resonant frequency

Clay Robert Moulton

Thesis submitted to the faculty of Virginia Polytechnic Institute and State University in partial fulfillment of the requirements for the degree of:

Master of Science in Architecture

Robert Dunay
Program Chair
Committee Chair

Mitzi Vernon
Associate Professor
Committee Member

William Green
Associate Professor
Committee Member

Clive Vorster
GTA
Committee Member

abstract:

This Industrial Design graduate thesis is a response to the discussion surrounding the question, *How can Design move from Green to Good?* Three artefacts have been designed. These artefacts respond to a context. Context, in this body of work, is *time*. Time as context is about knowing the *before now,* applying it to *the now,* to positively affect the *after now.* The artefacts respond to three distinct lifetimes: 5 minutes 45 seconds, 8 hours 45 minutes, and 10 years. The intent is to utilize a Natural system, *time,* in a manner beyond typical product life-cycle-analysis. Also included are a series of essays which investigate and comment on issues and insights encountered during the Design process of this thesis.

contents:

list of figures:

All images are property of the author, unless otherwise noted.

Industrial Design (ID)
is the professional
service of creating and
developing concepts and
specifications that optimize
the function, value and
appearance of products
and systems for the mutual
benefit of both user and
manufacturer.

Industrial Designers Society of America (IDSA), 2005

The statement at left may be considered the single driving force behind the work contained within the following pages. It is a definition of the professional field of Industrial Design (ID). Within recent history, the professional fields of the applied arts (Architecture, Interior Architecture, and Building Construction, Landscape Architecture, Industrial Design, Graphic Design) have begun to witness and adapt to a shift in paradigms. The paradigms *of making* are evolving, precipitating a reconsideration of the collection of methods, the process of Design, including our research, our drawings, our prototypes, and ultimately our *intent*.

A rapid increase in *Sustainable Design* methods and outcomes, also commonly called *Green Design*, have become an apparent zeitgeist of this most recent turn of the century. The world is becoming more focused on the negative environmental outcomes of the Industrial Revolution, and in doing so, is beginning to question, and redefine the paradigm of making.

Professional service fields are being *called*. They have shown through prior art their capability for producing novel solutions to specific questions. However, the *systems* in which they function are beginning to ask difficult questions. In short, the field of ID is being asked to *deepen* it's consideration.

Notice in this definition of ID, there is no mention of an intent to *positively* affect or benefit a greater *context*, or specifically the environment, which all products, users, designers, manufacturers, and systems, *share*. The instinctual reaction would be to create an addendum, perhaps by adding a single phrase to the definition:

> "... that optimize the function, value and appearance of products and systems for the mutual benefit of *the environment*, the user, and the manufacturer."

The proposed addendum above may help redefine the field of ID. It may, however, further confuse the question of *What is Sustainable Design?* If any change were to be *an addendum*, it would likely be executed as such. It would likely be studied, taught, practised and generally considered as solution set *to be added*.

An addendum, unfortunately, is not within the spirit of sustainability itself. A simple addition of elements does not align with basic principles of Biomimicry. Fundamentally, Biomimicry is the utilization of *Nature* as model (Benyus). Thus, Nature's complex designs and processes become inspiration for

wicked human problems — where beautifully complex needs precipitate beautifully complex outcomes.

Theories, definitions, models, methods, and ethics that seek to be *reflexive* within our global context are required if the field of ID is to *be sustainable* (and not just *design sustainably*). In the work presented here, *context is everything*. The design process *itself* requires feedback, critique, and following those steps, *analysis and proposal of new methods*.

This body of work functions as an exploration of a meta-method. Though the three artefacts may be viewed as single outcomes, or deliverables within a thesis, it is also proposed that they function as constructive critique of a *greater* method. By shifting context to the forefront of the design process, this work may better be viewed as a point of departure towards further analysis, or as an instigator of dialogue, to better align the *intent* of the applied arts, especially ID, with the reality of our Natural world.

How can Design move from Green to Good?

"If I had one hour to save the

world, I would spend **59 minutes**

defining the problem and

one minute resolving it."

attributed to Albert Einstein

As a response to the discussion surrounding the question, *How can Design move from Green to Good?* three artefacts have been designed. These artefacts respond to a context. Context, specifically *time*, is about knowing the *before now*, applying it to *the now*, to positively affect the *after now*. The artefacts respond to three distinct lifetimes. The intent is to utilize a Natural system, *time*, in a manner beyond typical product life-cycle-analysis.

These three lifetimes have been calculated to be 5 minutes and 45 seconds, 8 hours and 45 minutes, and 10 years. The relationship of these lifetimes is derived from the Fibonacci sequence. All three lifetimes are an exponential function of a time (t) of 3.15576 seconds where

artifact one with a lifetime equal to $t \times 10^3$ (315 seconds)
artifact two with a lifetime equal to $t \times 10^5$ (315,576 seconds)
artifact three with a lifetime equal to $t \times 10^8$ (315,576,000 seconds)

Concurrent with the design of these three artefacts, a series of essays are provided to discuss issues encountered during the design process. The essays are responses to questions, and propose questions themselves. It is important to recognize them as pertinent to the *analysis* of context. The essays are written to exist perhaps external of this document.

