathan Frederick Walz, and Kathleen Merrill Campagnolo, *This Is A Portrait If I Say So* (Brunswick: Bowdoin College Museum of Art; New Haven: Yale University Press, 2016).

Worcester Art Museum, "Frontiers: Collecting the Art of Our Time," Worcester Art Museum, http://www.worcesterart.org/exhibitions/past/manglano.html (accessed October 15, 2016). Reference number: Eliza S. Paine Fund, 2002.37.1-3.

See also: Liz Ingram and Bernd Hildebrandt, "Perplexed Realities" (2008)
Human DNA visualization montage "portraits" with chromosomal imagery

Sean Caulfield and Timothy Caulfield, ed., "Liz Ingram & Bernd Hildebrandt," in *Imagining Science: Art Science, and Social Change* (Edmonton: University of Alberta Press, 2008), 71-74.

Liz Ingram, "Installations," Liz Ingram, http://www.lizingram.com/installations.html (accessed October 15, 2016).

Heather Dewey-Hagborg, "Portrait and samples from New York:
Sample 3, Collected 1/6/13 12:17pm, Himrod Street, Brooklyn" (2013) from the series "Stranger Visions" (2012-)
Human DNA analysis visualization from discarded urban refuse, custom software, 3D printed
(http://deweyhagborg.com)

HEATHER DEWEY-HAGBORG'S FORENSIC DNA PHENOTYPING FACIAL VISUALIZATION MASKS

Basic Phenotype Information
Ethnic origin: African [MtDNA Haplogroup: L2a1]
Gender: Male [SRY Gene: present]
Eye color: Brown [rs12913832: AA]
Typical nose size [rs4648379: CC]
Typical odds for obesity [rs6548238: CC]
(http://deweyhagborg.com)

Started in 2012, Heather Dewey-Hagborg's "Stranger Visions" project creates representational sculptural portraits of anonymous individuals based on "analyses of genetic material collected in public spaces." (http://deweyhagborg.com) The artist uses recently discarded refuse such as gum, cigarette butts, and beverage containers as materials for forensic DNA phenotyping. Before collecting the sample for analysis, the artist documents the object in its found context, pairing imagery of the sample's location of origin with the resulting facial sculpture. The phenotyping process produces a dataset of genetic information concerning the samples' donor, including relevant factors indicating their ethnicity, skin tone, gender, eye color, relative nose size, and odds for obesity. This information is then run through the artist's self-produced code (publically available in Python 2.7) to generate approximated visualizations of the donors' faces. The pieces are then 3D printed and

wall mounted as sculptural masks of anonymous individuals put voyeuristically on display "unwittingly," without their permission or acknowledgement.

For "Sample 3, Collected 1/6/13 12:17pm, Himrod Street, Brooklyn" [images previous], Dewey-Hagborg found a used cigarette butt on the Belgian block border of a sidewalk tree planting located on the predominantly residential Himrod Street in the culturally diverse Bushwick neighborhood of Brooklyn, New York. The resulting facial sculpture appears ambiguously mixed race and slightly androgynous, with generic features that easily evoke open-ended interpretation and could result in pervasive conditions of misattribution (i.e. 'You all look alike to me' or 'They all look the same'). If Manglano-Ovalle's visualizations were meant to equalize individuals through the controlled abstraction of their genetic information, Dewey-Hagborg's visualizations outline the inverse potential for "a culture of biological surveillance" and discrimination through the mining of this information. The artist acknowledged this in her article for *The New Inquiry*, entitled "Sci-fi Crime Drama with a Strong Male Lead," pointing out that current "Forensic DNA Phenotyping" techniques are only capable of generating approximated renderings of a person based on statistical extrapolation, but that these rendering do not necessarily depict a person's likeness accurately. The artist concluded that this lack of accuracy only reinforced pre-existing sociocultural structures of inequality through the ad-hoc creation of aesthetically ethnicized 'bogey' peoples:

> ...forensic DNA phenotyping threatens to undermine decades of protest, education, and agitation for policy reform to end racial profiling, institutional racism, and discrimination. The implications here are not theoretical, abstract, or probabilistic, they are human lives, and they are disproportionately black lives.
> (http://thenewinquiry.com)

Even without their knowledge or consent, an individual's DNA can be used to produce the image of a person that is no longer that original individual, but an entity embedded with perhaps even more political, social, and cultural charge—albeit for unfortunate propagandistic purposes in this case—than the body of the original individual would have produced personally.

An ideal scenario would be for the mask to be united with its donor of origin for them to "meet," and for the donor to have the opportunity to confront both the mask, and the artist. Perhaps the ultimate physicalization of these visualization artifacts would occur during the moment in which the donor, wearing the mask, partakes in dialogue with the maker of the mask.

Heather Dewey-Hagborg, "Sci-fi Crime Drama with a Strong Male Lead," *The New Inquiry*, http://thenewinquiry.com/sci-fi-crime-drama-with-a-strong-black-lead (accessed October 15, 2016).

Heather Dewey-Hagborg, "Stranger Visions," Heather Dewey-Hagborg, http://deweyhagborg.com/projects/stranger-visions (accessed October 15, 2016).

William Myers, *Bio Art: Altered Realities* (New York: Thames & Hudson, 2015), 142-145.

See also: Rose-Lynn Fisher, "Topography of Tears" (2008-) Human tear visualizations

Rose-Lynn Fisher, "Tears," Rose-Lynn Fisher, http://www.rose-lynnfisher.com/tears.html (accessed October 15, 2016).

Caspar Berger, "Skeleton / Self-portrait 20" (2012)
Human humerus bone scan (the artist's), cast 18 carat gold, ebony, glass
(http://www.casparberger.nl)

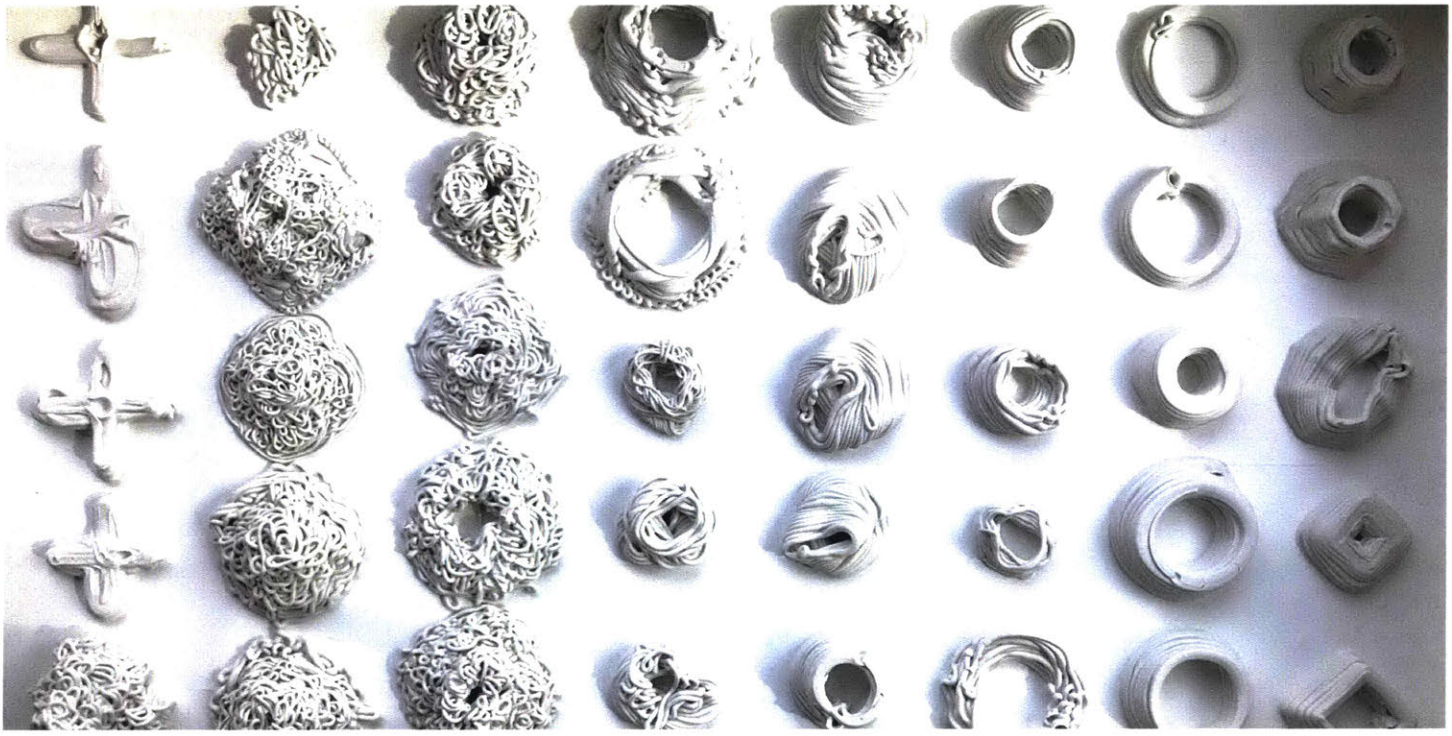
At the Museum Vrolik Academic Medical Center,
Amsterdam (http://www.casparberger.nl)

CASPAR BERGER'S CAST GOLD SKELETAL VISUALIZATION ARTIFACTS

Caspar Berger's ongoing "Skeleton" series uses the most advanced form of computed tomography (CT) scanner contemporarily available to produce digital models of his own bones, which are then physicalized using 3D printing tools. Berger's 2012 iteration "Skeleton / Self-portrait 20" [images previous] is a full-scale model of the largest bone of the artist's right arm, also known as the *humerus*, cast in 18 carat gold. The piece has been shown at the Museum Vrolik Academic Medical Center in Amsterdam, exhibited in a space alongside 'genuine' human bones. Exploring the concept of "skeleton as relic" and the "particular phenomenon of relic veneration," the artist positions the metallic artifacts of his "Skeleton" series as analogous to memorialized artifacts composed of human biomatter—if not more potent, for their material capacity to outlast the decomposition of bone. (http://www.casparberger.nl)

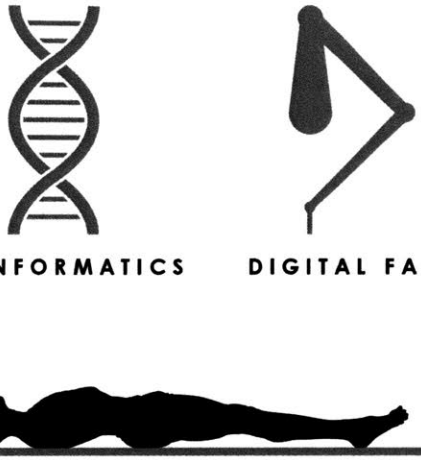
The artifacts of the "Skeleton" series visualize human information, but arguably fall short of becoming a physicalization. This is perhaps especially pronounced in juxtaposition with the relics of the Museum Vrolik, and also when measured against including Damien Hirst's diamound-encrusted skull "For the Love of God" and Studio Wieki Somers' "Consume or Conserve?" still life cremains series (both previously mentioned herein).

Caspar Berger, "Skeleton/Self-portrait 20," Caspar Berger, http://www.casparberger.nl/projects/self-portrait-20 (accessed October 15, 2016).



PROJECT

EXTRUSION PRINTING
'POST-MORDIAL' MEMORIAL ARTIFACTS
OF FORMALLY ENCODED GENETIC INFORMATION



Reza Aslan and others have speculated that human religiosity began with the ritual treatment of the deceased. This thesis speculates that common funerary practices do not reflect a wide enough range of contemporary cultural attitudes toward mortality, humanity, and end-of-life ritual.

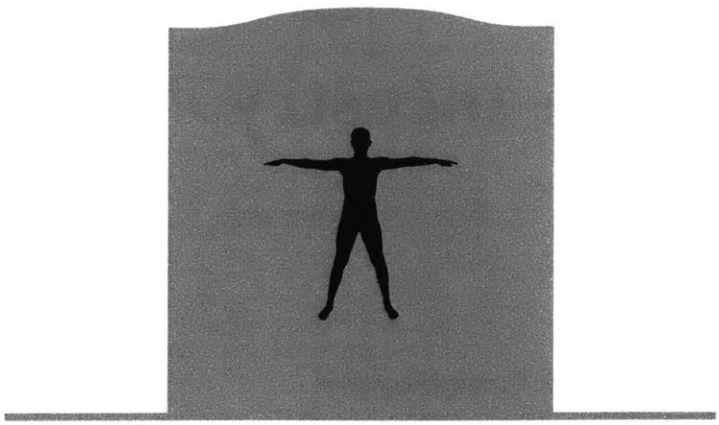
As human beings increasingly embrace the paradigms of bioinformatics and digital fabrication, this thesis proposes that alternative funerary practices will arise to reflect these cultural attitudes.

Reza Aslan, "WTF with Marc Maron" Episode 796 (March 23, 2017)
http://www.wtfpod.com/podcast/episode-796-reza-aslan (accessed May 23, 2017).

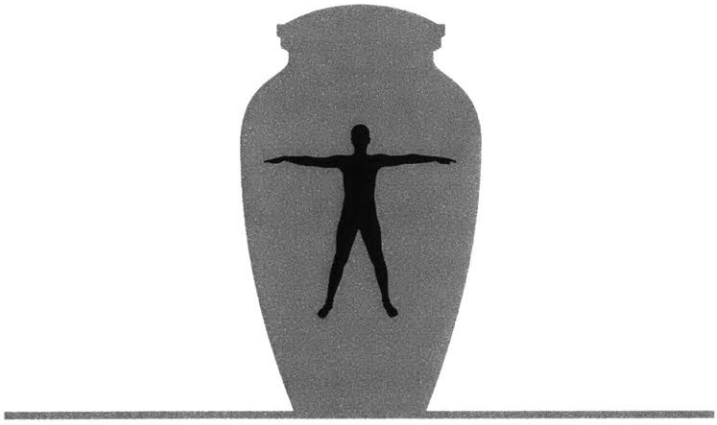
CREMATION
DISINTEGRATION

BURIAL
DECOMPOSITION

Contemporarily, there are two dominant forms of funerary practice: burial and cremation. While both processes entail the decomposition or disintegration of the body, in many cases this deconstruction will be supplemented with some form of construction: a grave marker, a tomb, a mausoleum, a columbarium, an urn, etc.



GRAVE MARKER
INDEX



URN
CONTAINER

Roughly catalogued into the overlapping categories of index and container,
these are artifacts that not only serve to semi-permanently contain the resulting bodily matter,
but also to posthumously index the existence of the individual with information about them.

There are people who choose to forego a grave marker.

There are those who opt for a "natural burial" without an enclosed membrane,
to decompose and redistribute at a faster rate.

And, there are those who choose to have their ashes dispersed freely.

However, there are still large groups of humans who,
through some means of physical artifact,
wish to be remembered.

COMMERCIAL GENOTYPING SERVICES

(https://www.23andme.com)

(https://www.ancestry.com)

Simultaneously, the contemporary rise of commercial DNA sequencing and genotyping services —such as "23andMe" and "AncestryDNA"—has granted humans access to previously inaccessible and profoundly meaningful information about ourselves.

However, this data remains largely intangible, abstract, and ephemeral.

Serendipitously, a diverse range of digital design and fabrication tools has enabled unprecedented levels of customizable control over a material's treatment and formal manipulation.

This includes recent computationally driven material extrusion techniques developed by designers and architects including New York artist Roxy Paine, UC Berkeley professors Andrew Atwood and Ronald Rael, and Ball State professor James Keresetes.

These are semi-mobile, semi-self-contained systems suitable for onsite fabrication, with high levels of control over sequential variation in their plastic extrusion outputs.

23andMe, "23andMe," 23andMe, https://www.23andme.com (accessed October 15, 2016).

Ancestry, "AncestryDNA," Ancestry, https://www.ancestry.com (accessed October 15, 2016).

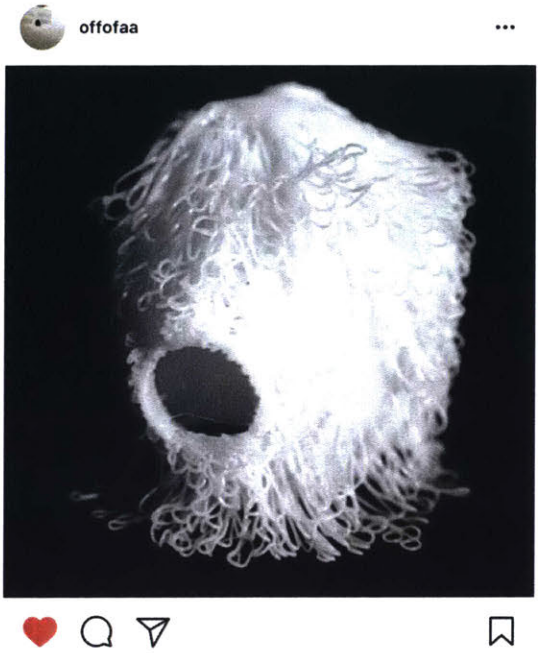
Art Brussels (artbrussels), "[c o u n t d o w n] With 60 days to go until #Vernissage we are featuring Chelouche Gallery - Roxy Paine / Roxy Paine, Scumak, 2007, low density polyethylene. #sneakpeek #artbrussels2017 #PRIME #artfair #chelouchegallery #roxypaine #artbrusselscountdown #tourandtaxis #contemporaryart #artist #gallery #brussels #art @chelouchegallery @roxypaine" published February 19, 2017, https://www.instagram.com/p/BQtGc6ehgH9 (accessed May 23, 2017).

Andrew Atwood and Anna Neimark (offofaa), "Project 1" published February 6, 2016 https://www.instagram.com/p/BBdwpsyOQeo (accessed May 23, 2016).

James Kerestes (jameskerestes), "Robotic Gestures (Machine Latency) trial 3 (failure 3) w/ @alaynadavidson and @zr_young at #ballstatearchitecture #muncie #indiana #ballstatecap #capimade #capfablab #kuka #kukarobotics #robot #roboticgestures #digitalfabrication #glitch #iphone #blackandwhite #picoftheday #critday #imadethat #redlinedarch #iarchitectures #nextarch #superarchitects #thearchiologist #make #cap_imade" published March 30, 2017, https://www.instagram.com/p/BSRPIPdhJHw (accessed May 23, 2017).

Ronald Rael (rrael), "One Fat Ombré #emergingobjects #3dprintedceramic #3dprinting #badombre" published January 12, 2017, https://www.instagram.com/p/BPLv62rBJ1z (accessed May 23, 2017).

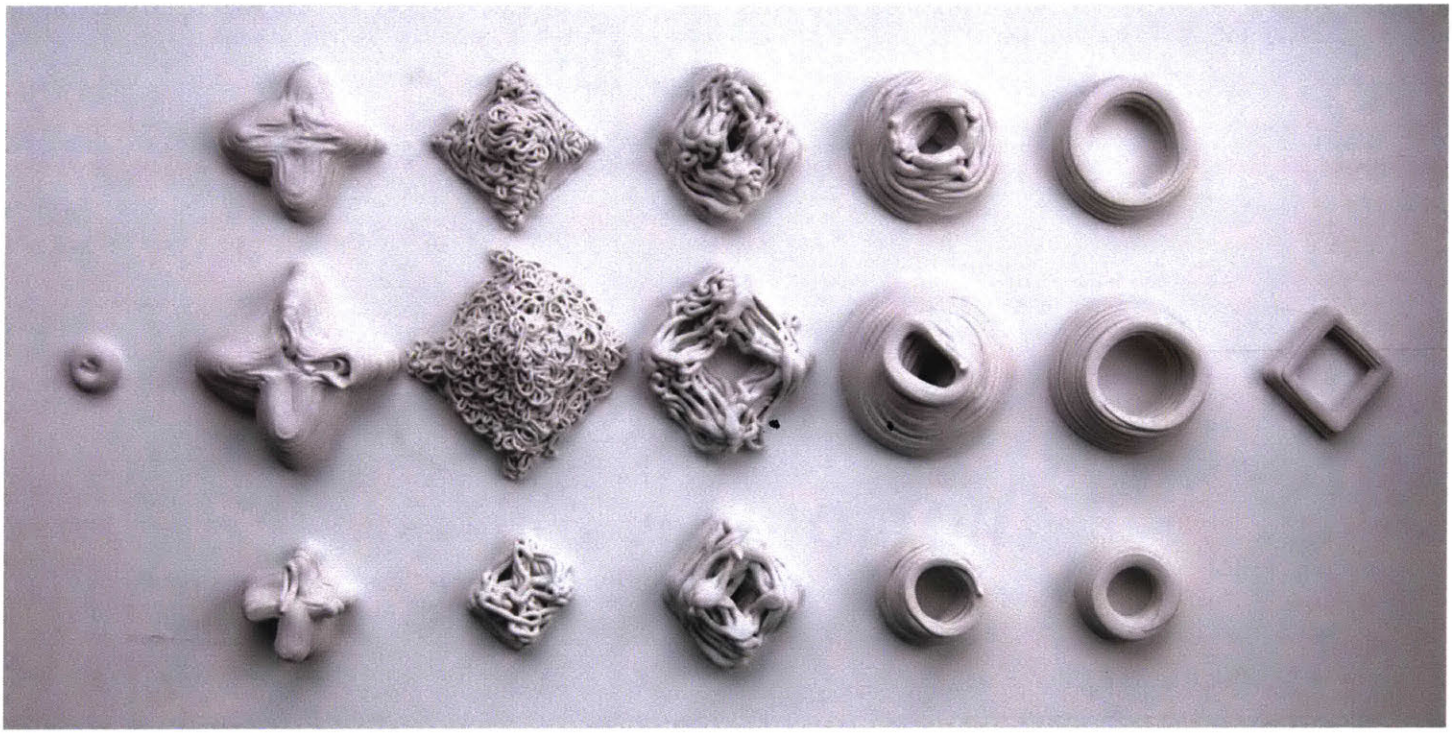
Roxy Paine (via Art Brussels,
https://www.instagram.com/p/BQtGc6ehgH9)



Andrew Atwood
(https://www.instagram.com/p/BBdwpsyOQeo)

Ronald Rael
(https://www.instagram.com/p/BPLv62rBJ1z)

James Kerestes
(https://www.instagram.com/p/BSRPIPdhJHw)



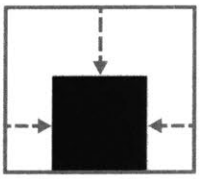
This thesis anticipates that alternative funerary practices will arise to adapt to these paradigm shifts,
with human beings taking on increasing levels of both personal and collaborative agency
in the design of their own memorial artifacts,
and those of their loved ones.

Through a series of speculative models,
this thesis projects a scenario in which a group of humans
embrace their corporeal materiality and its internalized information
as precious and sacred,

to produce memorial artifacts
that are constructed from their own biomatter,
and that formally encode streams of human genetic information.