The scope of this exercise is to explore the application of so-called *Green* Design methods in an attempt to better understand integrated, designed solutions. By combining *Green* and *Good* Design, or understanding them as an holistic intent, the process of Design may provide more powerful solutions to deeper social, environmental, and economic questions.

The three artefacts individually attempt to sustain *something*: a material, an activity, and an icon. Collectively, however, they attempt to sustain a specific understanding of Design.

t x 10^3

t x 10^8

t x 10^5

one 5 minute 45 second lifetime
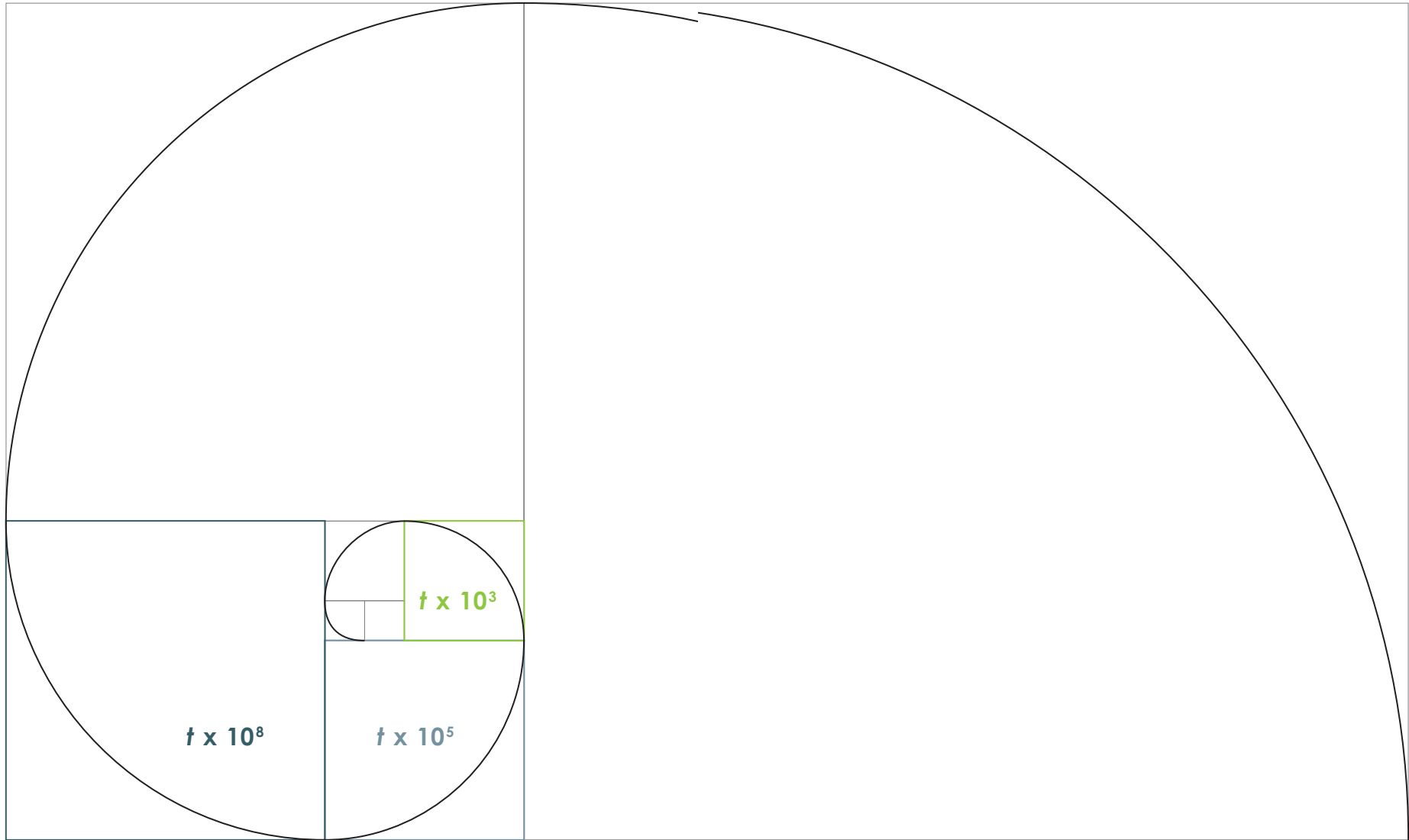
ninety-one 5 minute 45 second lifetimes
(8 hours 45 minutes)
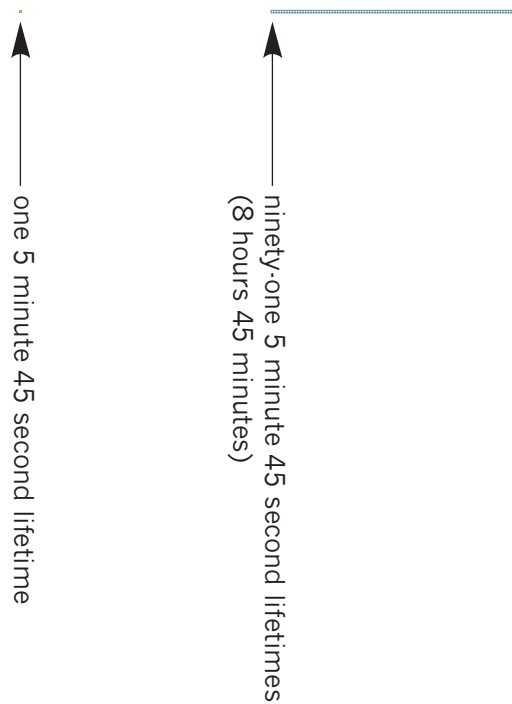
essay: on time