1

DECEASED HUMAN(S)



2

PULVERIZED BIOMATTER

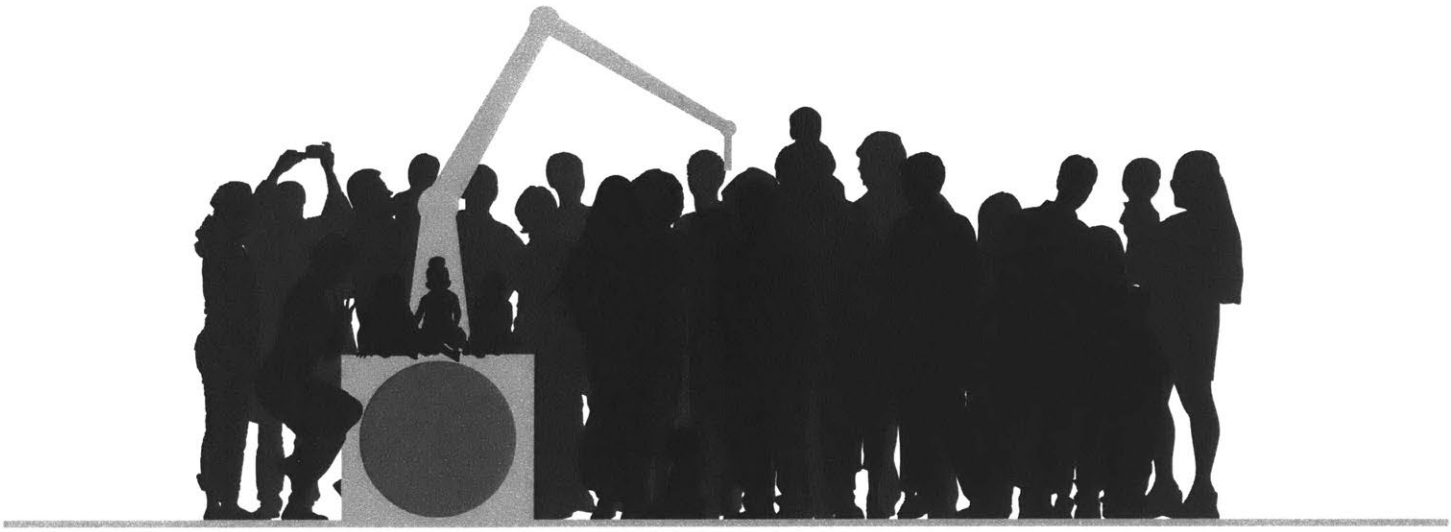
3

VISCOUS FLUID WITH FINE AGGREGATE

STABILIZING AND CURATIVE AGENTS

4

BIOMATTER SLURRY



5

FUNERAL CEREMONY

(1) Supplementing the conventions of decomposition and disintegration,
this introduces the paired processes of pulverization and concretization,

(2) compacting and milling the entire quantity of one or more deceased humans' remaining biomatter
into a viscous combination of fluid and fine aggregate.

(3) This substance is then blended
with minimal amounts of cement-like stabilizing and curative agents,
in a quantity up to equal the mass of the input substance.

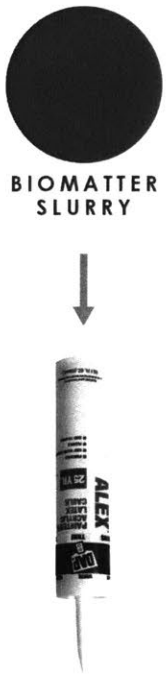
This quantity varies between each input,
based on the relative lipid content of the given substance.

(4) The resulting material is an actively curing slurry mix.

(5) This slurry is input into a mobile robotic extrusion device,
and deployed at the predetermined resting site of the artifact.

The material extrusion process becomes a performative funeral ceremony,
a new ritual gathering.

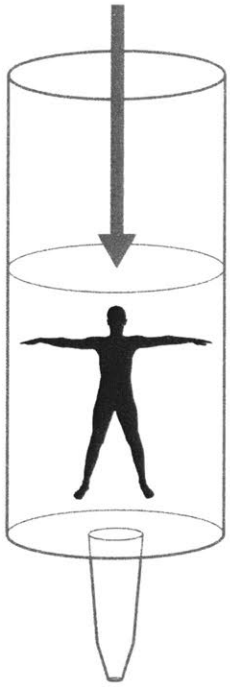
MATERIAL APPROXIMATION



This series of speculative models
uses water-based acrylic latex caulk
as a material approximation
hypothetically comparable
in both viscosity and chemical composition
to this matter.

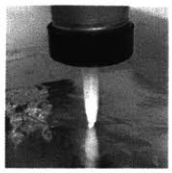
(See section 3.1.2.1)

PNEUMATIC EXTRUSION



The "painter's caulk" is extruded pneumatically,
harnessing air pressure
to mechanically breathe the material
from the orifice of a robotic appendage.

(See section 3.1.2.2)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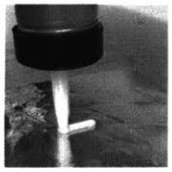
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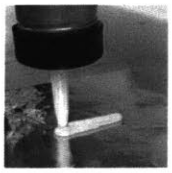
A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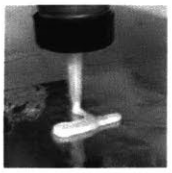
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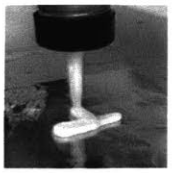
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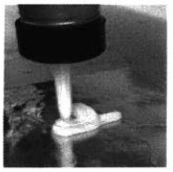
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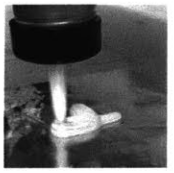
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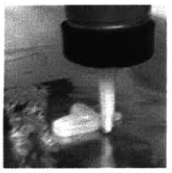
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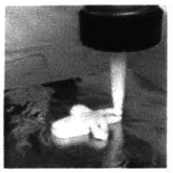
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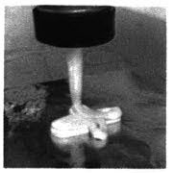
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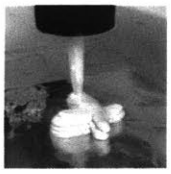
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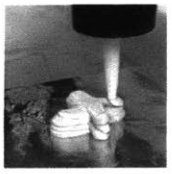
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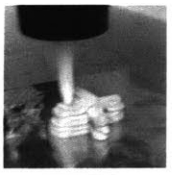
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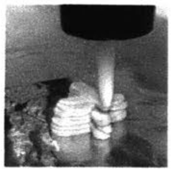
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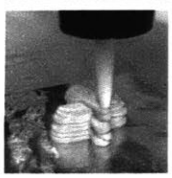
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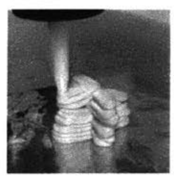
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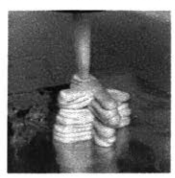
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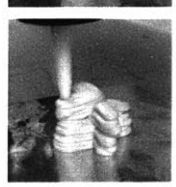
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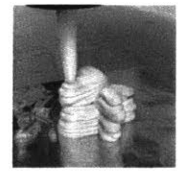
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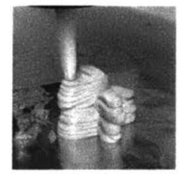
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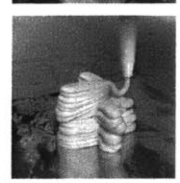
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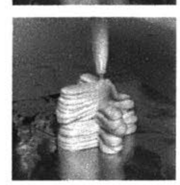
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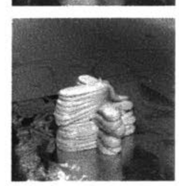
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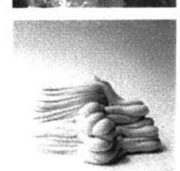
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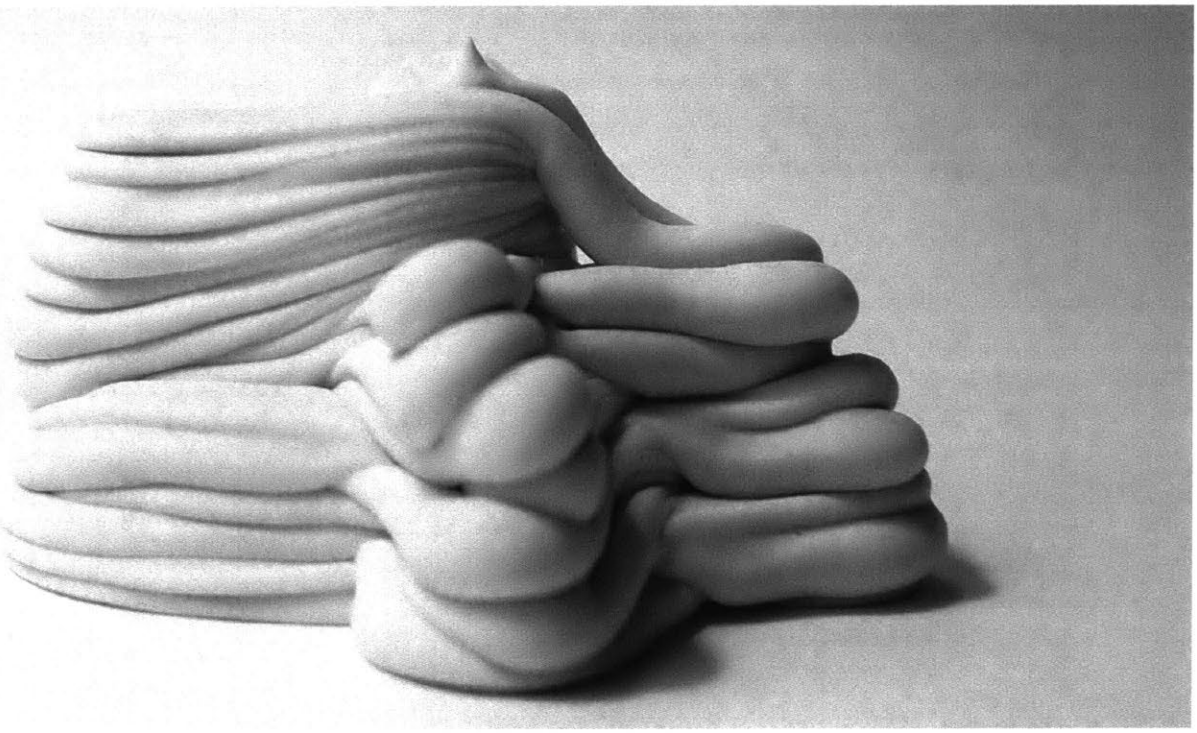
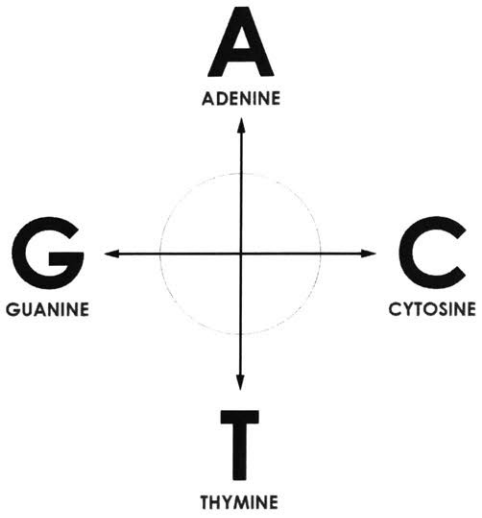


As the extrusion rig prints the matter into space
without the support of formwork,
a select sequence of its genetic information
informs the rhythmic formal variations
in its curvilinear tool path.

From a (0,0) point,
the robotic appendage reaches out
to the four compass points
as it slowly climbs the Z-dimension
on an axis extending from the center of the earth,
through the center of the artifact,
and beyond.

Through this esoteric geometric choreography,
the artifact is born
as a concretized embodiment
of human matter
of human information
of human being.

GENETIC COMPASS

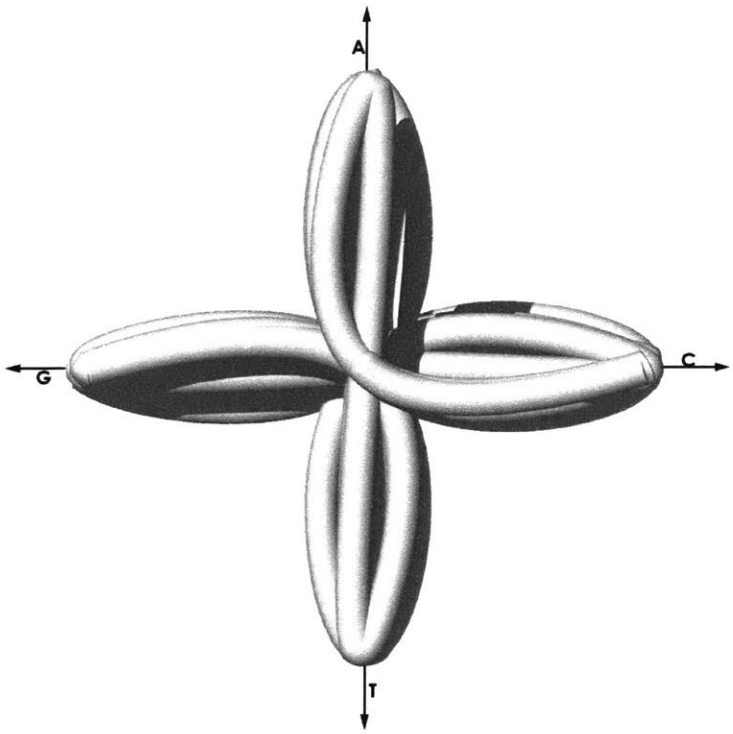


The theoretical cultural construct of a "genetic compass"
introduces a necessary system of macro-spatial orientation
to the micro-systems of DNA nucleobases.

In this cultural fiction,
the set of paired binaries A and T, G and C
are perpendicularly superimposed
into a quadrantal spatial relationship.

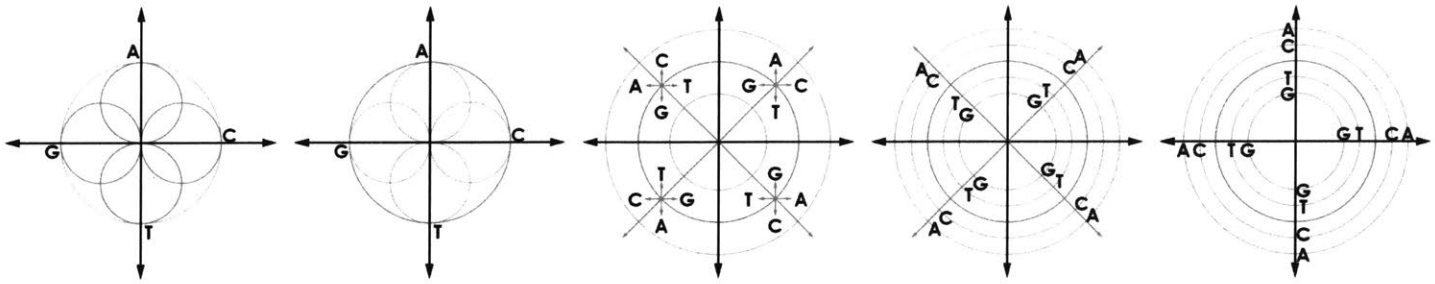
This condition permeates the ethos of its adherents,
as a potent icon with existential implications.

(See section 3.1.2.1.3)

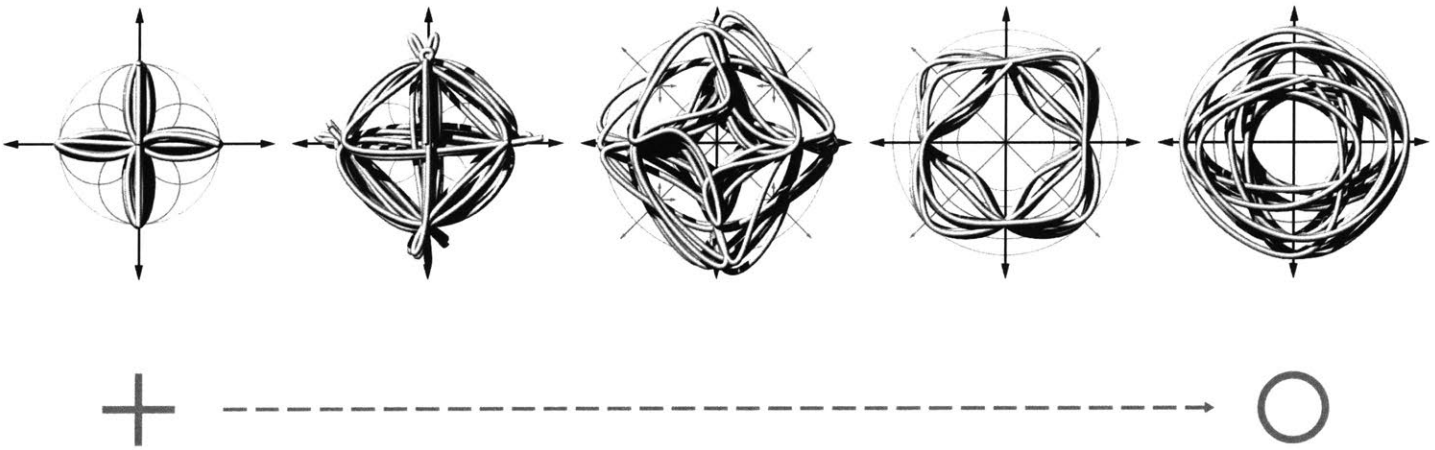


Prior to their passing,
each adherent is tasked with the design
of a unique set of tool path parameters
for their own funerary extrusion.

GENETIC TRANSLATIONS



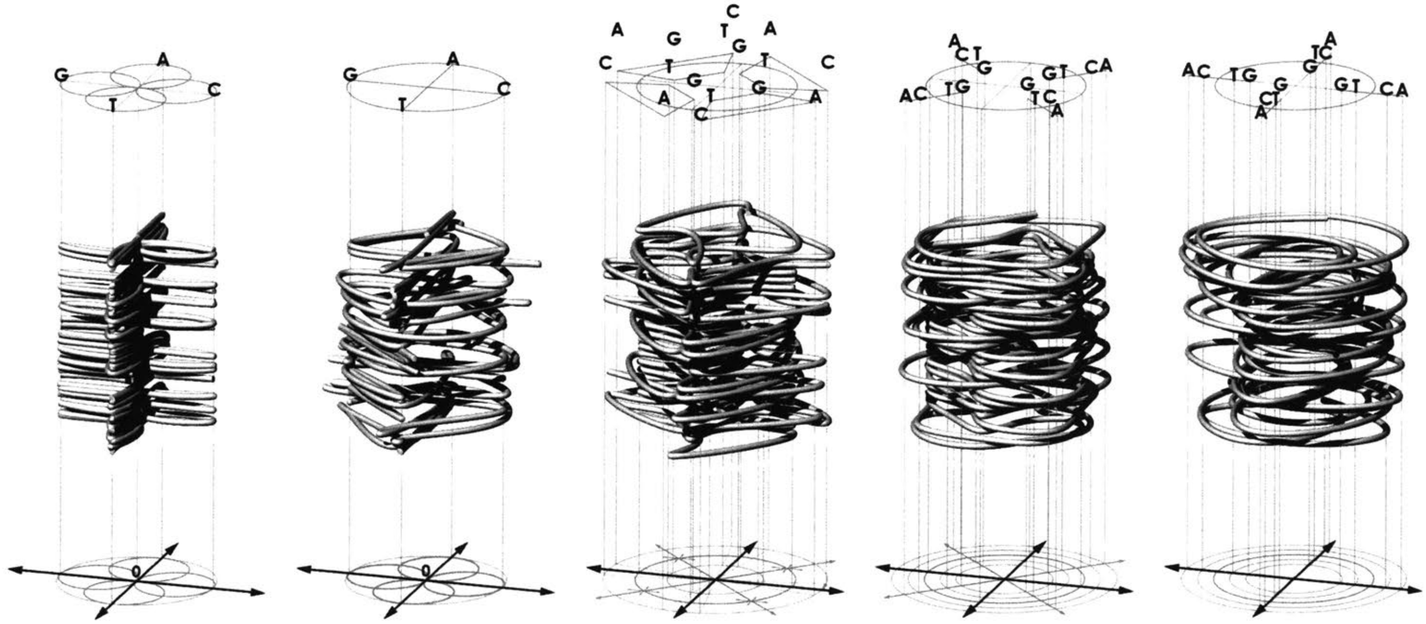
GENERIC TOOL PATH PLANS



The genetic compass serves as the basis for the development
of a morphological series of formal translations

that produces a wide variation of extrusion tool paths
across a spectrum from cross to circle,
from interiorized, four-limbed, "bodily" entity,
to hollow, "bodiless" entity.

GENERIC TOOL PATH AXONS



ATTCTCAAGC	ATTCTCAAGC	ATTCTCAAGC	ATTCTCAAGC	ATTCTCAAGC
CGATTTTATT	CGATTTTATT	CGATTTTATT	CGATTTTATT	CGATTTTATT
ACGTCTTATG	ACGTCTTATG	ACGTCTTATG	ACGTCTTATG	ACGTCTTATG
CCTGTATAAG	CCTGTATAAG	CCTGTATAAG	CCTGTATAAG	CCTGTATAAG
TCACATGTTG	TCACATGTTG	TCACATGTTG	TCACATGTTG	TCACATGTTG
TTTGGTTGCT	TTTGGTTGCT	TTTGGTTGCT	TTTGGTTGCT	TTTGGTTGCT
GGACGCAGGG	GGACGCAGGG	GGACGCAGGG	GGACGCAGGG	GGACGCAGGG
CGTGTGTAAC	CGTGTGTAAC	CGTGTGTAAC	CGTGTGTAAC	CGTGTGTAAC
GGGTGGCTTA	GGGTGGCTTA	GGGTGGCTTA	GGGTGGCTTA	GGGTGGCTTA
GACTTGGTAT	GACTTGGTAT	GACTTGGTAT	GACTTGGTAT	GACTTGGTAT

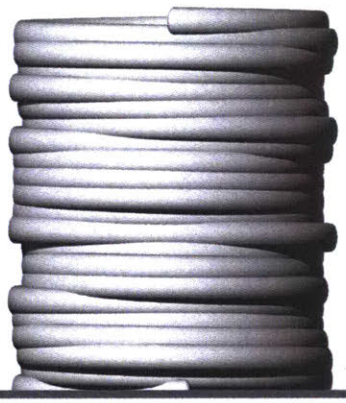
These parametric translations inevitably result in unique formal configurations,
even from identical streams of genetic information.

In this case each unique translation tool path embodies the same one hundred consecutive bases of DNA.

As all human beings share a vast majority of their genetic sequence in common,
all of the artifacts excerpt from the same stream of information,
a basic protein building block that occurs in the DNA of all humans.

Difference between the artifacts is therefore registered through the act of design,
in the variable parameters of their formal translations.

Ryan Hoover, "Alba," Ryan Hoover, http://www.ryanhoover.org/rd/alba.php (accessed October 15, 2016).

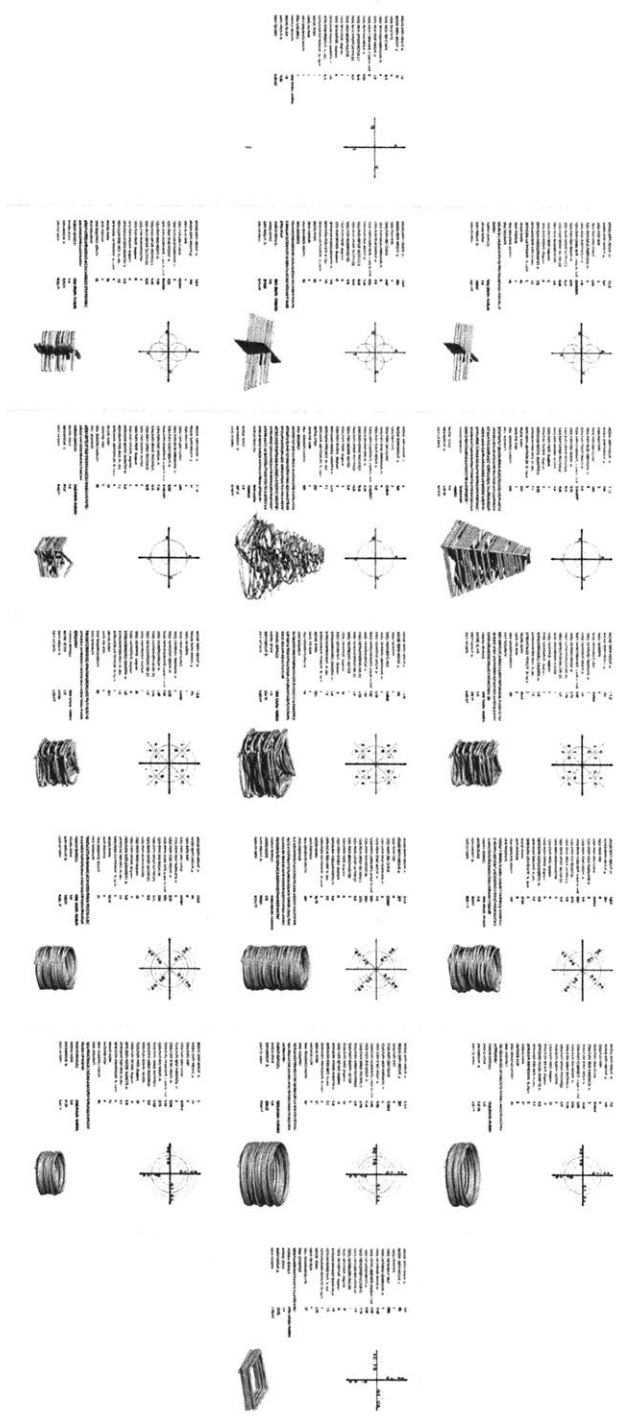


VESSEL

This internal congruity across a range of external difference
engenders empathy between humans,
and enables them to transcend the index and container dichotomy,

to create 'vessels' of human being,
whereby rather than listing personal information about the deceased individuals,
such as their name or date of birth,
these surrogate artifacts portray their species' origin,

and the matter of the human body
—and its resulting configuration—
serves to embody their individuality.



> An artifact is an object of intrigue that elicits close readings and analyses,
> which in turn may reveal evidence of its culture and its use.
>
> A close reading of an artifact involves examination of all of its physical characteristics,
> including its figural, structural, material, and decorative features.
>
> This study is done not only with the aim of identifying the cultural significance of the particular object,
> but also with the broader aspiration of understanding the rituals and values of the users of the object,
> and those of its makers.
>
> (*Room for Artifacts* 7)

Embedded in each human being artifact
is a unique set of design parameters
that reformulate a unique quantity of matter
into a unique and irreplaceable formal configuration.

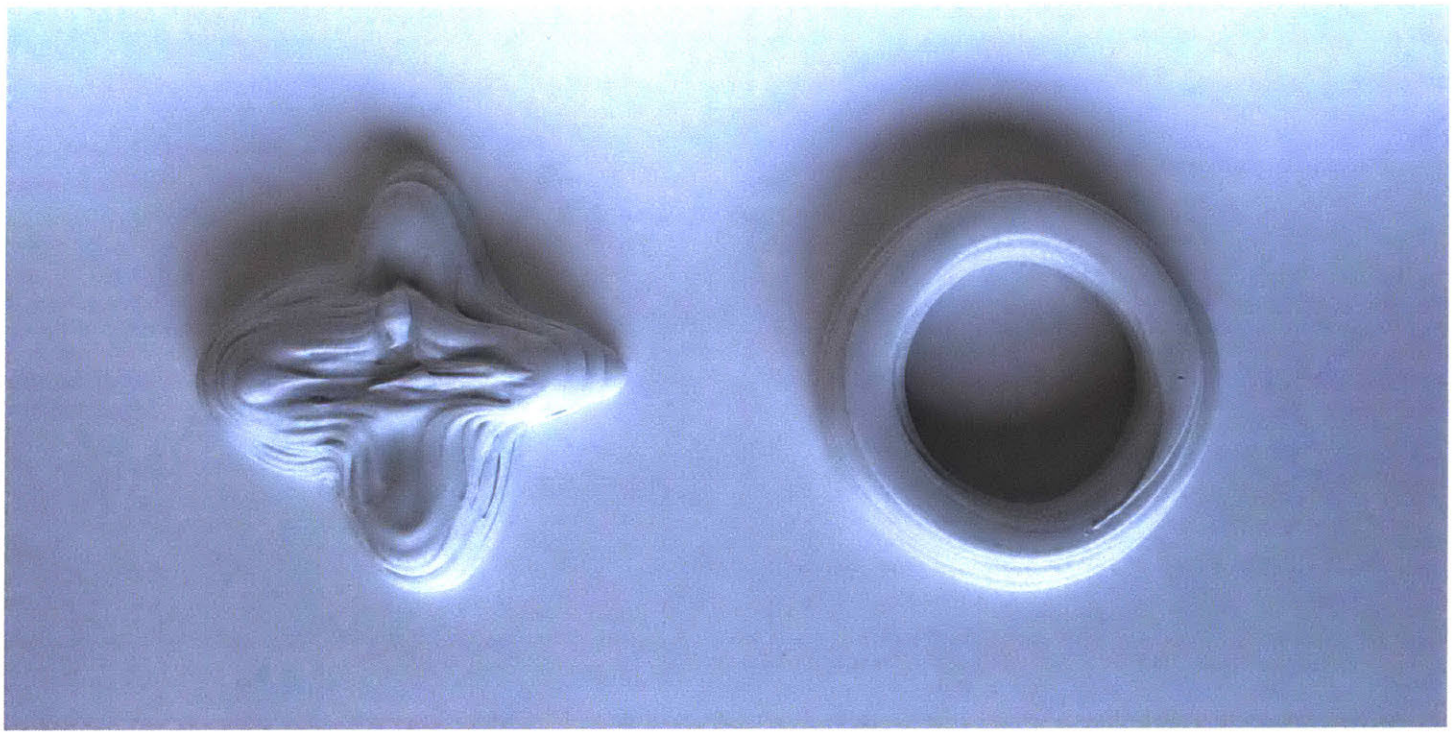
Reflecting the intentions of their respective makers,
variations in these parameters
have drastic influence on the final character of these artifacts.

(See section 3.1.3.1.3)

William O'Brien Jr. & WOJR Organization for Architecture, *Room for Artifacts: The Architecture of WOJR* (Zurich, Switzerland: Park Books, 2016).

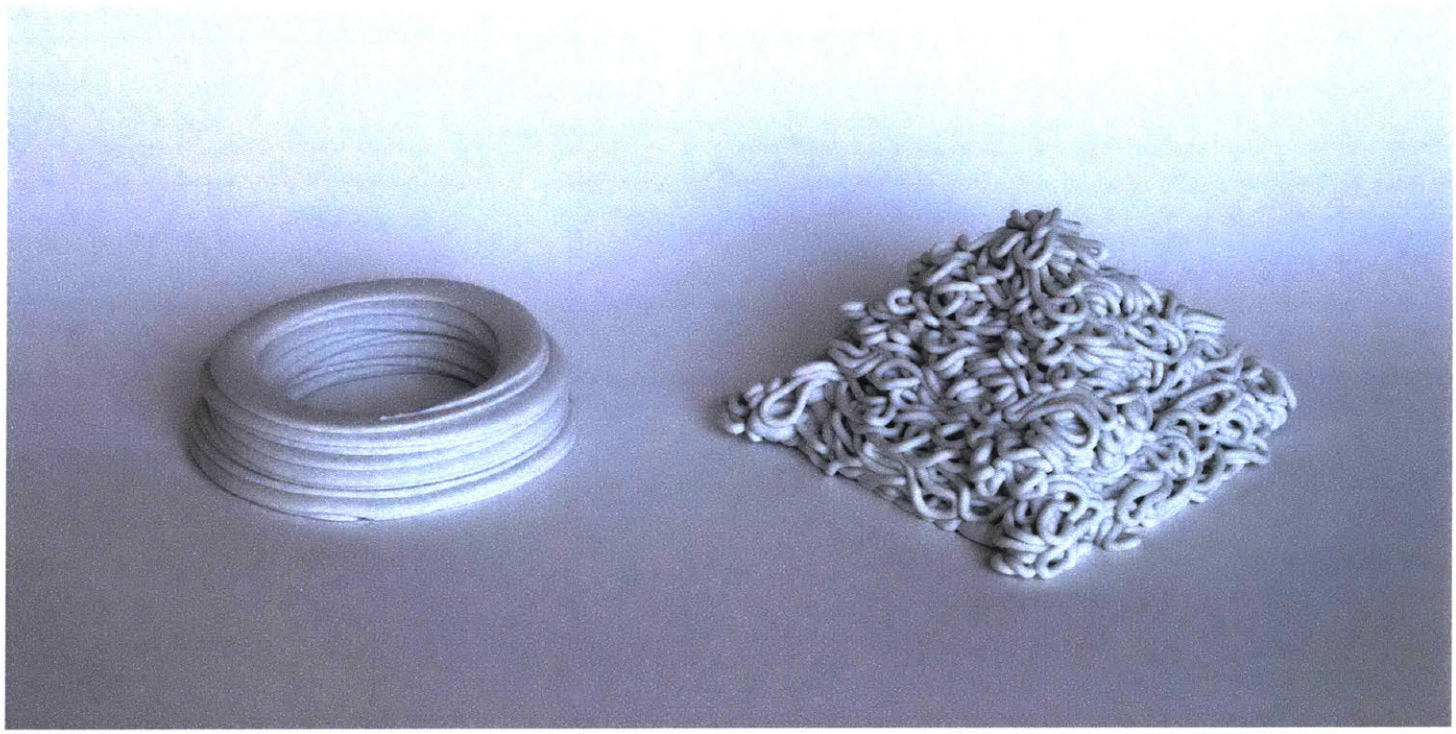
In other words,

each artifact is a product of its designer(s)' personal choices:

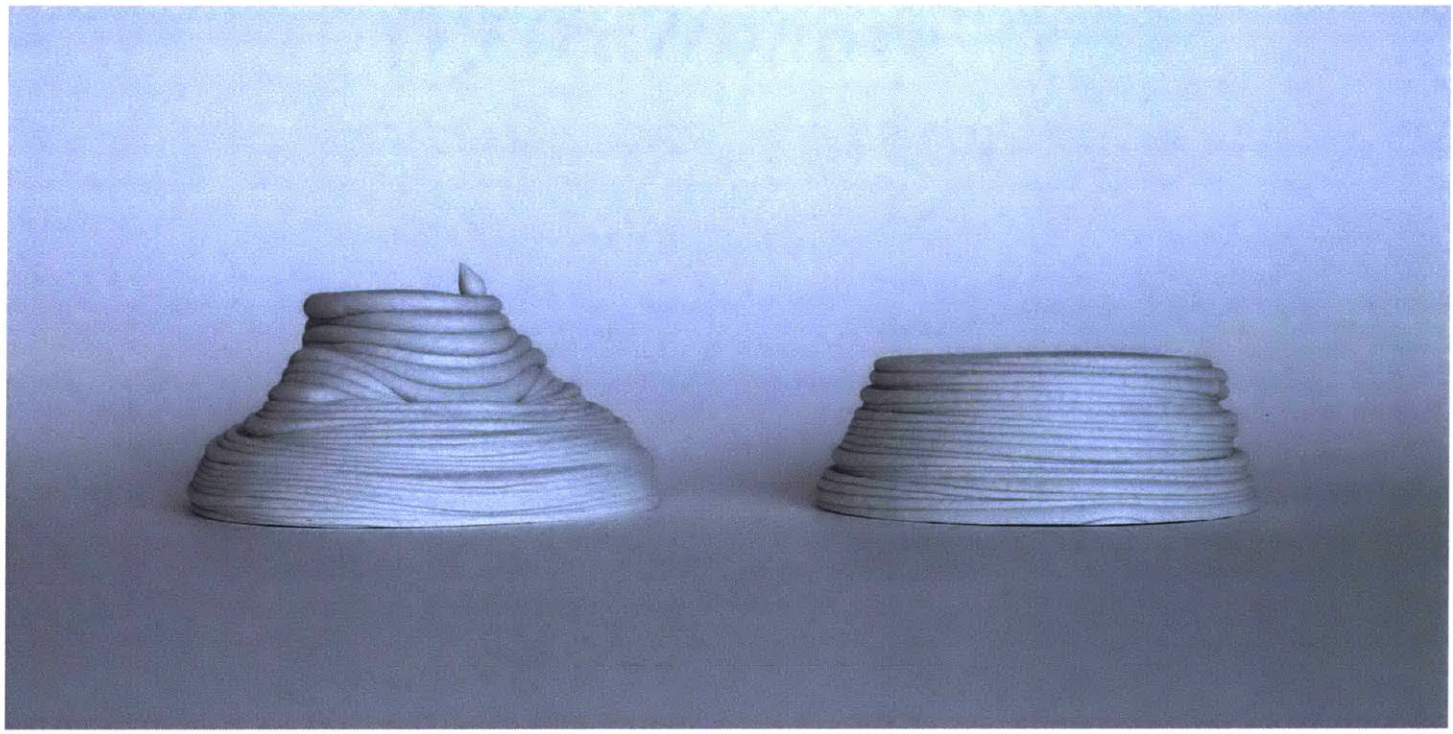


The choice for a bodily, limbed form,

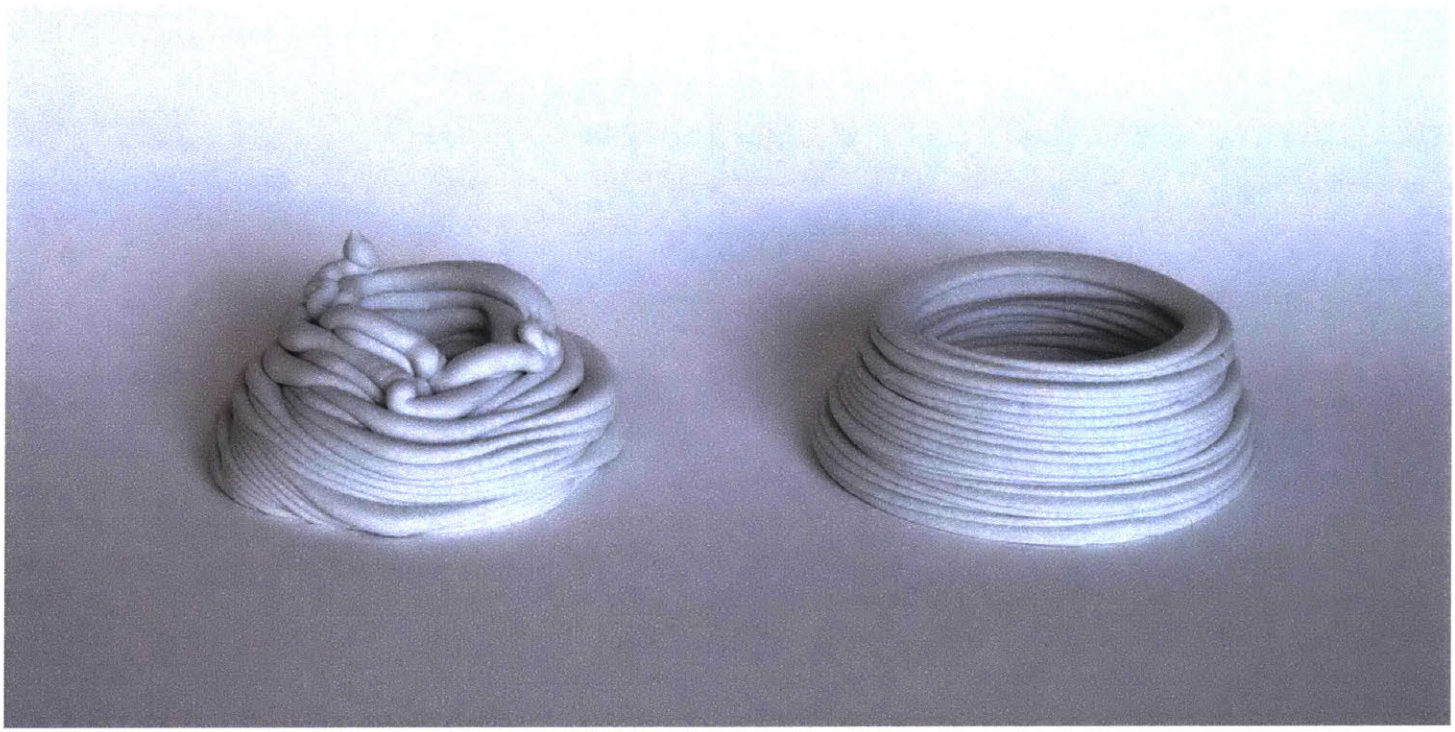
or an increasingly bodiless and open one.



The choice between smooth, controlled material extrusion,
or more seemingly random and wild coiling.



The choice between striving for height, and possibly overreaching,
or accepting one's material limitations and increasing in base width.

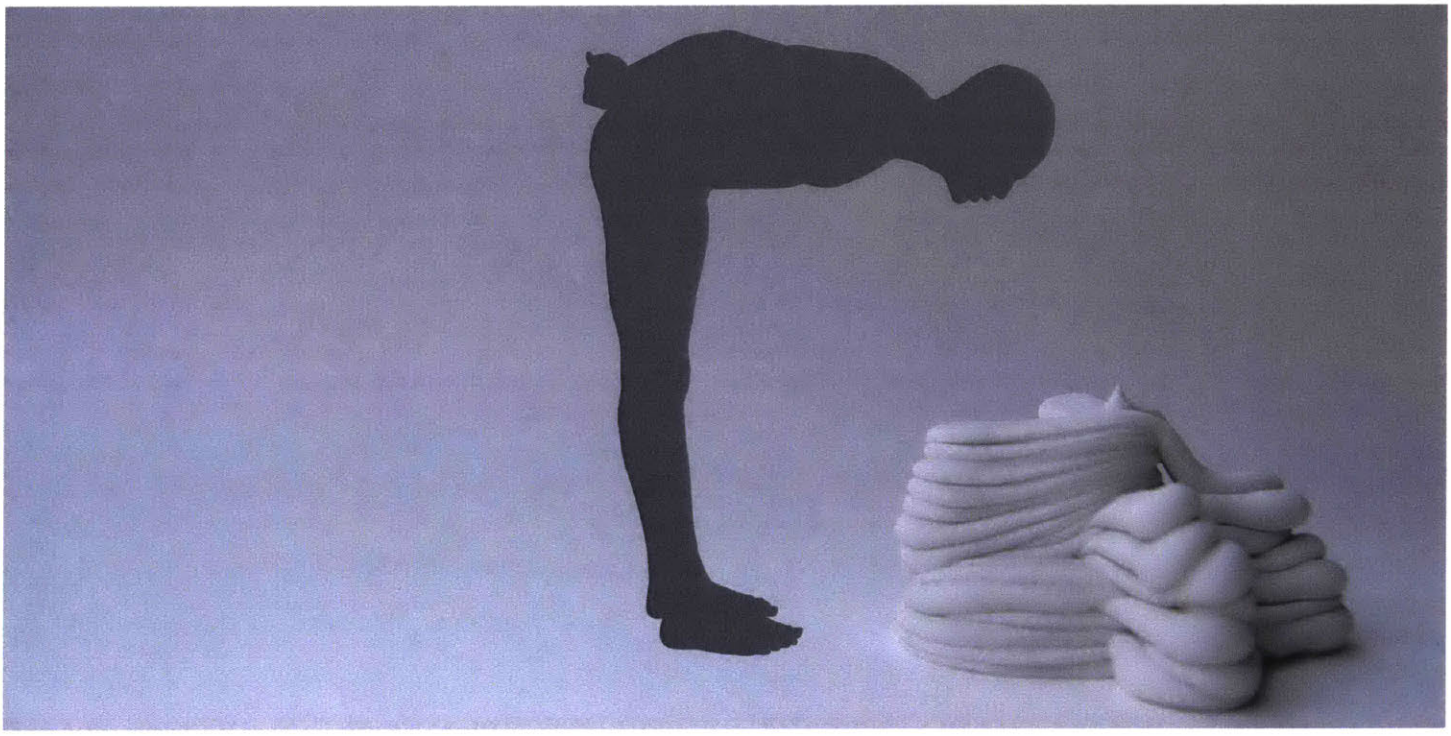


The choice between formally emphasizing its embedded information and reducing its structural viability,
or maximizing the quantity of information embedded by reducing its formal legibility.