In developing this method, where the a Natural system (time) drives the conceptualization of objects, it became obvious that a literal, graphic representation could help clarify a notion of *consequence*.

Understanding the *potential for consequences* is imperative to understanding the economic, ecological and social power of ID. Everything we design is manifest in multiples; many, many, many multiples. Therefore, every precise line, every well-formed curve and every molded plastic bit we conceive is representative of the thousands, tens of thousands, hundreds of thousands, and perhaps millions of consequences, both *good* and *bad*.

Presented with this essay are three diagrams which attempt to show a specific understanding of *lifetime in relation to consequence*; a quantitative *and* relative understanding. These diagrams are born from a question: *Where do people see big numbers?*

Much of this graphic exercise is dependant on *resolution*. The specific resolutions which we see very regularly are on computer screens, and on printed materials, 72 dots-per-inch and 300 dots-per-inch, respectively. When viewing a typical 15"-diagonal computer monitor (with a pixel matrix 1024w x 768h), we are actually seeing 786,432 pixels. If we are to consider

2. Opposite: diagram of consequences 1:91

that the typical computer monitor *refreshes* at a rate of 60Hz, we are *actually* seeing 7,185,920 pixels *per second.*

The numbers derived from the application of the Fibonacci sequence are *big.* Ten years is 315,576,000 seconds. Rather than present big numbers as *just* a number, these diagrams represent 315,576,000 seconds, 315,576 seconds, and 315 seconds in a way that shows the *potential for consequence* of a designed object existing in time.

A single lifetime is represented by a single 0.0139" x 0.0139" pixel, or 1/72nd of an inch squared. The grid represents the potential for consequence relative to the next object lifetime.

Durations based on human activities offer another potential for understanding objects in time. An anthropocentric view provides a point of reference. *What do we do or use for 5 minutes? For eight hours? or for ten years?* Can we understand *contexts of larger scales* better through these associations between humans, objects and time?

By presenting these numbers graphically, as they are on these pages, a connection may be made to a model of thinking common to ID; manufactured, in multitude, *many of the same.* These massive grids present an understanding of consequence similarly. The power of alternative investigative drawings may also be seen. The artefacts presented in this document attempt to converse with these associations and interactions between designed objects and the context of time, using these visualization methods.

one 8 hour 45 minute lifetime

ten-thousand-eighteen 8 hour 45 minute lifetimes
(ten years)
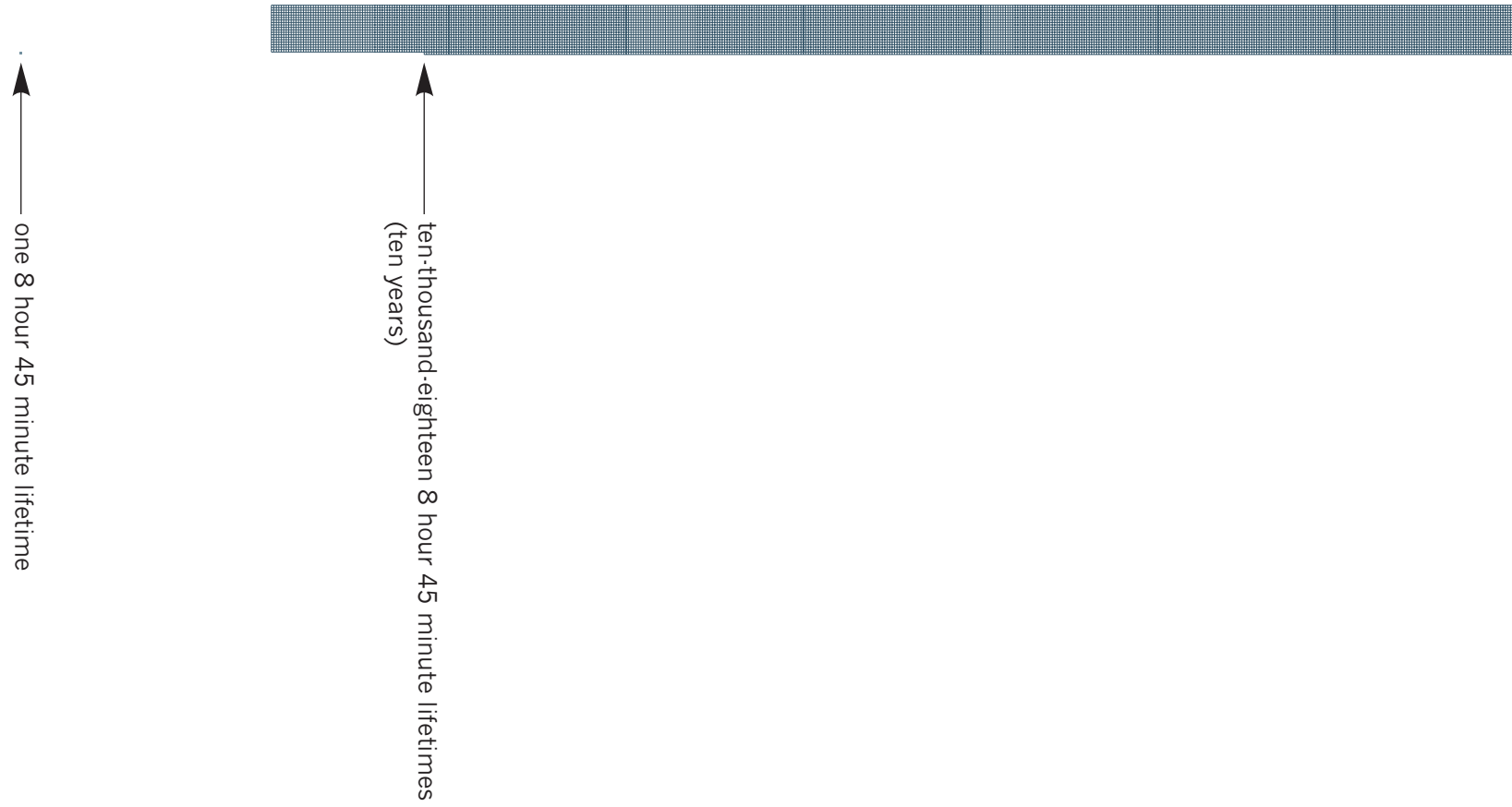
3. Diagram of conse-
quences 1:10,018

4. Following spread:
diagram of consequenc-
es 1:914,714

nine-hundred-fourteen-thousand-seven-hundred-fourteen 5 minute 45 second lifetimes
(10 years)