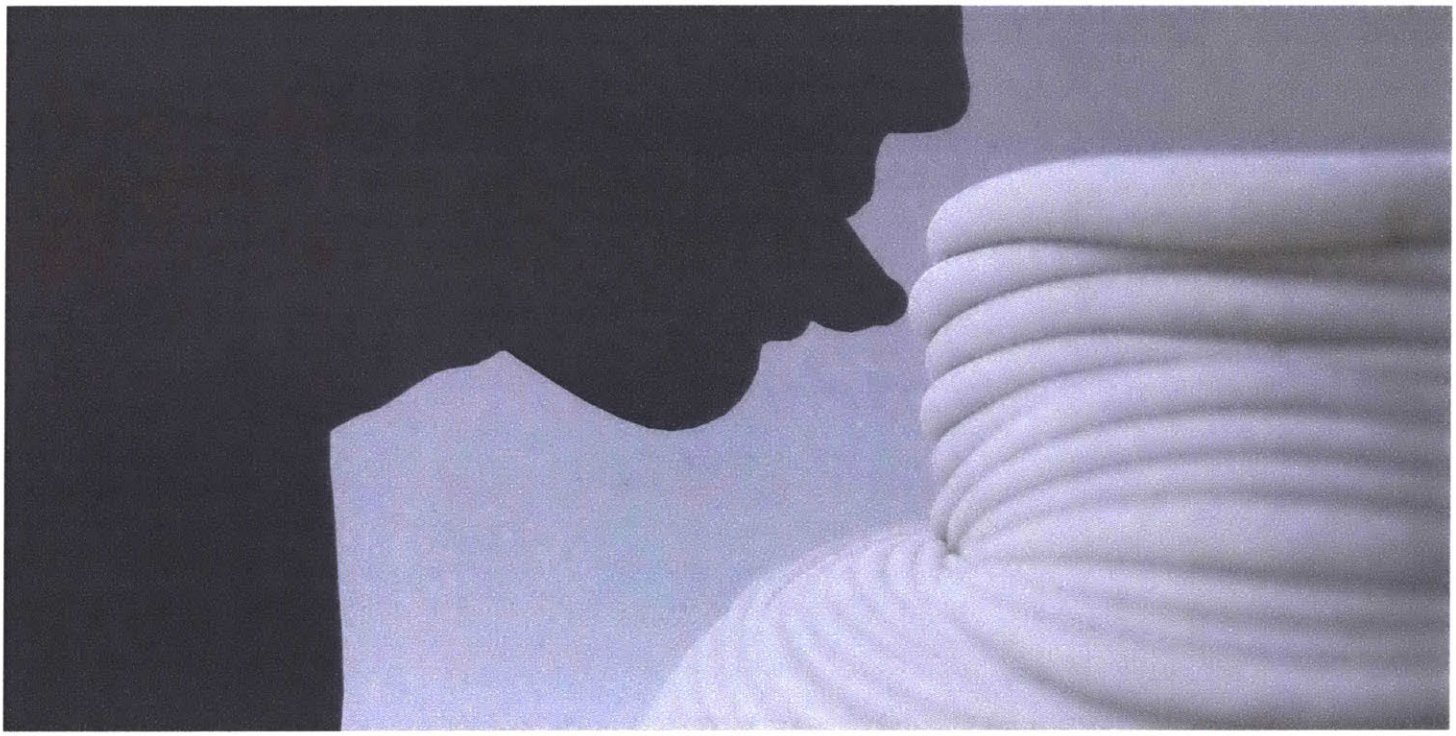
(More emphasis means less structural stability, which means that less information can be printed adequately.)

Although these esoteric parameters might not be directly discernible,
their effects are nonetheless exhibited in the artifact,
and reflect the broader cultural and ritual aspirations of the designer.

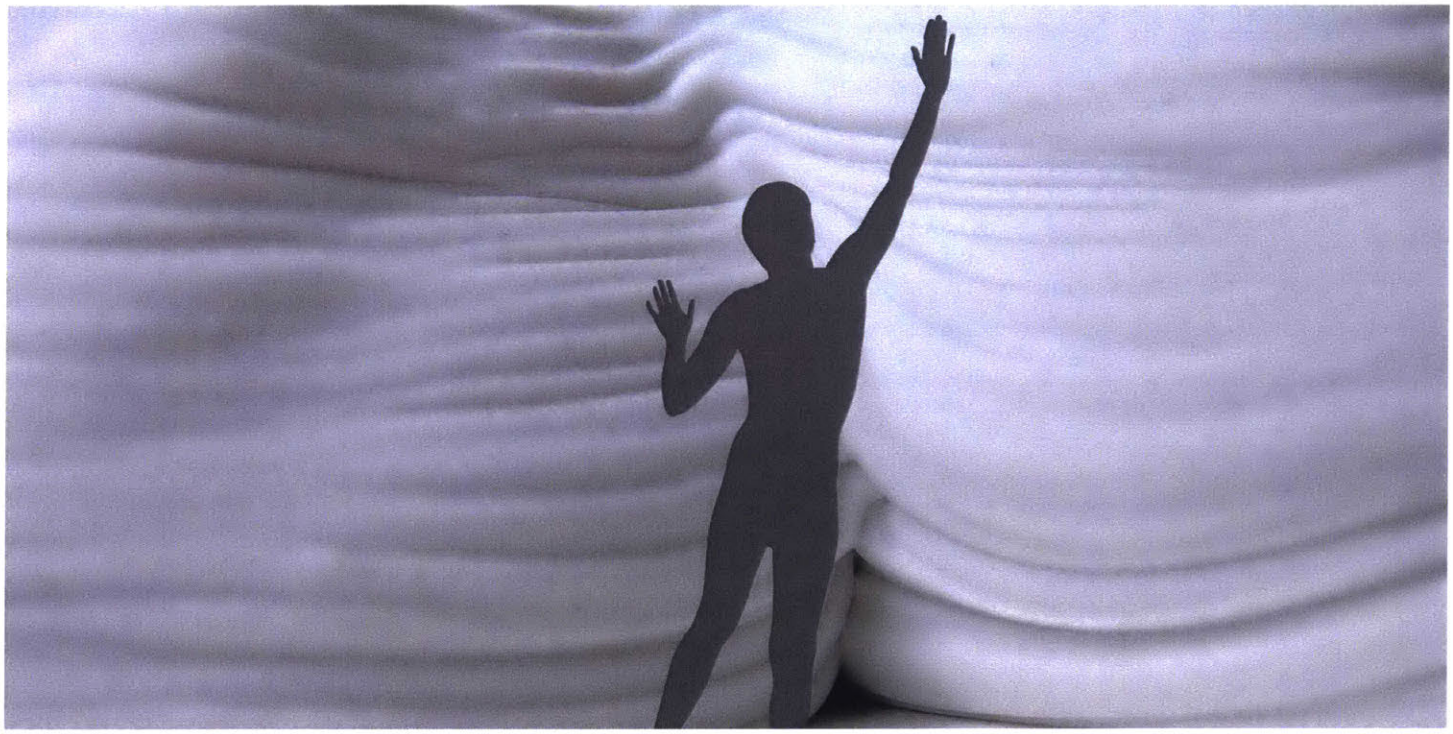
As artifacts of architectural design,
these objects beg for human interaction.



A human bends over and curiously sniffs one,
smelling it like a flower.



A human touches and feels and gropes one,
feeling its luscious curves and slumps and folds and coils.



A human sticks out their tongue and tastes one,
curious to see if it might be familiar to their palate.

A human cradles themselves inside of one,

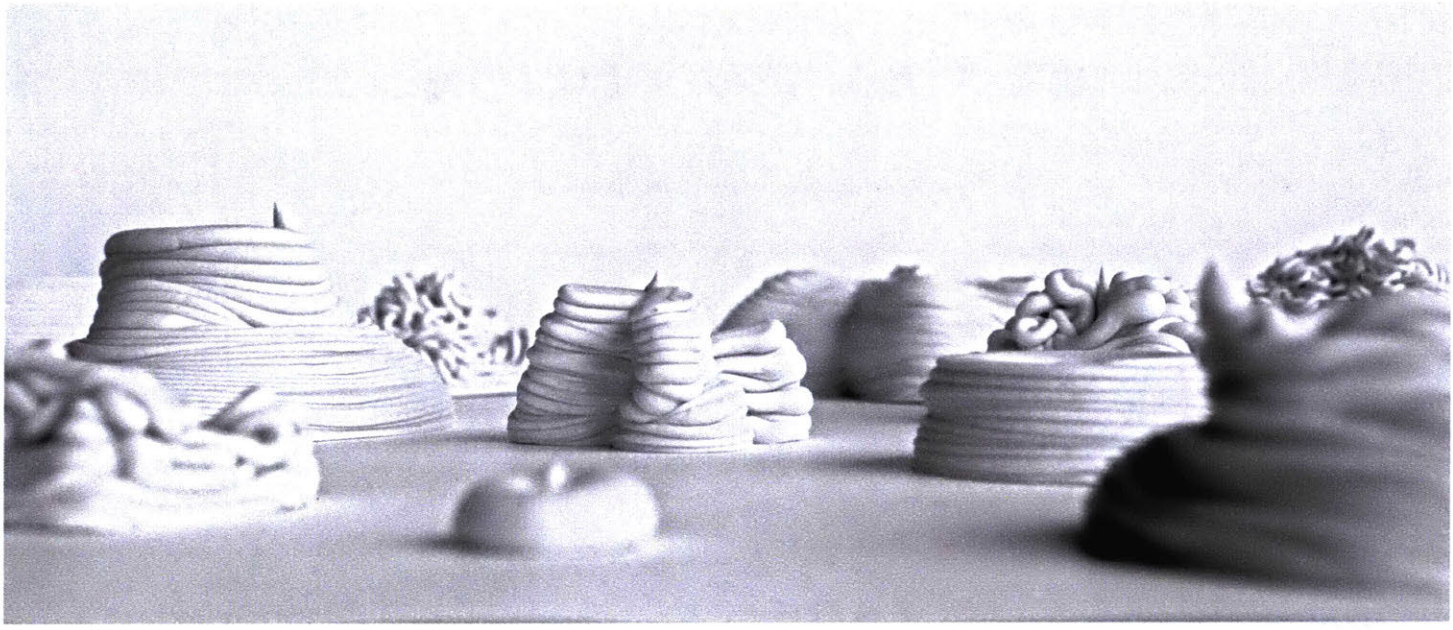
hearing sound echo in a ghostly form of communication.

In *Architecture of First Societies*, Mark Jarzombek describes the megalithic artifacts of Carnac, France as an accumulation of arduously quarried, transported, and placed stones that represent a long series of successive generations. (380)

In rows unevenly space and unevenly aligned, each grand stone artifact memorializes an individual human or generation of humans, and through their aggregation, the artifacts express a greater lineage, a past human culture.

Mark Jarzombek, *Architecture of First Societies: A Global Perspective* (Hoboken: Wiley, 2013).

Photo above: Clemens Koppensteiner, "Stones in the Fog 1" (2005), https://www.flickr.com/photos/caramdir (accessed May 23, 2016). Creative Commons license.



In this new Carnac,
this "post-mordial" cemetery of transmogrification and transubstantiation,
these artifacts truly strive to become emodiments of human being,
existing as totems of past human lineage,
and 'momento mori' for those remaining.

Transfiguration

When I enter a room
my body consumes space.
In darkness
my eyes touch,
in light
they pierce walls of silence.
While the features of my own weight
define me,
precede me,
imprison me,
elsewhere, far away,
behind the mountains,
a room of clouds
awaits another body.

Raimund Abraham, *[Un]built / Raimund Abraham*, ed. Brigitte Groihofer (Wien; New York: Springer, 1996), 114.

EXTRUSION PRINTING

The process of extrusion forces an input of plastic matter through an aperture.

Through the assistance of CNC (computer numerical control) automation,
the extrusion aperture moves through space
to print the material,
leaving a trail of sculptural ink.

MATERIAL

DAP ALEX™ Acrylic Latex Painter's Caulk

EQUIPMENT

ShopBot CNC Router
Campbell Hausfeld Air Powered Caulk Gun (PL155800AV)
Built-in architecture shop air regulator with manual valve

PARAMETERS

Tool path translation type

Tool path line/curve optimization

Tool path base dimension, in.

Tool path start height, in.

Tool path climb rate, z-axis in./unit

Tool path end height, in.

Tool path offset factor (1)

Tool path offset factor (2)

Tool path morph factor

Tool path twist, degrees

Tool path rotate, degrees

Extrusion nozzle diameter, in.

Extrusion feed rate, in./sec.

Extrusion air pressure, lb./sq.in.

Model rows

Units per row

DNA sequence length

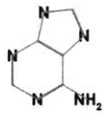
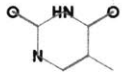
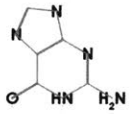
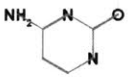
DNA sequence

VARIABLES (NOT IN CONTROL)

ShopBot bed shake/movement (affecting material settle)

Manufacture consistency of material container (affecting extrusion nozzle diameter)

Material consistency and manufacture date (affecting relative material viscosity)

MOLECULAR STRUCTURE	CHEMICAL FORMULA	IUPAC ID[1]	GIVEN NAME	ABBR.
	$C_5H_4N_5$	**9H-purin-6-amine**	**ADENINE**	**A**
	$C_5H_5N_2O_2$	**5-Methylpyrimidine-2,4(1H,3H)-dione**	**THYMINE**	**T**
	$C_5H_4N_5O$	**2-amino-1H-purin-6(9H)-one**	**GUANINE**	**G**
	$C_4H_4N_3O$	**4-aminopyrimidin-2(1H)-one**	**CYTOSINE**	**C**

COLOR SCHEME[2]	F. DRAKE, SAGANS[3]	J. DAVIS *MICROVENUS*[4]	J. DAVIS *MILKY WAY*[5]	PETER EISENMAN[6]	EDUARDO KAC[7]
GREEN	1 1 1 0 0 0 0 0 0 0 0 1 1 0 0 1 1 1 1 1	**3 = XXX**	**10**		**WORD SPACE**
RED	1 1 0 0 0 0 0 1 1 0 1 1 0 0 0 1 1 1 1 1	**2 = XX**	**01**		**DASH (-)**
YELLOW	1 1 1 0 0 0 0 0 0 0 0 1 1 1 0 1 1 1 1 1	**4 = XXXX**	**11**		**LETTER SPACE**
BLUE	1 1 0 0 0 0 0 1 0 0 0 0 1 1 0 1 1 1 1 1	**1 = X**	**00**		**DOT (.)**

FORMALLY ENCODED GENETIC INFORMATION

Genetic information is a coded representation of biochemical streams of microscopic matter,
making a previously unknown biological essence accessible to the naked eye
through various means of representational description and/or translation.

DNA NUCLEOBASE DESCRIPTION AND TRANSLATION

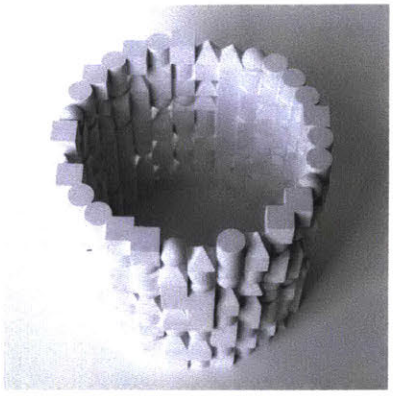
All humans wear more than one hat, and go by more than one name.
So do the four nucleobases of DNA, Adenine, Thymine, Guanine, and Cytosine,
since their respective discoveries throughout the Nineteenth Century,
and their formal classifications in the Twentieth,
and onto later appropriations by designers, architects, and bioartists.

The previous table depicts the differing names and coded translations
that have been applied to the four nucleobases of DNA,
from the initial diagramming of their molecular structures,
to the definition of their chemical formulas and formal identifications,
to their given names and abbreviations A, T, G, C,
and common systems of color coding,
to finally some translations by various artists and designers.

1. IUPAC, "International Union of Pure and Applied Chemistry," IUPAC, https://iupac.org (accessed October 15, 2016).
2. Ryan Hoover, "Alba," Ryan Hoover, http://www.ryanhoover.org/rd/alba.php (accessed October 15, 2016).
3. Carl Sagan et al, "A Message from Earth," *Science* 175 (1972): 881-884.
4. Joe Davis, "Microvenus," *Art Journal* 55.1 (April 1996): 70-74. Stable URL: http://www.jstor.org/stable/777811 (accessed October 15, 2016).
5. Joe Davis, "Romance, Supercodes, and the Milky Way DNA" symposium paper, in *Ars Electronica 2000 Catalog: Next Sex*, ed. Gerfried Stocker and Christine Schöpf (Vienna: Springer Verlag, 2000), 217-235.
6. Peter Eisenman, "Biocentrum," Peter Eisenman fonds Collection, *Centre Canadien d'Architecture*, Montréal, reference number: DR1999:0646 ©CCA.
7. Sheilah Britton and Dan Collins, ed., *The Eighth Day: The Transgenic Art of Eduardo Kac* (Tempe, AZ: Institute for Studies in the Arts, Arizona State University, 2003).

POINT TO SHAPE-SOLID

[Sequence set *S* ~ Matrix set *N*]



[SQ. PYRAMID: L = W = H] $\forall$ $A_s(x_N, y_N, z_N)$

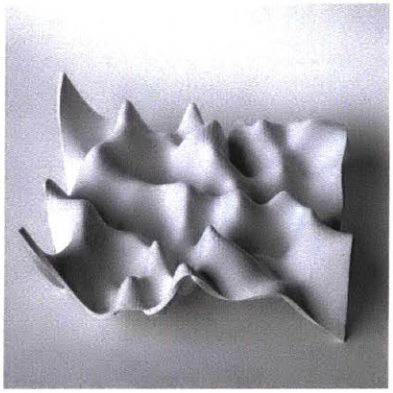
[CUBE: L = W = H] $\forall$ $T_s(x_n, y_n, z_n)$

[CYLINDER: D = H] $\forall$ $G_s(x_n, y_n, z_n)$

[SPHERE] $\forall$ $C_s(x_n, y_n, z_n)$

POINT TO SURFACE

[Sequence set *S* ~ Matrix set *N*]



(0, 0, 1) $\forall$ $A_s(x_N, y_N, z_N)$

(0, 0, 2) $\forall$ $T_s(x_N, y_N, z_N)$

(0, 0, 3) $\forall$ $G_s(x_N, y_N, z_N)$

(0, 0, 4) $\forall$ $C_s(x_N, y_N, z_N)$

POINT TO LINE

$\sum_{S=1}^{S} \overrightarrow{E_S F_{S+1}}$ $\forall$ [Sequence set *S*]

$A_s(0x_s, +1y_s, z_s), (0x_s, -1y_s, z_s)$

$T_s(0x_s, -1y_s, z_s), (0x_s, +1y_s, z_s)$

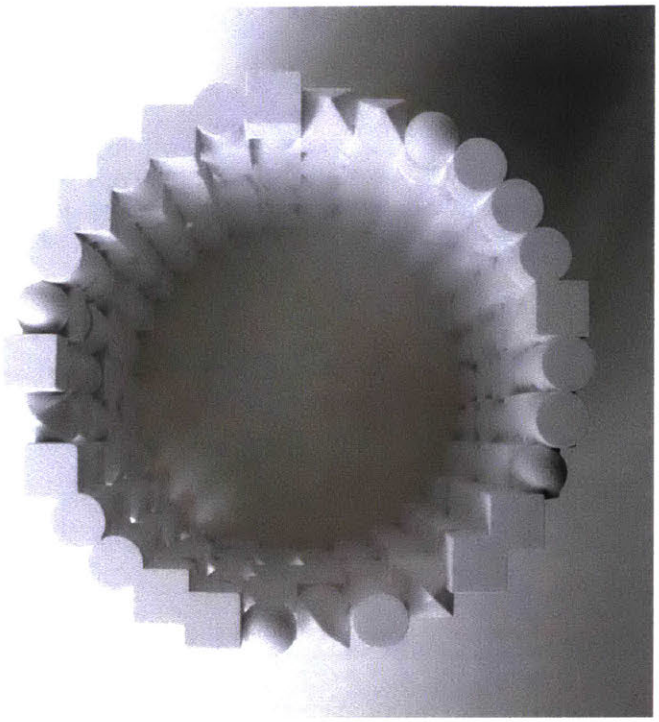
$G_s(-1x_s, 0y_s, z_s), (+1x_s, 0y_s, z_s)$

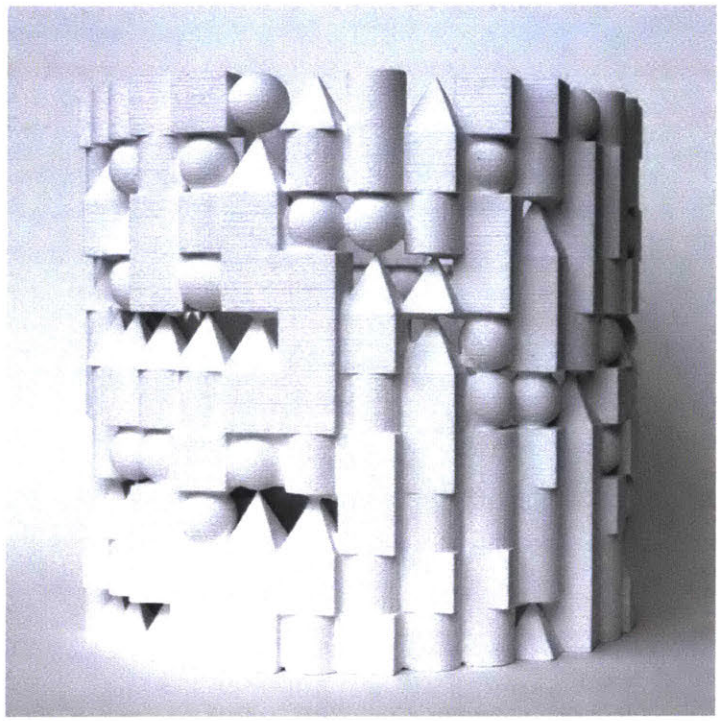
$C_s(+1x_s, 0y_s, z_s), (-1x_s, 0y_s, z_s)$

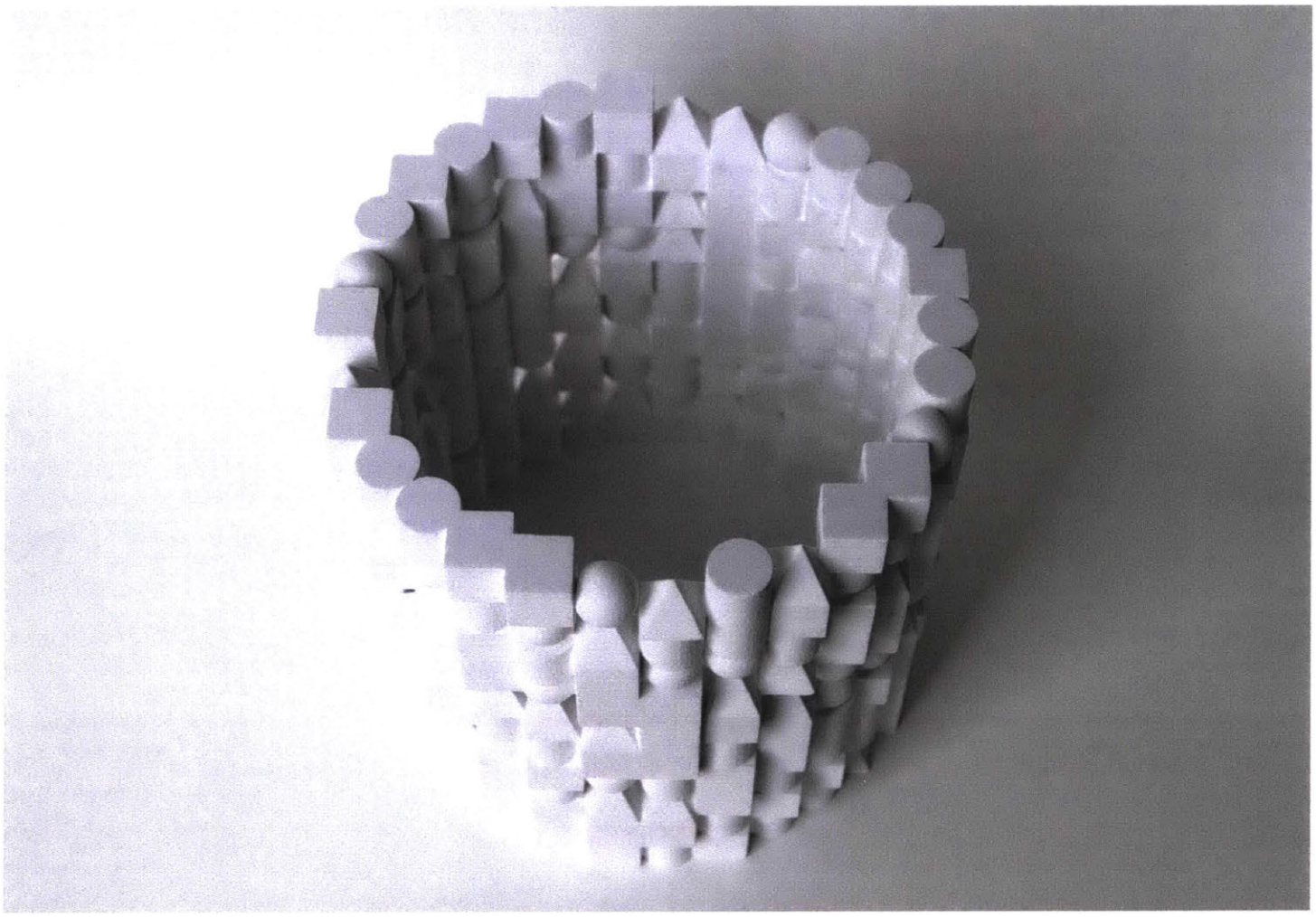
As with any mode of artifact making that arises out of a belief system,
this project speculates that over time and amongst varying groups,
varying attitudes toward the artifacts' material treatment and formal translation will evolve.

The previous tables depict equations of formal and spatial translation developed for this project.

Each equation encodes point-streams of genetic information into a formal configuration in space,
from point to shape-solid,
from point to surface,
and from point to line.





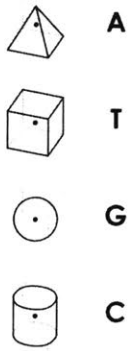


POINT-TO-SHAPE-SOLID TRANSLATION

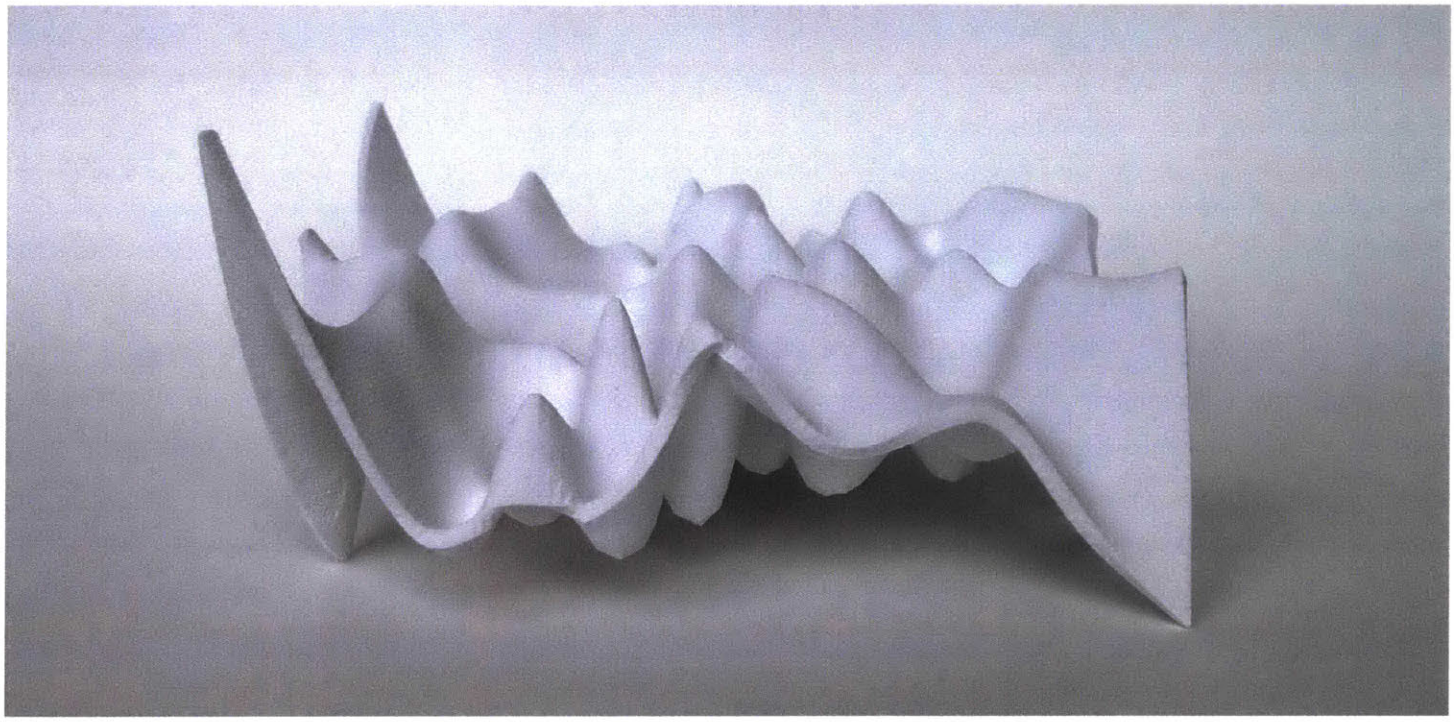
Streams of genetic information are represented as alphabetic symbols, encoding the four nucleobases of DNA as A, T, C, and G. The "Point to Shape-Solid" system re-encodes this information formally, adopting platonic forms from Vincenzo Scamozzi's 1615 "Vitruvian Man," which was published in his treatise *The Idea of a Universal Architecture*. This formal encoding mechanism translates A, T, C, and G through an alphabet of primal shapes, into pyramid, cube, sphere, and cylinder, elemental units of Vitruvian masonry units.

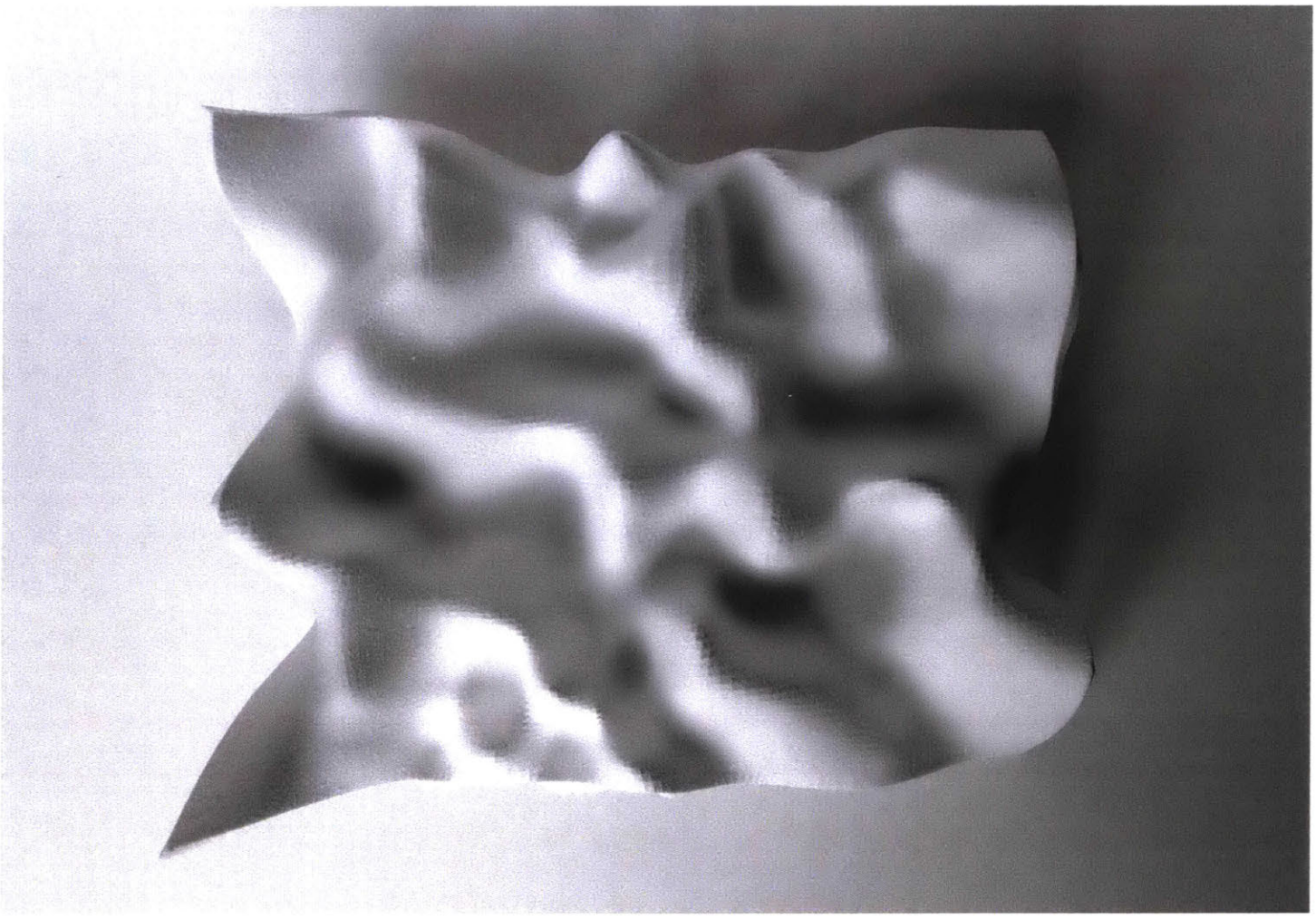
These units are uniform in their cubic extents, and the "Point to Shape-Solid" system aggregates these units as tangentially connected to one another, or otherwise interconnected through webbing. Complex parametric variations can modulate unit size, scale, symmetry, proportion, connection, and porosity, producing potential conditions of overlapping, intersecting, interlocking, enframing, etc. Based on these parameters, this system has the potential to produce surfaces and volumetric aggregations with varying levels of figurative legibility. This parametric encoding mechanism enables rapid schematic iteration, which can then be continuously evaluated and tinkered with in sculptural terms of aesthetics and composition. Through architectural conventions, these models can also be evaluated, developed, and further calibrated through architectural means. Orthographic elevation and section analyses reveal the porosity of the screen, and it approximate opening-to-enclosure ratio. Section analyses can further outline the model's lateral points of connection, and confirm potential vertical stability and structural viability in the model. Factoring into consideration the model's potential materiality, a hypothetical rebar plan can outline how the model might be constructed using reinforced concrete. This necessitates additional design decisions, including concern for points of contact between units, and the improvement of their connection details. An axonometric drawing for a hypothetical injection mold further details potential construction logic for the fabrication of the model into a physical artifact. This digital model can of course be physicalized at almost any scale, and at this point in the process can be made tangible and evaluated as a prototype artifact. A circular, iterative design process juggles back and forth between many variables, in a sophisticated confluence of different design factors, including: program and context, surface shape, size, scale, depth, orientation, grid map and geometric structure, genetic information stream size and type, script direction, culturally or contextually appropriate, genetic information encoding device and its origin, context, or intended meaning, formal aesthetic and the sublime, functionality, porosity, materiality, structural viability, construction logic, and so much more.

At certain scales, and in certain iterations,
these models can be designed and calibrated (or might happen to lend themselves)
to be fabricated using human biomatter,
as archetypal artifacts of *human being architecture*.



Vincenzo Scamozzi, "Vitruvian Man" (1615) in *L'idea della architettura universale*
Mark Garcia, ed., *The Diagrams of Architecture* (Chichester, UK: Wiley, 2010), 12.



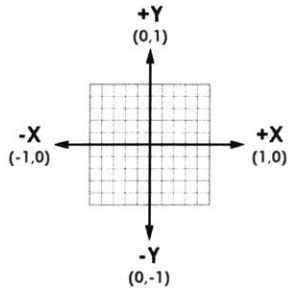


POINT-TO-SURFACE TRANSLATION

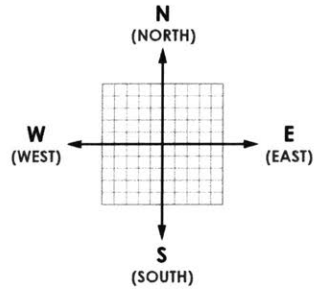
Point-to-surface translation maps streams of genetic information onto gridded planes of points, whereby the nucleobases A, T, G, and C are encoded by differing offset distances perpendicular to the plane, in this case 1x, 2x, 3x, and 4x, respectively.

Joining these points produces a smooth, undulating, "bodiless" surface:
a "human-scape."

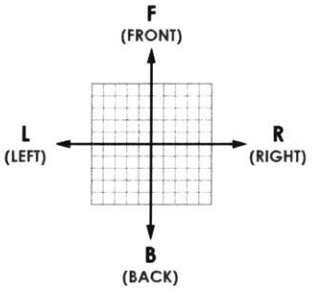
CARTESIAN COORDINATES



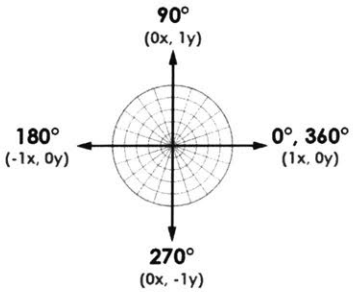
CARDINAL DIRECTION



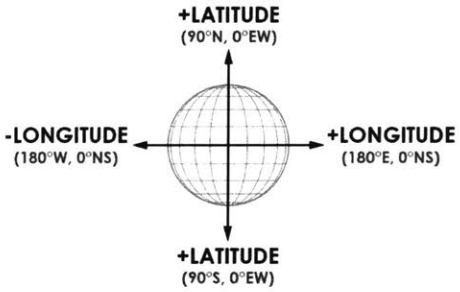
LOCALIZED ORIENTATION



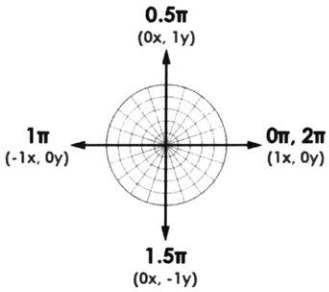
DEGREE ANGLES



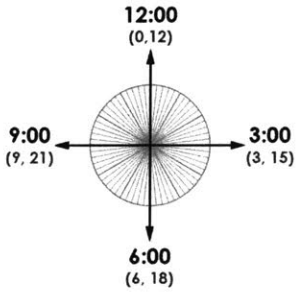
GEOGRAPHIC COORDINATES



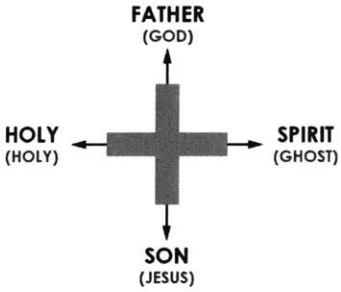
RADIAN ANGLES



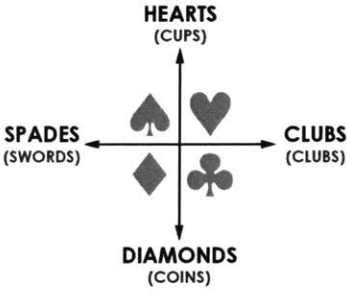
TIMEPIECE DIAL



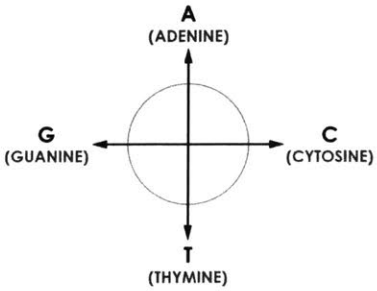
CHRISTIAN TRINITY

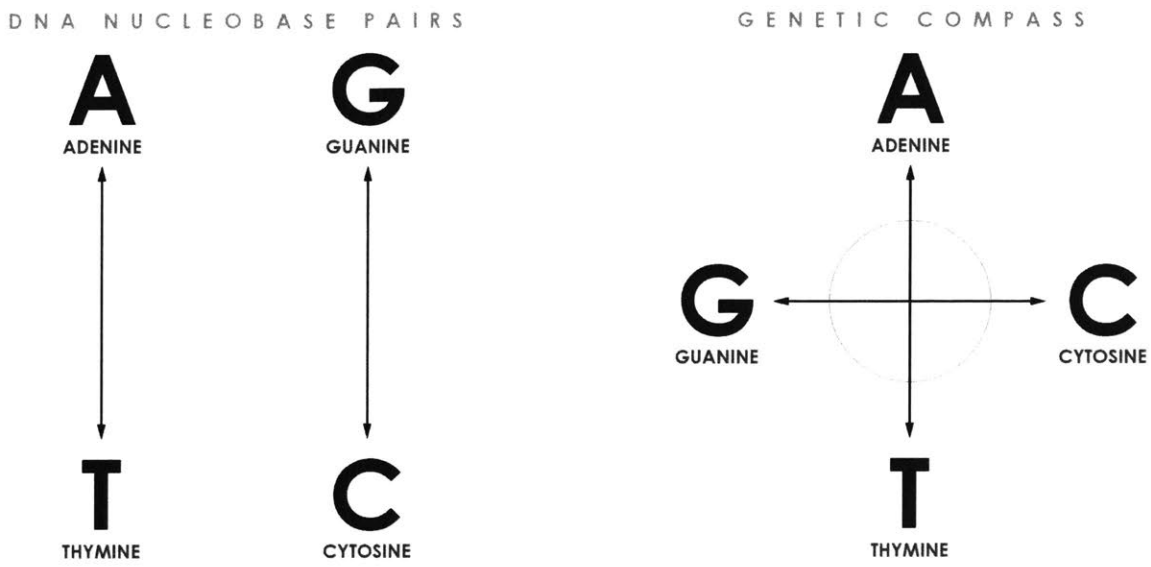


SUIT SYSTEMS



GENETIC COMPASS





POINT-TO-LINE TRANSLATION

Genetic information consists of paired binaries, A and T, G and C.
Point-to-line translation reconfigures the pairs to be perpendicular and overlapping with one another,
aligning with quadrantal systems of spatial description:
the Cartesian coordinates of Euclidean space, with positive and negative X- and Y-axes,
the cardinal directions of terrestrial space, with North and South, East and West, and
the localized orientations of human space, with Front and Back, Right and Left,
the angles of degrees and radians, from zero to 360, and zero to 2pi,
the geographic coordinates of Earth, with positive and negative Latitude and Longitude.

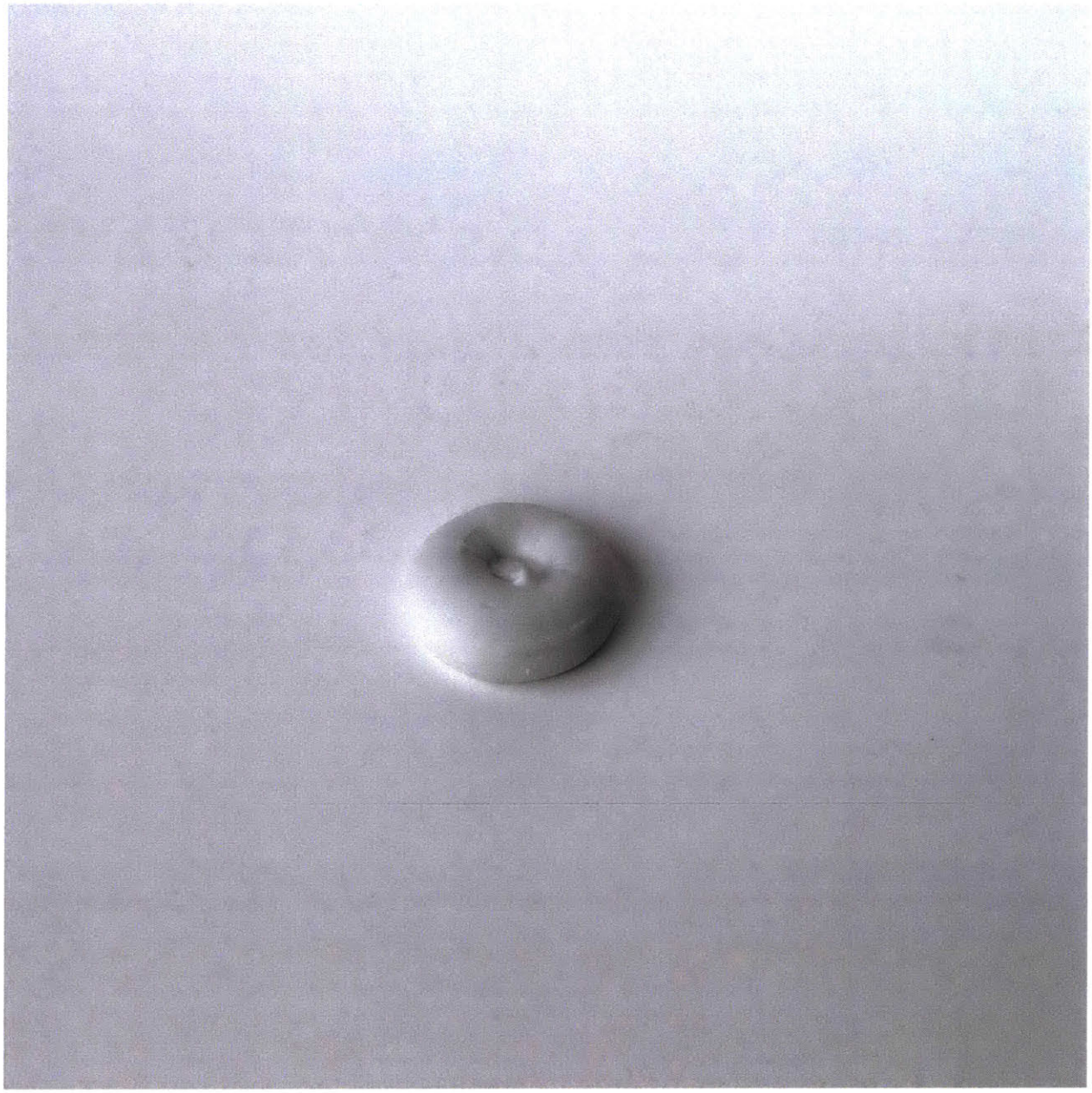
These kinds of axial, quadrant-based systems of spatial orientation
exist in other systems of orientation and cultural belief,
including the face of the modern timepiece,
the layout of suits of cards,
and the crucifix form of the Christian Trinity.

"Point-to-Line" translation is founded on the fictional "genetic compass,"
which imbues the pairs of A and T, G and C, with spatial orientation,
as a newly-formed cultural system of belief.