one 5 minute 45 second lifetime
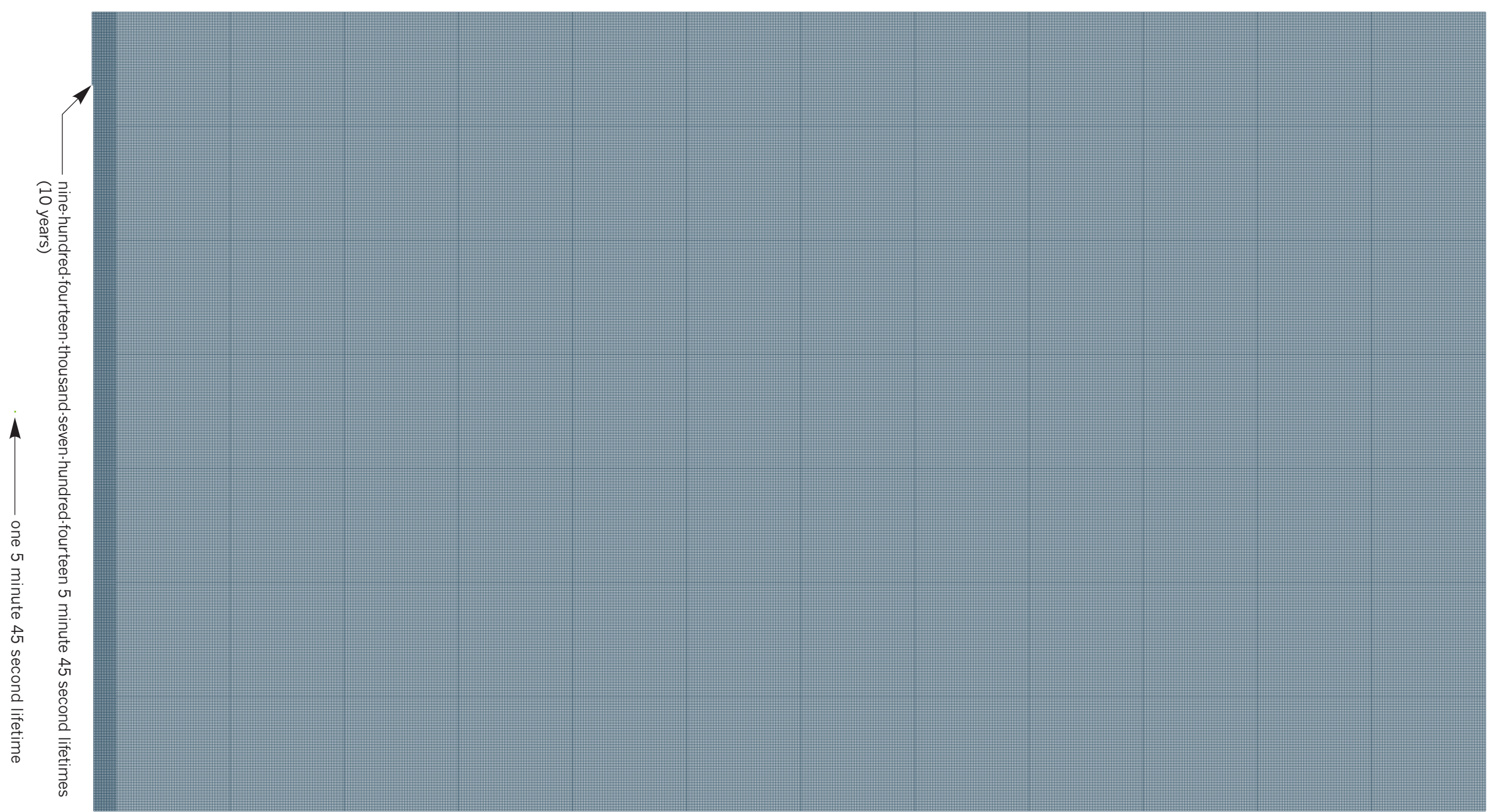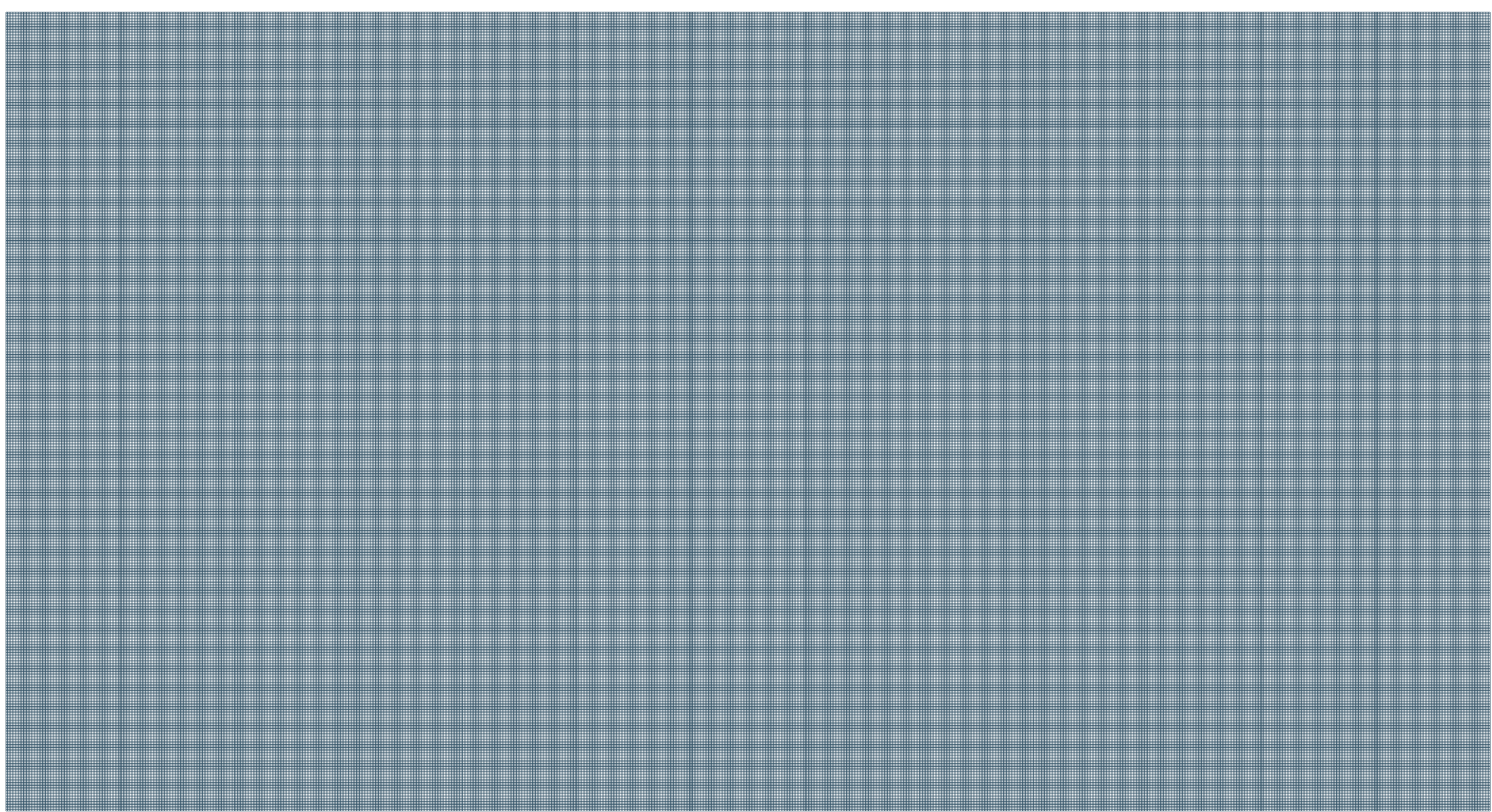
essay: product vs. artefact

If Designers are to understand the totality of manifesting our imaginations, we must address issues that exist within systems and scales beyond our immediate human scale. We often refer to our profession as Product Design, as opposed to, or in addition to, Industrial Design. This reference relies on a specific understanding of a single word: Product.

Product: an article or substance that is manufactured or refined for sale

Products are manufactured and sold, and therefore function within the systems of industry and economy. We may ask our ideas: *Will the Product be economically profitable? Will it be easy to make? Ultimately, will it be an item that intends to be manufactured and sold?* Industry and economy are *human constructs*. We consider them in *human lifetimes, human currencies, human capabilities,* etc., and may fail to realize the greater scope and scale of our design activities and their outcomes.

Another term may lend more potential in realizing the greater scope, scale, and perhaps power of our profession: Artefact.

Artefact: an object made by a human being, typically an item of cultural or historical significance.

Within the definition of Artefact, the terms 'cultural interest' connote a system of human relationships with each other, as well as human relationships with 'items' or 'objects'. The terms 'historical interest' imply that these relationships exist for some duration, with many having occurred in the past, some now, and many more in the future. Artefacts begin to imply time, a system of greater scale than our human constructs.

Designers of Artefacts may start to question their ideas with: *Will this object help sustain an economy or all economies? Will it be easy to make here and elsewhere, now and in fifty years? Will it be an item that intends to manifest cultural or historical interest?* By intending to create Artefacts, we may get closer to understanding the depth and totality of the profession of Design.

The definitions of Product and Artefact suggest systems in which they function. The question we are left with: *which thing, a Product or an Artefact, holds greater potential in defining our processes, our activities, and our outcomes? What is our intent? Product or Artefact?*

Industrial Designers tend to draw a certain way. We draw to communicate a combination of form and function, and to some extent material. If we excel at drawing a certain way, we can make *that* thing appear like it is a shiny, polycarbonate sheet covering an OLED screen, and *that other* thing on the side is made of African mahogany or is fuzzy and pink. Many of these drawings are *killer;* they look *good*, they *impress people,* and they *sell our ideas.*

We might even understand this way of drawing to be some sort of an industry standard, or better yet, the mountaintop, or the culmination of a set of communication skills. Beyond being necessary, these drawings might even represent, to some outside our profession (think: entrepreneurs, accountants, CEO's, market analysts, engineers), the essence or the intent the profession of ID. These drawings help establish a *vernacular.*

But do we really understand how or why these drawings work? Perhaps we are exploiting a characteristic of this particular style — without realizing it, or fully understanding it. What other profession shares many of the tools, techniques and general tricks with our killer drawings? The names of Jack Kirby, Neal Adams, and Osamu Tezuka may come to mind here. These are comic artists, perhaps some of the greatest and most influential.

Their methods in narrative, framing, motion, gesture, caricature, exaggeration, and visually emotive drawing are cornerstones of the graphic arts. They are *great* storytellers.

It may be argued that we attempt to do much of the same with our drawings. We use them to tell the story of our ideas. We are often trying to convince others that our ideas make sense, and will add value to a certain condition, or solve a relevant problem. We show *active* use of our ideas by people, in a place or setting. To do so, we need narrative, motion, exaggeration, etc., to make our potentially lifeless drawing vital — it's got to 'pop' off the page.

What happens when our ideas need help *in generation?* What drawings do we use when our field is evolving, and our paradigms are changing? In this sense, the comic art methods of narrative, motion, etc., seem to fail in allowing study of an idea or concept as abstract as a paradigm shift. Perhaps we start to understand the ideas themselves as an exaggerated, in-your-face, slammed-to-the-walls 2-point perspective with maximum contrast and non-copy-blue pencil construction lines. Exaggeration, caricature, gesture, may not be necessary, and worse, may cloud the exploration of such abstract ideas.