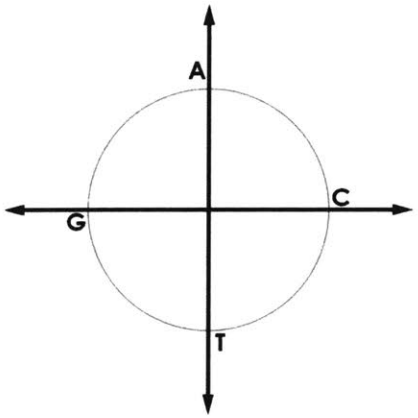
The compass serves as the basis for a series of different tool paths,
each experimenting with different techniques for material buildup and mounding.

'POST-MORDIAL' EXTRUSION ARTIFACTS

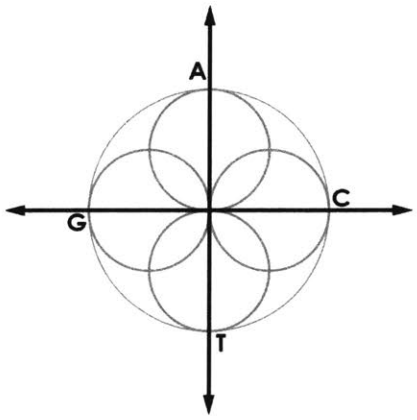
The primary series of artifacts produced for this thesis project use "Point-to-Line" translation for extrusion-based printing.

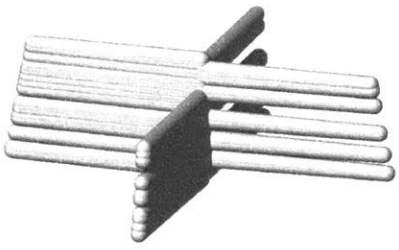


MODEL BIRTH HEIGHT, in.	1/2
MODEL BIRTH WEIGHT, g.	11
TOOL PATH TYPE	0
TOOL PATH LINE/CURVE	N/A
TOOL PATH BASE DIMENSION, in.	0
TOOL PATH START HEIGHT, in.	1/8
TOOL PATH CLIMB RATE, z-axis in./unit	0
TOOL PATH END HEIGHT, in.	0.00
TOOL PATH OFFSET FACTOR (1)	N/A
TOOL PATH OFFSET FACTOR (2)	N/A
TOOL PATH MORPH FACTOR	1
TOOL PATH TWIST, degrees	0
TOOL PATH ROTATE, degrees	0
EXTRUSION NOZZLE DIAMETER, in.	1/8
EXTRUSION FEED RATE, in./sec.	N/A
EXTRUSION AIR PRESSURE, lb./sq.in.	5
MODEL ROWS	1
UNITS PER ROW	1
DNA SEQUENCE LENGTH	1
DNA SEQUENCE	?
HUMAN BEING(S)	ONE ANON. HUMAN
MODEL SCALE	1/8
BIRTH WEIGHT, lb.	12.42
DATE OF BIRTH	4/21/17

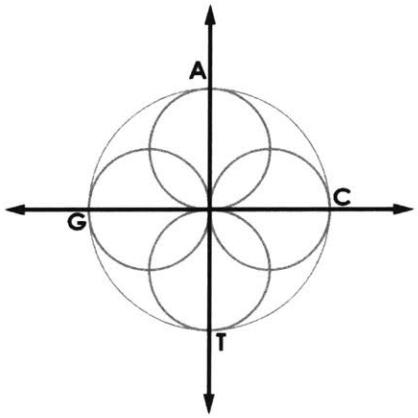


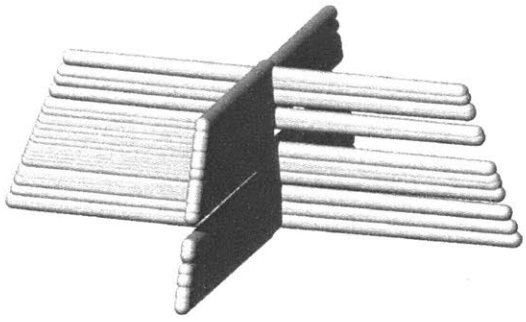
MODEL BIRTH HEIGHT, in.	1 1/8
MODEL BIRTH WEIGHT, g.	169
TOOL PATH TYPE	1
TOOL PATH LINE/CURVE	LINE
TOOL PATH BASE DIMENSION, in.	3
TOOL PATH START HEIGHT, in.	1/4
TOOL PATH CLIMB RATE, z-axis in./unit	0.0234375
TOOL PATH END HEIGHT, in.	0.94
TOOL PATH OFFSET FACTOR (1)	N/A
TOOL PATH OFFSET FACTOR (2)	N/A
TOOL PATH MORPH FACTOR	1/4
TOOL PATH TWIST, degrees	0
TOOL PATH ROTATE, degrees	0
EXTRUSION NOZZLE DIAMETER, in.	1/8
EXTRUSION FEED RATE, in./sec.	1.5
EXTRUSION AIR PRESSURE, lb./sq.in.	5
MODEL ROWS	40
UNITS PER ROW	1
DNA SEQUENCE LENGTH	40
DNA SEQUENCE	
GGACGCAGGGCGTGTGTAACGGGTGGCTTAGACTT	
GGTAT	
HUMAN BEING(S)	ONE ANON. HUMAN
MODEL SCALE	1/8
BIRTH WEIGHT, lb.	188.50
DATE OF BIRTH	4/21/17

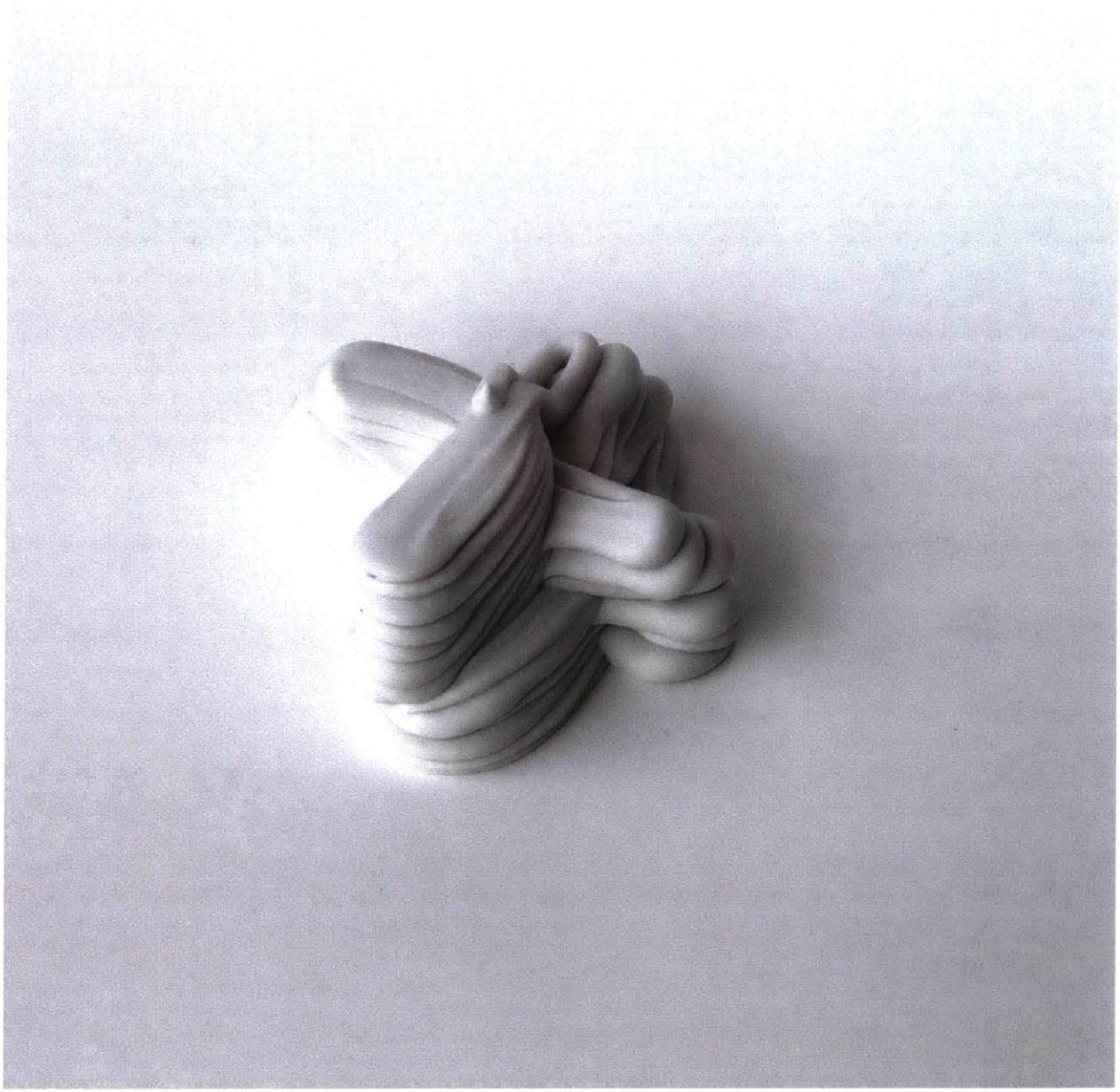




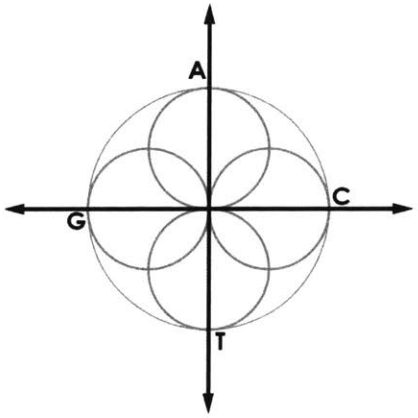
MODEL BIRTH HEIGHT, in.	1 4/7
MODEL BIRTH WEIGHT, g.	335
TOOL PATH TYPE	1
TOOL PATH LINE/CURVE	LINE
TOOL PATH BASE DIMENSION, in.	4
TOOL PATH START HEIGHT, in.	3/8
TOOL PATH CLIMB RATE, z-axis in./unit	0.02
TOOL PATH END HEIGHT, in.	1.64
TOOL PATH OFFSET FACTOR (1)	N/A
TOOL PATH OFFSET FACTOR (2)	N/A
TOOL PATH MORPH FACTOR	1/4
TOOL PATH TWIST, degrees	0
TOOL PATH ROTATE, degrees	0
EXTRUSION NOZZLE DIAMETER, in.	1/8
EXTRUSION FEED RATE, in./sec.	1.5
EXTRUSION AIR PRESSURE, lb./sq.in.	5
MODEL ROWS	82
UNITS PER ROW	1
DNA SEQUENCE LENGTH	82
DNA SEQUENCE	
TTACGTCTTATGCCTGTATAAGTCACATGTTGTTTGGTTG	
CTGGACGCAGGGCGTGTGTAACGGGTGGCTTAGA	
CTTGGTAT	
HUMAN BEING(S)	TWO ANON. HUMANS
MODEL SCALE	1/8
BIRTH WEIGHT, lb.	375.88
DATE OF BIRTH	4/19/17

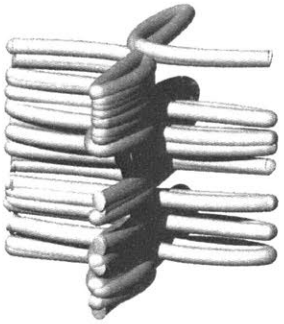






MODEL BIRTH HEIGHT, in.	1 4/9
MODEL BIRTH WEIGHT, g.	104
TOOL PATH TYPE	1
TOOL PATH LINE/CURVE	CURVE
TOOL PATH BASE DIMENSION, in.	2
TOOL PATH START HEIGHT, in.	3/32
TOOL PATH CLIMB RATE, z-axis in./unit	0.03125
TOOL PATH END HEIGHT, in.	1.78
TOOL PATH OFFSET FACTOR (1)	N/A
TOOL PATH OFFSET FACTOR (2)	N/A
TOOL PATH MORPH FACTOR	1
TOOL PATH TWIST, degrees	0
TOOL PATH ROTATE, degrees	0
EXTRUSION NOZZLE DIAMETER, in.	1/8
EXTRUSION FEED RATE, in./sec.	1.5
EXTRUSION AIR PRESSURE, lb./sq.in.	5
MODEL ROWS	57
UNITS PER ROW	1
DNA SEQUENCE LENGTH	57
DNA SEQUENCE	
ATGTTGTTTGGTTGCTGGACGCAGGGCGTGTGTAAC	
GGGTGGCTTAGACTTGGTAT	
HUMAN BEING(S)	ONE ANON. HUMAN
MODEL SCALE	1/8
BIRTH WEIGHT, lb.	115.13
DATE OF BIRTH	4/22/17

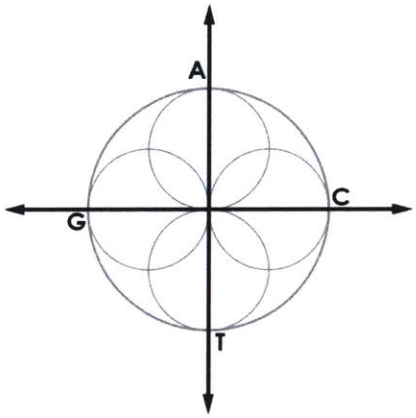




MODEL BIRTH HEIGHT, in.	1 1/2
MODEL BIRTH WEIGHT, g.	128
TOOL PATH TYPE	2
TOOL PATH LINE/CURVE	LINE
TOOL PATH BASE DIMENSION, in.	4
TOOL PATH START HEIGHT, in.	1/8
TOOL PATH CLIMB RATE, z-axis in./unit	0.0234375
TOOL PATH END HEIGHT, in.	4.00
TOOL PATH OFFSET FACTOR (1)	N/A
TOOL PATH OFFSET FACTOR (2)	N/A
TOOL PATH MORPH FACTOR	1/4
TOOL PATH TWIST, degrees	0
TOOL PATH ROTATE, degrees	0
EXTRUSION NOZZLE DIAMETER, in.	3/32
EXTRUSION FEED RATE, in./sec.	1.5
EXTRUSION AIR PRESSURE, lb./sq.in.	5
MODEL ROWS	250
UNITS PER ROW	1
DNA SEQUENCE LENGTH	250
DNA SEQUENCE	

GTTTTGTGTTAGCGATGGATACTCCTTGGGTAACTA
ATTGTTGTCAATTCTGGTTCTTGTTGCTCCGACTTAGG
GTGGTTCCTGGTACCTGTTGGTGGTTGATGGATGTT
ACGCACGTCATTAAAAAGGCGCGCTCCATGTTTAT
GTTTAATTCTCAAGCCGATTTTATTACGTCTTATGCCT
GTATAAGTCACATGTTGTTTGGTTGCTGGACGCAG
GGCGTGTGTAACGGGTGGCTTAGACTTGGTAT

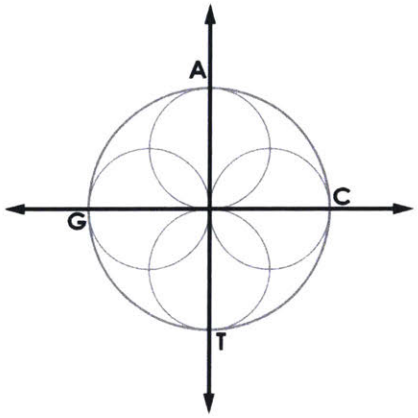
HUMAN BEING(S)	ONE ANON. HUMAN
MODEL SCALE	1/8
BIRTH WEIGHT, lb.	142.22
DATE OF BIRTH	4/19/17



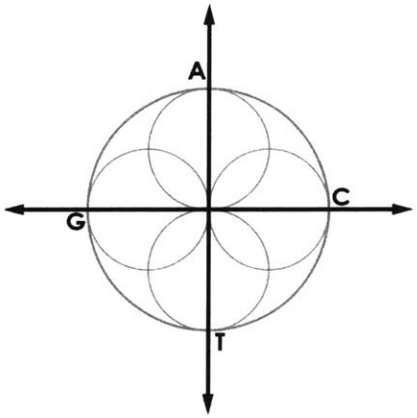
MODEL BIRTH HEIGHT, in.	2
MODEL BIRTH WEIGHT, g.	345
TOOL PATH TYPE	2
TOOL PATH LINE/CURVE	CURVE
TOOL PATH BASE DIMENSION, in.	4
TOOL PATH START HEIGHT, in.	1/8
TOOL PATH CLIMB RATE, z-axis in./unit	0.0234375
TOOL PATH END HEIGHT, in.	4.00
TOOL PATH OFFSET FACTOR (1)	N/A
TOOL PATH OFFSET FACTOR (2)	N/A
TOOL PATH MORPH FACTOR	1/4
TOOL PATH TWIST, degrees	0
TOOL PATH ROTATE, degrees	0
EXTRUSION NOZZLE DIAMETER, in.	1/16
EXTRUSION FEED RATE, in./sec.	1.5
EXTRUSION AIR PRESSURE, lb./sq.in.	5
MODEL ROWS	250
UNITS PER ROW	1
DNA SEQUENCE LENGTH	250
DNA SEQUENCE	

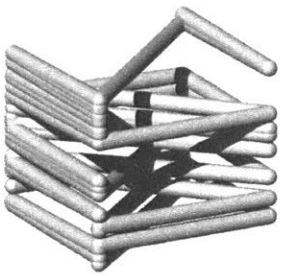
GTTTTGTGTTAGCGATGGATACTCCTTGGGTAACTA
ATTGTTGTCAATTCTGGTTCTTGTTGCTCCGACTTAGG
GTGGTTCCTGGTACCTGTTGGTGGTTGATGGATGTT
ACGCACGTCATTAAAAAGGCGCGCTCCATGTTTAT
GTTTAATTCTCAAGCCGATTTTATTACGTCTTATGCCT
GTATAAGTCACATGTTGTTTGGTTGCTGGACGCAG
GGCGTGTGTAACGGGTGGCTTAGACTTGGTAT

HUMAN BEING(S)	TWO ANON. HUMANS
MODEL SCALE	1/8
BIRTH WEIGHT, lb.	387.17
DATE OF BIRTH	4/19/17

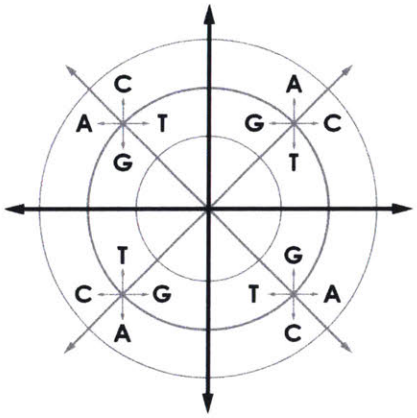


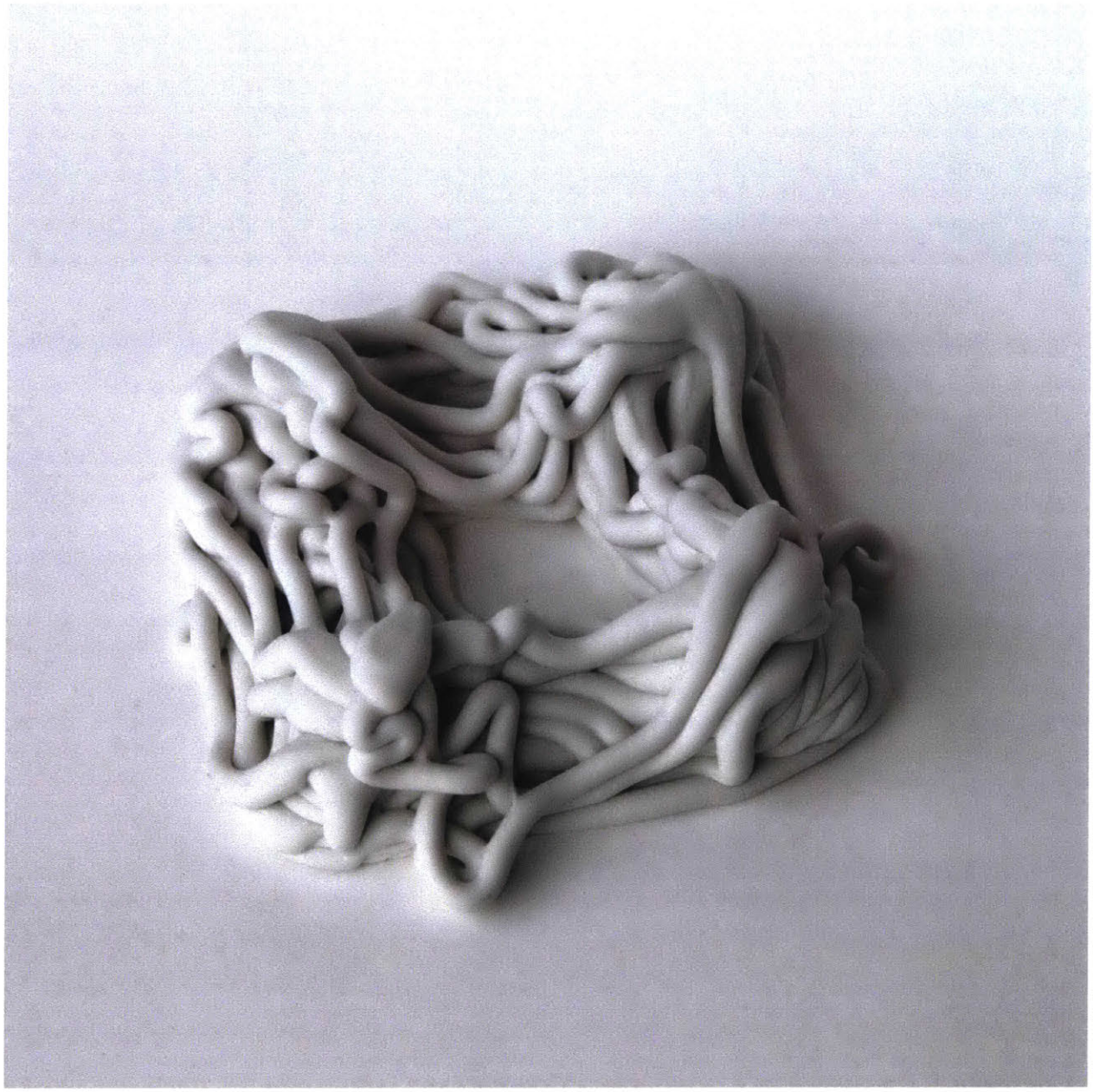
MODEL BIRTH HEIGHT, in.	1 1/8
MODEL BIRTH WEIGHT, g.	67
TOOL PATH TYPE	2
TOOL PATH LINE/CURVE	LINE
TOOL PATH BASE DIMENSION, in.	2
TOOL PATH START HEIGHT, in.	3/32
TOOL PATH CLIMB RATE, z-axis in./unit	0.0234375
TOOL PATH END HEIGHT, in.	1.36
TOOL PATH OFFSET FACTOR (1)	N/A
TOOL PATH OFFSET FACTOR (2)	N/A
TOOL PATH MORPH FACTOR	1
TOOL PATH TWIST, degrees	0
TOOL PATH ROTATE, degrees	0
EXTRUSION NOZZLE DIAMETER, in.	1/8
EXTRUSION FEED RATE, in./sec.	1.5
EXTRUSION AIR PRESSURE, lb./sq.in.	5
MODEL ROWS	58
UNITS PER ROW	1
DNA SEQUENCE LENGTH	58
DNA SEQUENCE	
ACATGTTGTTTGGTTGCTGGACGCAGGGCGTGTGT	
AACGGGTGGCTTAGACTTGGTAT	
HUMAN BEING(S)	ONE ANON. HUMAN
MODEL SCALE	1/8
BIRTH WEIGHT, lb.	73.37
DATE OF BIRTH	4/22/17