Designers have many different ways of understanding and using the tool of graphic communication in various media. Isometric, axonometric, diagramatic, sections, plans, elevations, watercolor renderings... Some of these drawings are used to explain how an object is to be built, or how it was built. These drawings have actual physical outcomes in many cases. Usually, we give these drawings to other people that are in charge of making the molds for our plastic bits and pieces in the thousands and millions.
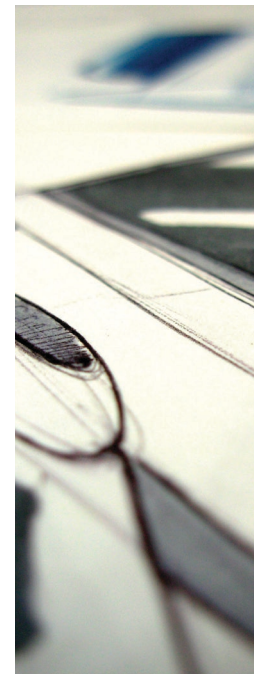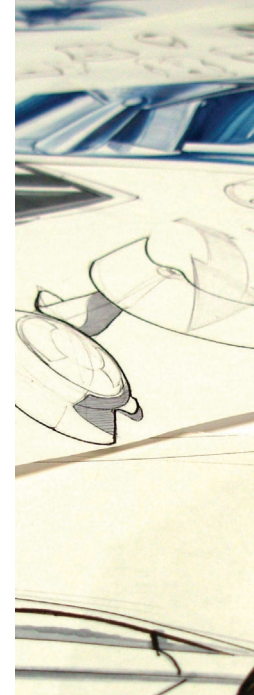
On the other hand, some of our drawings are used to explain how an object is conceived, or are used as tools within the process of conception. We usually give these to each other to create a dialogue about our ideas. We use them to solicit feedback. And they help our ideas get *smarter.*

Smart ideas *must* be queried, opened for dialogue, investigated — studied even. However, I think we may begin to confuse the utility of these different drawing methods. Is my good idea getting killed by my *killer* drawings? Are yours? Maybe some ways we draw will help us create a more powerful definition of the things we make. Maybe by investigating our ideas *through* drawing, rather than *just* trying to animate them, we can answer questions that bigger systems ask us. Design *can* solve big problems, and answer very difficult questions if we let it. So, are we just telling a story, or can we use drawings to investigate *critical* topics; to answer big questions?

5. Images of potentially killer drawings

arte-
fact
one

A sponge is dipped in fluid porcelain clay. After drying, the porcelain-impregnated sponge is burnt in an oven. In this way porcelain products can be created without the use of moulds. The sponge disappears entirely and the porcelain adapts perfectly to its shape.
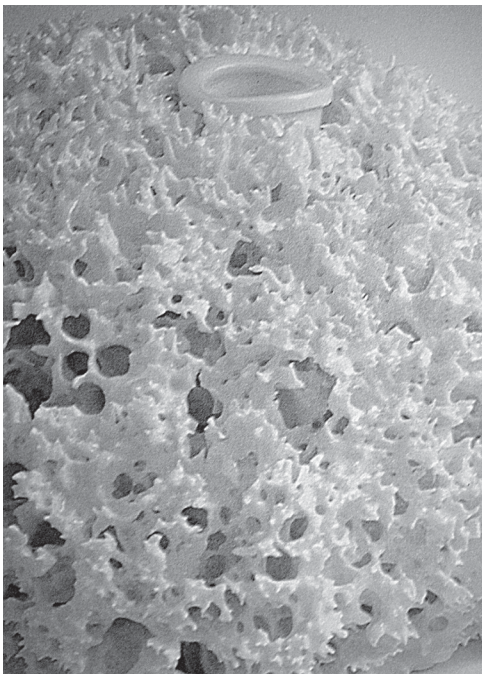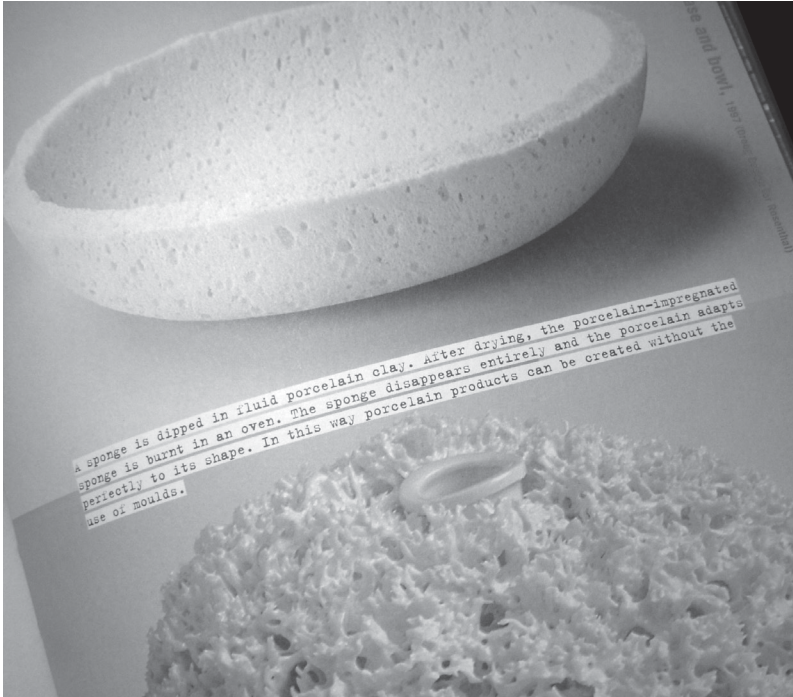
6. Previous: image of Corrulain espresso