MODEL BIRTH HEIGHT, in.	1 1/2
MODEL BIRTH WEIGHT, g.	213
TOOL PATH TYPE	3
TOOL PATH LINE/CURVE	CURVE
TOOL PATH BASE DIMENSION, in.	2
TOOL PATH START HEIGHT, in.	1/8
TOOL PATH CLIMB RATE, z-axis in./unit	0.02
TOOL PATH END HEIGHT, in.	2.10
TOOL PATH OFFSET FACTOR (1)	1/16
TOOL PATH OFFSET FACTOR (2)	1/3
TOOL PATH MORPH FACTOR	1
TOOL PATH TWIST, degrees	0
TOOL PATH ROTATE, degrees	0
EXTRUSION NOZZLE DIAMETER, in.	1/8
EXTRUSION FEED RATE, in./sec.	1.5
EXTRUSION AIR PRESSURE, lb./sq.in.	5
MODEL ROWS	26.25
UNITS PER ROW	4
DNA SEQUENCE LENGTH	105
DNA SEQUENCE	
GTTTAATTCTCAAGCCGATTTTATTACGTCTTATGCCTGT	
ATAAGTCACATGTTGTTTGGTTGCTGGACGCAGGGC	
GTGTGTAACGGGTGGCTTAGACTTGGTAT	
HUMAN BEING(S)	ONE ANON. HUMAN
MODEL SCALE	1/8
BIRTH WEIGHT, lb.	238.17
DATE OF BIRTH	4/21/17

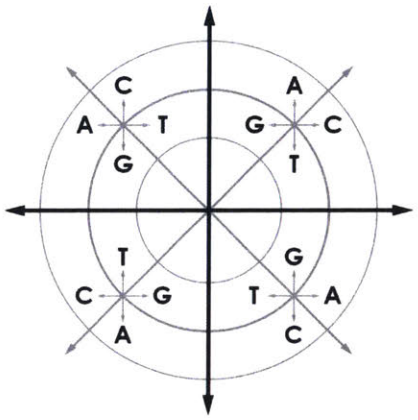


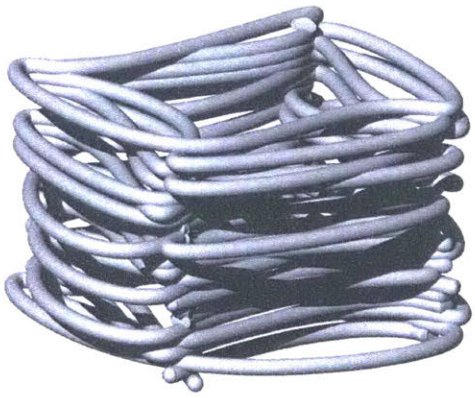


MODEL BIRTH HEIGHT, in.	1 1/4
MODEL BIRTH WEIGHT, g.	194
TOOL PATH TYPE	3
TOOL PATH LINE/CURVE	CURVE
TOOL PATH BASE DIMENSION, in.	3
TOOL PATH START HEIGHT, in.	3/32
TOOL PATH CLIMB RATE, z-axis in./unit	0.02
TOOL PATH END HEIGHT, in.	1.88
TOOL PATH OFFSET FACTOR (1)	1/16
TOOL PATH OFFSET FACTOR (2)	1/3
TOOL PATH MORPH FACTOR	1
TOOL PATH TWIST, degrees	10
TOOL PATH ROTATE, degrees	-5
EXTRUSION NOZZLE DIAMETER, in.	1/8
EXTRUSION FEED RATE, in./sec.	1.5
EXTRUSION AIR PRESSURE, lb./sq.in.	5
MODEL ROWS	23.5
UNITS PER ROW	4
DNA SEQUENCE LENGTH	94
DNA SEQUENCE	

TCAAGCCGATTTTATTACGTCTTATGCCTGTATAAGTCA
CATGTTGTTTGGTTGCTGGACGCAGGGCGTGTGTAAC
GGGTGGCTTAGACTTGGTAT

HUMAN BEING(S)	ONE ANON. HUMAN
MODEL SCALE	1/8
BIRTH WEIGHT, lb.	216.72
DATE OF BIRTH	4/22/17

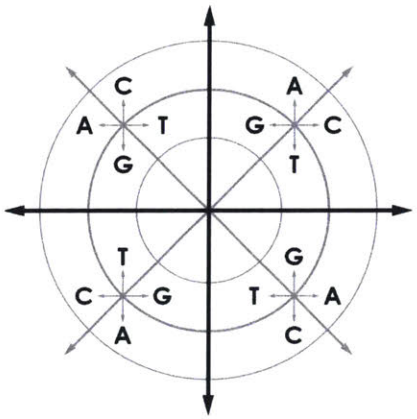


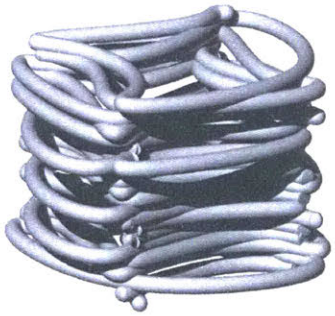


MODEL BIRTH HEIGHT, in.	1 3/4
MODEL BIRTH WEIGHT, g.	195
TOOL PATH TYPE	3
TOOL PATH LINE/CURVE	CURVE
TOOL PATH BASE DIMENSION, in.	2
TOOL PATH START HEIGHT, in.	3/32
TOOL PATH CLIMB RATE, z-axis in./unit	0.02
TOOL PATH END HEIGHT, in.	1.64
TOOL PATH OFFSET FACTOR (1)	1/16
TOOL PATH OFFSET FACTOR (2)	1/3
TOOL PATH MORPH FACTOR	1
TOOL PATH TWIST, degrees	10
TOOL PATH ROTATE, degrees	-5
EXTRUSION NOZZLE DIAMETER, in.	1/8
EXTRUSION FEED RATE, in./sec.	1.5
EXTRUSION AIR PRESSURE, lb./sq.in.	5
MODEL ROWS	20.5
UNITS PER ROW	4
DNA SEQUENCE LENGTH	82
DNA SEQUENCE	

TTACGTCTTATGCCTGTATAAGTCACATGTTGTTTGGTTG
CTGGACGCAGGGCGTGTGTAACGGGTGGCTTAGA
CTTGGTAT

HUMAN BEING(S)	ONE ANON. HUMAN
MODEL SCALE	1/8
BIRTH WEIGHT, lb.	217.85
DATE OF BIRTH	4/22/17



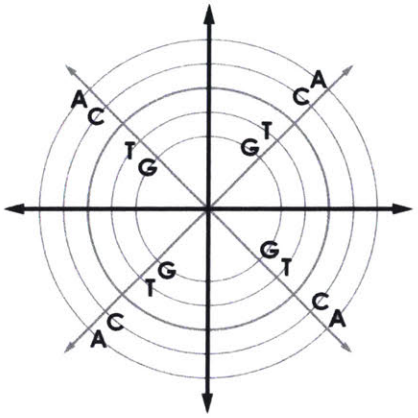


MODEL BIRTH HEIGHT, in.	1 2/3
MODEL BIRTH WEIGHT, g.	236
TOOL PATH TYPE	4
TOOL PATH LINE/CURVE	CURVE
TOOL PATH BASE DIMENSION, in.	2
TOOL PATH START HEIGHT, in.	1/8
TOOL PATH CLIMB RATE, z-axis in./unit	0.02
TOOL PATH END HEIGHT, in.	2.18
TOOL PATH OFFSET FACTOR (1)	1/8
TOOL PATH OFFSET FACTOR (2)	1/3
TOOL PATH MORPH FACTOR	1
TOOL PATH TWIST, degrees	0
TOOL PATH ROTATE, degrees	0
EXTRUSION NOZZLE DIAMETER, in.	1/8
EXTRUSION FEED RATE, in./sec.	1.5
EXTRUSION AIR PRESSURE, lb./sq.in.	5
MODEL ROWS	27.25
UNITS PER ROW	4
DNA SEQUENCE LENGTH	109

DNA SEQUENCE

TTATGTTTAATTCTCAAGCCGATTTTATTACGTCTTATGC
CTGTATAAGTCACATGTTGTTTGGTTGCTGGACGCAG
GGCGTGTGTAACGGGTGGCTTAGACTTGGTAT

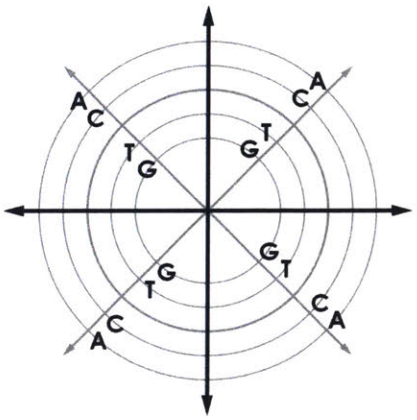
HUMAN BEING(S)	ONE ANON. HUMAN
MODEL SCALE	1/8
BIRTH WEIGHT, lb.	264.13
DATE OF BIRTH	4/21/17



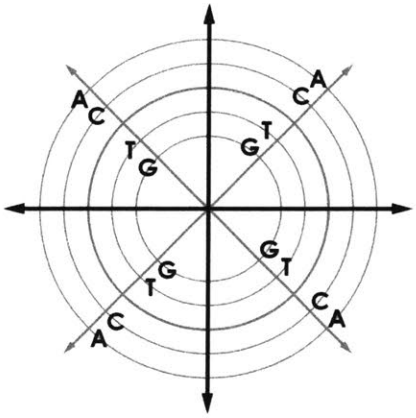
MODEL BIRTH HEIGHT, in.	2 1/5
MODEL BIRTH WEIGHT, g.	377
TOOL PATH TYPE	4
TOOL PATH LINE/CURVE	CURVE
TOOL PATH BASE DIMENSION, in.	2
TOOL PATH START HEIGHT, in.	1/8
TOOL PATH CLIMB RATE, z-axis in./unit	0.02
TOOL PATH END HEIGHT, in.	2.80
TOOL PATH OFFSET FACTOR (1)	1/16
TOOL PATH OFFSET FACTOR (2)	1/3
TOOL PATH MORPH FACTOR	1
TOOL PATH TWIST, degrees	0
TOOL PATH ROTATE, degrees	0
EXTRUSION NOZZLE DIAMETER, in.	1/8
EXTRUSION FEED RATE, in./sec.	1.5
EXTRUSION AIR PRESSURE, lb./sq.in.	5
MODEL ROWS	36.75
UNITS PER ROW	4
DNA SEQUENCE LENGTH	147
DNA SEQUENCE	

GGATGTTACGCACGTCATTAAAAAGGCGCGCTCCA
TGTTTATGTTTAATTCTCAAGCCGATTTTATTACGTCTTAT
GCCTGTATAAGTCACATGTTGTTTGGTTGCTGGACGC
AGGGCGTGTGTAACGGGTGGCTTAGACTTGGTAT

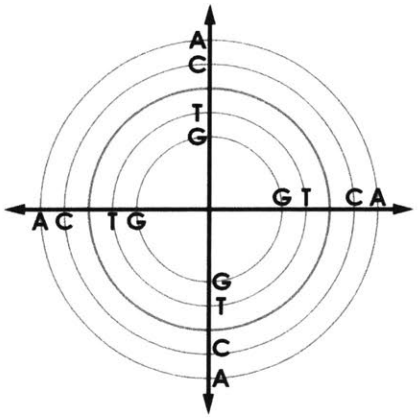
HUMAN BEING(S)	THREE ANON. HUMANS
MODEL SCALE	1/8
BIRTH WEIGHT, lb.	423.29
DATE OF BIRTH	4/21/17

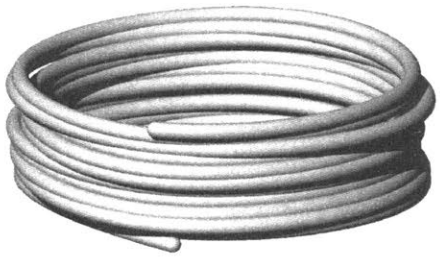


MODEL BIRTH HEIGHT, in.	1 3/8
MODEL BIRTH WEIGHT, g.	93
TOOL PATH TYPE	4
TOOL PATH LINE/CURVE	CURVE
TOOL PATH BASE DIMENSION, in.	2
TOOL PATH START HEIGHT, in.	3/32
TOOL PATH CLIMB RATE, z-axis in./unit	0.02
TOOL PATH END HEIGHT, in.	1.50
TOOL PATH OFFSET FACTOR (1)	1/16
TOOL PATH OFFSET FACTOR (2)	1/3
TOOL PATH MORPH FACTOR	1
TOOL PATH TWIST, degrees	10
TOOL PATH ROTATE, degrees	-5
EXTRUSION NOZZLE DIAMETER, in.	1/8
EXTRUSION FEED RATE, in./sec.	1.5
EXTRUSION AIR PRESSURE, lb./sq.in.	5
MODEL ROWS	18.75
UNITS PER ROW	4
DNA SEQUENCE LENGTH	75
DNA SEQUENCE	
TTATGCCTGTATAAGTCACATGTTGTTTGGTTGCTGGAC	
GCAGGGCGTGTGTAACGGGTGGCTTAGACTTGGTAT	
HUMAN BEING(S)	ONE ANON. HUMAN
MODEL SCALE	1/8
BIRTH WEIGHT, lb.	102.72
DATE OF BIRTH	4/22/17



MODEL BIRTH HEIGHT, in.	7/8
MODEL BIRTH WEIGHT, g.	115
TOOL PATH TYPE	5
TOOL PATH LINE/CURVE	CURVE
TOOL PATH BASE DIMENSION, in.	3
TOOL PATH START HEIGHT, in.	5/64
TOOL PATH CLIMB RATE, z-axis in./unit	0.02
TOOL PATH END HEIGHT, in.	0.88
TOOL PATH OFFSET FACTOR (1)	1/32
TOOL PATH OFFSET FACTOR (2)	1/3
TOOL PATH MORPH FACTOR	1
TOOL PATH TWIST, degrees	10
TOOL PATH ROTATE, degrees	-5
EXTRUSION NOZZLE DIAMETER, in.	1/8
EXTRUSION FEED RATE, in./sec.	1.5
EXTRUSION AIR PRESSURE, lb./sq.in.	5
MODEL ROWS	11
UNITS PER ROW	4
DNA SEQUENCE LENGTH	44
DNA SEQUENCE	
TGCTGGACGCAGGGCGTGTGTAACGGGTGGCTTAG	
ACTTGGTAT	
HUMAN BEING(S)	ONE ANON. HUMAN
MODEL SCALE	1/8
BIRTH WEIGHT, lb.	127.55
DATE OF BIRTH	5/5/17



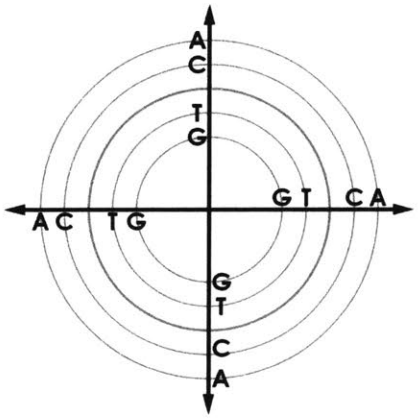


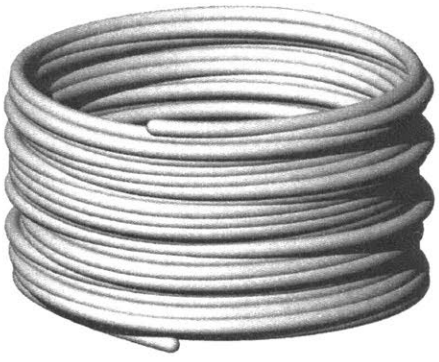
MODEL BIRTH HEIGHT, in.	1 4/9
MODEL BIRTH WEIGHT, g.	201
TOOL PATH TYPE	5
TOOL PATH LINE/CURVE	CURVE
TOOL PATH BASE DIMENSION, in.	3
TOOL PATH START HEIGHT, in.	3/32
TOOL PATH CLIMB RATE, z-axis in./unit	0.02
TOOL PATH END HEIGHT, in.	1.68
TOOL PATH OFFSET FACTOR (1)	1/16
TOOL PATH OFFSET FACTOR (2)	1/3
TOOL PATH MORPH FACTOR	1
TOOL PATH TWIST, degrees	10
TOOL PATH ROTATE, degrees	-5
EXTRUSION NOZZLE DIAMETER, in.	1/8
EXTRUSION FEED RATE, in./sec.	1.5
EXTRUSION AIR PRESSURE, lb./sq.in.	5
MODEL ROWS	21
UNITS PER ROW	4
DNA SEQUENCE LENGTH	84

DNA SEQUENCE

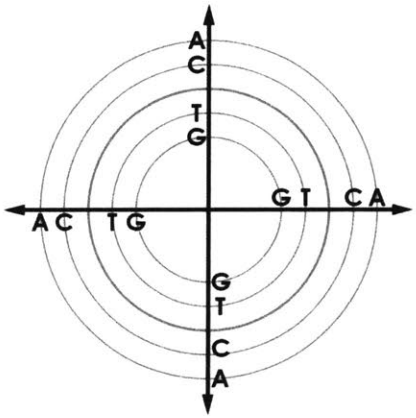
TATTACGTCTTATGCCTGTATAAGTCACATGTTGTTTGGT
TGCTGGACGCAGGGCGTGTGTAACGGGTGGCTTAG
ACTTGGTAT

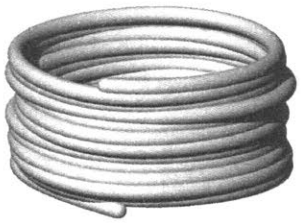
HUMAN BEING(S)	TWO ANON. HUMANS
MODEL SCALE	1/8
BIRTH WEIGHT, lb.	224.62
DATE OF BIRTH	4/22/17

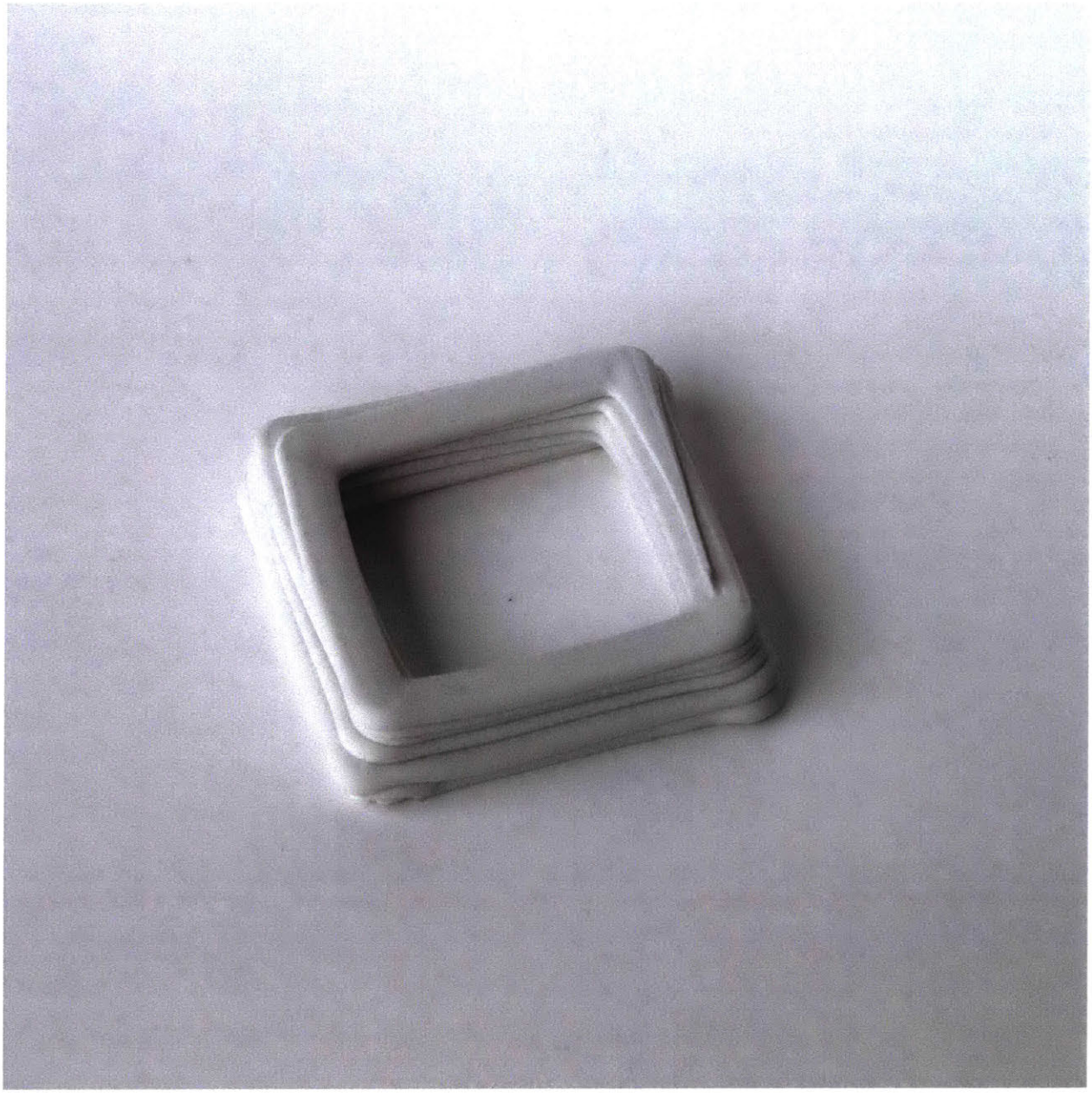




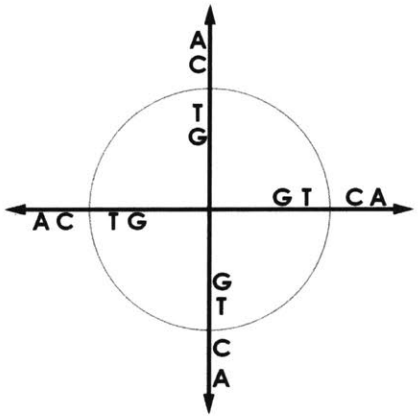
MODEL BIRTH HEIGHT, in.	1
MODEL BIRTH WEIGHT, g.	74
TOOL PATH TYPE	5
TOOL PATH LINE/CURVE	CURVE
TOOL PATH BASE DIMENSION, in.	2
TOOL PATH START HEIGHT, in.	5/64
TOOL PATH CLIMB RATE, z-axis in./unit	0.02
TOOL PATH END HEIGHT, in.	0.96
TOOL PATH OFFSET FACTOR (1)	1/32
TOOL PATH OFFSET FACTOR (2)	1/3
TOOL PATH MORPH FACTOR	1
TOOL PATH TWIST, degrees	10
TOOL PATH ROTATE, degrees	-5
EXTRUSION NOZZLE DIAMETER, in.	1/8
EXTRUSION FEED RATE, in./sec.	1.5
EXTRUSION AIR PRESSURE, lb./sq.in.	5
MODEL ROWS	12
UNITS PER ROW	4
DNA SEQUENCE LENGTH	48
DNA SEQUENCE	
TGGTTGCTGGACGCAGGGCGTGTGTAACGGGTGGC	
TTAGACTTGGTAT	
HUMAN BEING(S)	ONE ANON. HUMAN
MODEL SCALE	1/8
BIRTH WEIGHT, lb.	81.27
DATE OF BIRTH	5/5/17

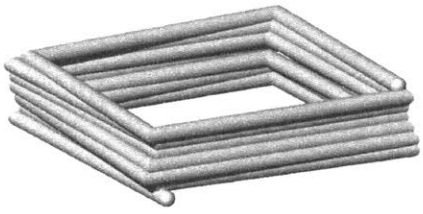


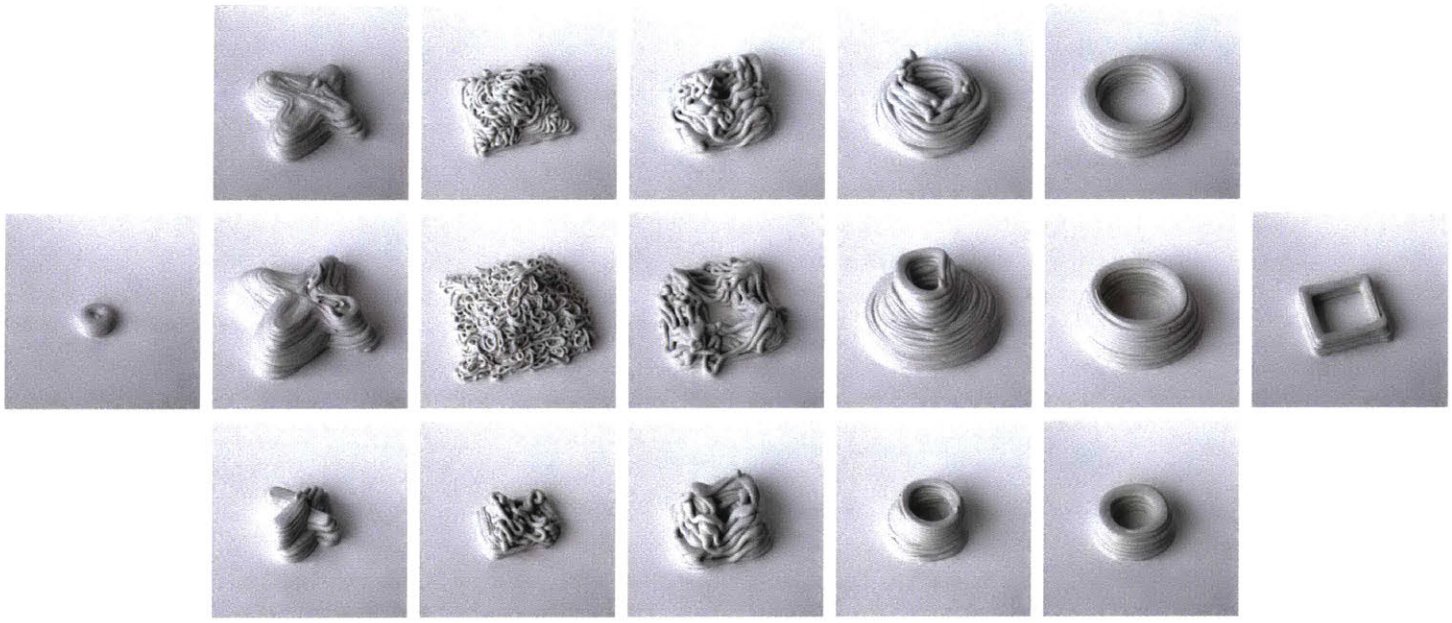


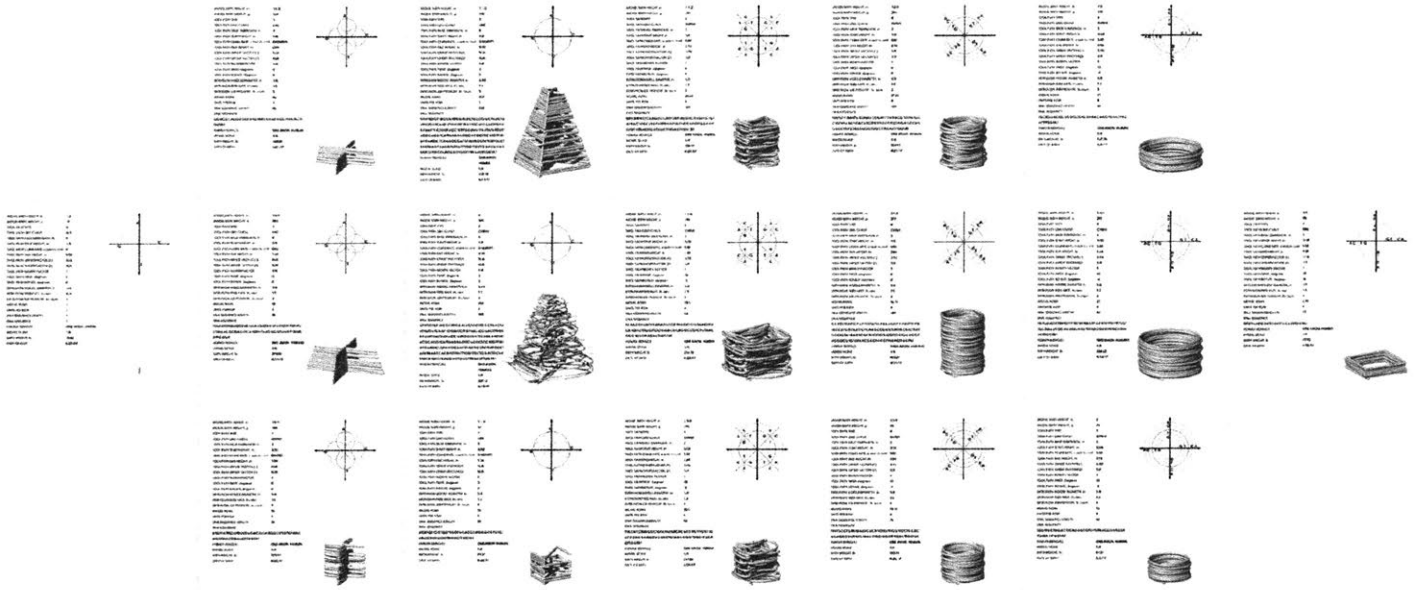


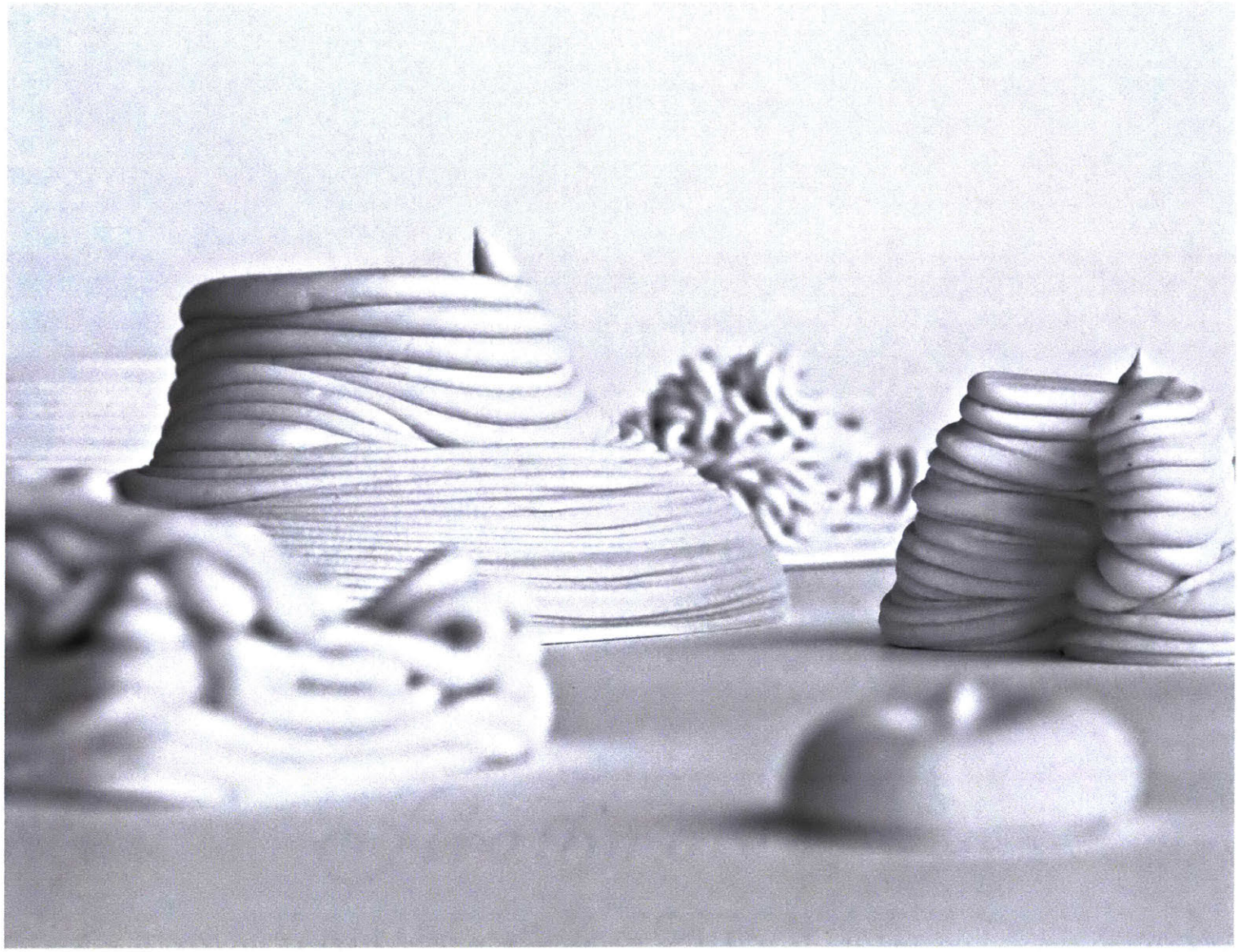
MODEL BIRTH HEIGHT, in.	5/8
MODEL BIRTH WEIGHT, g.	48
TOOL PATH TYPE	6
TOOL PATH LINE/CURVE	LINE
TOOL PATH BASE DIMENSION, in.	3
TOOL PATH START HEIGHT, in.	5/64
TOOL PATH CLIMB RATE, z-axis in./unit	0.02
TOOL PATH END HEIGHT, in.	0.54
TOOL PATH OFFSET FACTOR (1)	1/16
TOOL PATH OFFSET FACTOR (2)	1/3
TOOL PATH MORPH FACTOR	1
TOOL PATH TWIST, degrees	10
TOOL PATH ROTATE, degrees	-5
EXTRUSION NOZZLE DIAMETER, in.	1/8
EXTRUSION FEED RATE, in./sec.	1.5
EXTRUSION AIR PRESSURE, lb./sq.in.	5
MODEL ROWS	6.75
UNITS PER ROW	4
DNA SEQUENCE LENGTH	27
DNA SEQUENCE	
GTGTAACGGGTGGCTTAGACTTGGTAT	
HUMAN BEING(S)	ONE ANON. HUMAN
MODEL SCALE	1/8
BIRTH WEIGHT, lb.	51.92
DATE OF BIRTH	4/22/17

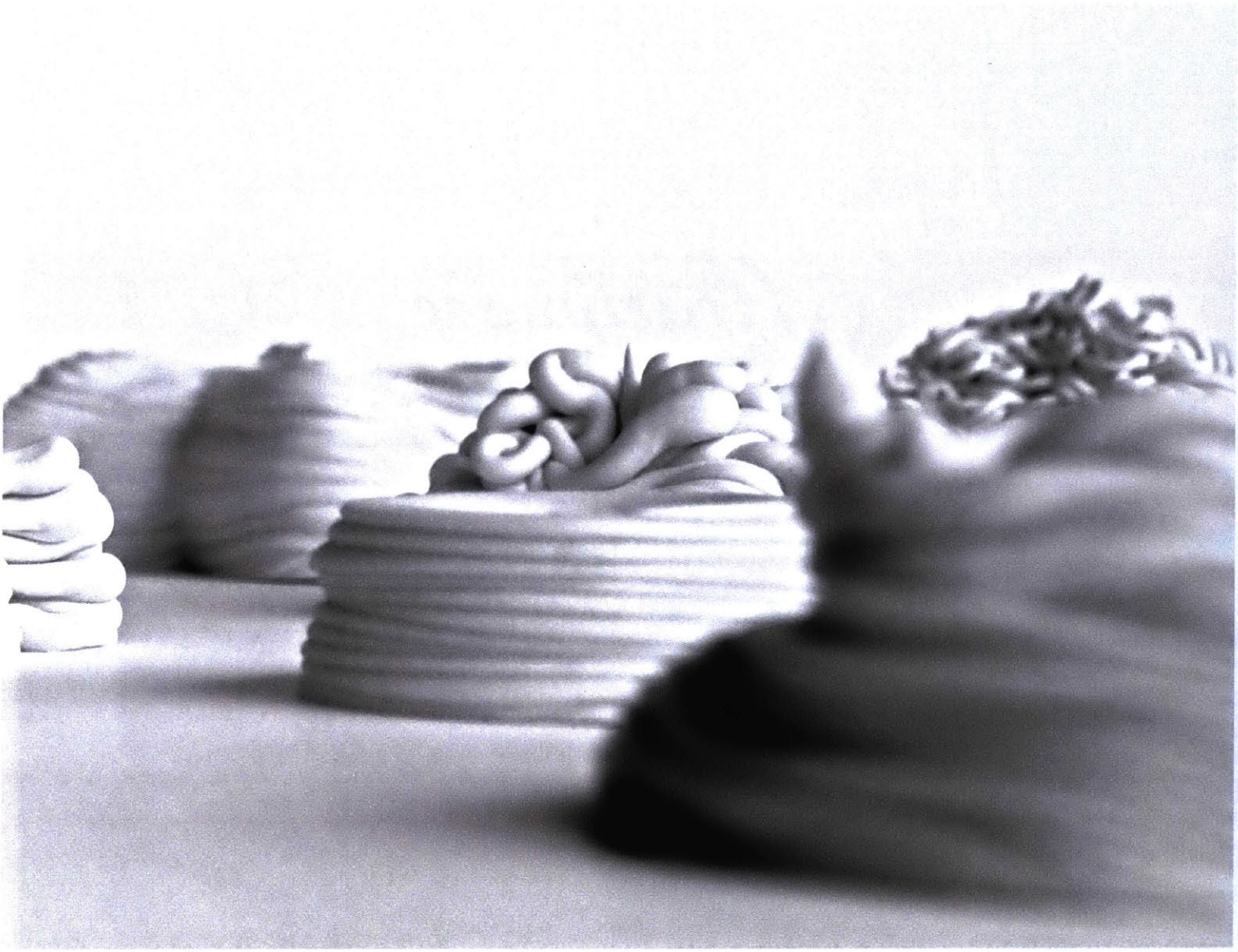












EPILOGUE

RAISON(S) D'ÊTRE (FOR WHO?)

These short texts provide some human context and personal background regarding the origins, impetus, and intentions of this thesis.

ARCHITECTURAL DESIGN DISCOURSE

As a project within the Massachusetts Institute of Technology Department of Architecture, this thesis is subject to the context and conventions of progressive American architectural academia, and presented to an audience of architecturally minded individuals. The conversation between this collection of individuals (past, present, and future)—and the amalgamation of texts and projects and constructions that they have produced—comprises the discourse of architectural design. Although this thesis explores subjects, materials, and techniques which are for the most part outside of the discourse and beyond the capacities that a contemporary architect is conventionally compensated for, it does so with the aim of appropriation, to redirect these ideas back into the discourse as viable modes of operation. This point is made methodologically, through the use of fairly conventional means of architectural research, design, and fabrication tools, in an attempt to express an alternative trajectory that might lie dormant in the discourse.

MY SELF (AND ALL EMPATHIC BEINGS)

> What is the goal of life? It is to create yourself a soul. (Jodorowsky)

It is often discussed how a thesis is important to a discipline or discourse, but rarely is it examined how a thesis is important to us personally as humans. An individual inevitably invests a great deal of their self in anything that they do. With enough self-awareness and personal reflection, an individual has the opportunity to learn a great deal about their self in the process of doing anything that they do. I am personally grateful to have this opportunity with this thesis, to use it to find out more about myself, what interests and excites me, what drives me. This thesis is also an opportunity to initiate—or perhaps discern a pre-existing—a project (in the Eisenmanian sense) for myself, to continue in life beyond academia. For this project, this thesis is intended to create—and build on—documents and artifacts to refer back to, reflect on, a build on as I continue forward. As a project of transformative self-expression, this thesis is latent with the desire to reach other empathic and receptive human beings—and all sentient beings, alien or otherwise—to seek out like minds, and perhaps even change some unlike.

Alejandro Jodorowsky, *Jodorowsky's Dune*, dir. Frank Pavlich (2013; Cannes: Sony Pictures Classics, 2014.).

Peter Eisenman, "Project or Practice?" (lecture, Syracuse University School of Architecture, Syracuse, NY, September 30, 2011).

OBJECTIVELY SUBJECTIVE

> It matters what stories we tell to tell other stories with;
>
> it matters what concepts we think to think other concepts with.
>
> (Haraway 138)

Who am I?

What am I?

What makes me *me*?

Why am I here?

Where do I come from?

Where do I go from here?

How can I find meaning?

How can I find contentment?

How can I be happy?

Why do I feel this way?

Why do I think this way?

What is the goal of all of this?

It seems fundamentally human to ask these questions, and also fundamentally human to believe that one has—or can have—answers. It is a comforting way to go through life to believe that one has these answers. One can also find comfort in the belief that there is no point in trying to find them. It is (or should be) a right of each individual, however worrisome and discomforting and perhaps unforgiving, to stake out one's own path in these respects. Most humans want to believe that what they believe is 'right' (or at least 'okay').

This thesis simultaneously embraces the subjective nature of being human *and* the contrasting human tendency towards presuming personal objectivity. (This is a roundabout way of saying that I know that I have no idea what I'm talking about, but for the most part, neither does anyone else.)

Donna J. Haraway, "Sowing Worlds: A Seed bag for Terraforming with Earth Others" (2010), in *Beyond the Cyborg: Adventures with Donna Haraway*, by Margret Grebowicz and Helen Merrick (New York: Columbia University Press, 2013), 137-146.

IDENTITY AND AESTHETICS

> Without getting too complicated, let's say that the word being points to life, to our social constructions, and to a sense of identity in the world, whether valid or not, whether validated or not.
> (Jarzombek 2)

Human being	Human being
roving	curious
pissing	sensitive
shitting	caring
fucking	loving
spitting	empathic
shedding	gentle
bleeding	fragile
bags of blood.	creatures.

This thesis makes little attempt to define human being, only to explore what it means to be human. In fact, one might speculate that there are more definitions of what it means to be human than there are humans. Past definitions have delineated humans from other animals through characteristics including skin tone, body hair, cranial shape, manual dexterity, bipedal stance, and brain complexity, each leading to varying degrees of alienation and discrimination. This thesis positions design relative to the 2008 *Museum of Modern Art* exhibition "Design and the Elastic Mind," as means for human beings to negotiate new modes for understanding and expressing—not necessarily defining—our selves, and to make tangible previously inaccessible information about our selves (including that of our genetic code). This thesis posits that through the ongoing human project of technological advancement, the definition of human being will only continue to expand and augment.

Human beings are conventionally understood, characterized, or identified through their body and its outer membrane. (Teyssot) However, this corporeal description is growingly increasingly inadequate, through continuously expanding notions of selfhood, and continuously increasing awareness of human potentialities. And for some humans, the body that they are born with will never serve as an authentic expression of their self-identity. On a personal level, rarely in my life has my outer appearance matched match my inner feelings, or sense of self. For most of my life, I've dealt inwardly with feelings of depression, and yet I've done my best to maintain an outwardly positive disposition. I'd rather hold these feelings in than bear the guilt of imposing them to another being. In spite of my internalized conflict, I would describe myself as having a fairly cheerful and optimistic temperament. I don't necessarily think any of these conflicts will be solved, or get better, but I do hope that I'll get better at coping and adapting to them. I was born with the body of a male, and yet I've always emotionally empathized more so with females (perhaps even from the perspective of a female, *as* a female), dealing with feelings of male inadequacy and overcompensating for my self-perceived effeminacy. I was born from an interracial couple, in a relationship that would not have been constitutionally protected in the United States when they themselves were born, and yet I have blue eyes, light hair, and fair skin. As a white male of almost Aryan aesthetic, I go through life with profound privilege: privileges that might not normally be afforded to one side of my family, to one actual half of me; privileges that I myself feel that I do not deserve, that no person or group of people should deserve if they are not afforded to all human beings. I disclose this personal perspective to emphasize the profound weight of the potential disconnect between identity and aesthetics on the everyday human experience (as understood through my own human experience), and to outline this intersection as a powerful and weighted locus for design investigation and intervention with the plastic art of architecture. Design can be a rigorous means of self-exploration, self-expression, and self-actualization.

Paola Antonelli et al, *Design and the Elastic Mind* (New York: Museum of Modern Art, 2008).

Mark Jarzombek, *Digital Stockholm Syndrome in the Post-Ontological Age* (Minneapolis: University of Minnesota Press, 2016).

Georges Teyssot, "Architecture as Membrane," in *Explorations in Architecture: Teaching Design Research*, ed. Reto Geiser (Basel: Birkhäuser, 2008), 166-175.

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[Exhibition: February 24 – May 12, 2008 http://www.moma.org/calendar/exhibitions/58 (accessed June 15, 2016).]
The state of design is strong. In this era of fast-paced innovation, designers are becoming more and more integral to the evolution of society, and design has become a paragon for a constructive and effective synthesis of thought and action. Indeed, in the past few decades, people have coped with dramatic changes in several long-standing relationships—for instance, with time, space, information, and individuality. We must contend with abrupt changes in scale, distance, and pace, and our bodies and minds need to adapt to acquire the elasticity necessary to synthesize such abundance.
(Glenn D. Lowry, "Foreward" 4-5.)

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