7. Above: image of Marcel Wanders' Foam Bowl and Vase, 1997, Droog Design for Rosenthal (photo courtesy of Marcel Wanders Studio)

8. Left: detail of Marcel Wanders' Foam Vase (photo courtesy of Marcel Wanders Studio)

9. Right: the forms of corrugated kraft paper

concept: Corrulain
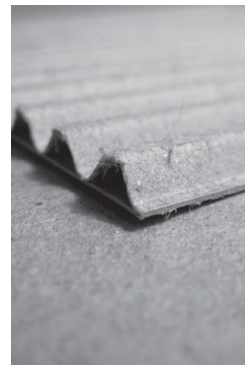
So what do people do for five minutes and forty-five seconds? To initiate the research for the first artefact, I posed that question to a dozen-or-so friends and fellow students in a casual and unscientific fashion; this is not to be confused with in depth ethnographic research. Overwhelmingly, the answers tended towards the activities of eating and drinking.

The types of products associated with consuming food or beverage generally break out into two categories: *fast* and *slow*. For the first artefact, this notion of *fast* mates well with the five minute and forty-five second lifetime. Most people are familiar with *fast food*, and likewise, the associated fast food packaging and service products (*fast products*).

Regardless of the function, the vast majority of *fast products* share something in common beyond their respective short lifetimes. The materiality of *fast*, in this specific food sense, is largely derived from processed wood pulp, in various forms and finishes. Paper cups, paper plates, paper bags, paper containers, cardboard boxes, kraft paper, etc., carry a specific connotation due to their inherent lack of durability. These products are not *intended* to last, and therefore the forms, as influenced by their materiality, connote similar intent.

The question posed by the Corrulain cups exploits this dichotomy. By generating a form influenced by a specific materiality (in this case, corrugated kraft paper), and applying a new material (unglazed, low-fire porcelain), can the *intent* to last (or not) be highlighted? Simply put, how can 5 minutes be made to last in perpetuity?

The manufacturing method for the Corrulain cups resembles the process used in Marcel Wanders' Foam Bowl and Vase manufactured by Rosenthal. A carbon-based substrate is dipped in porcelain, and when fired, burns away, leaving a shell of its former, less durable self. The use of porcelain in Wanders' Foam Bowl and Vase, as well as the Corrulain cups, attempts to freeze the *fast* form in a *slow* product.

Corrulain may be seen as a process including several artefacts. The first artefact is a kraft paper donor cup. The donor could exist quite happily as a fast product, as an insulated disposable cup if it is waxed and sealed. However, the kraft paper donor can be dipped in low-fire porcelain and bisque-fired. Once dipped, the cup is essentially useless until it is fired, or the porcelain is rinsed away. After the cup has been fired, it exists with a larger *potential for consequence*; to be a long-life artefact. Once fired, It can be used perpetually, or crushed and the porcelain shards returned to the manufacturer to be reclaimed.

The fired pieces are not intended to be glazed. The reasons for this are two-fold. First, glazed porcelain is not able to be re-used as easily as unglazed porcelain. Second, by leaving the interior surface of the vessel slightly porous, liquids such as coffee will leave an imprint. The porcelain cups are willing to accept a patina of sorts, and will provide for a record of their use, locking it into the material.

The vitrification of the porcelain could take place in a distributed fashion, that is, either at a place of manufacture, or in a coffee shop, or in a home. Corrulain gives the choice to be *fast* or *slow* to the user, and at multiple points within its lifetime. A five-minute life may no longer last just 5 minutes.

10. Images of Corrulain espresso

2.50" ⌀

A

2.60"

A
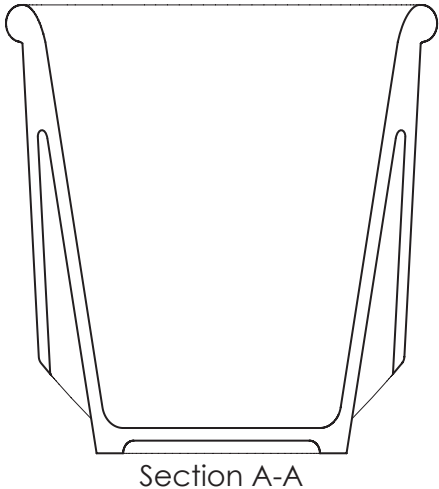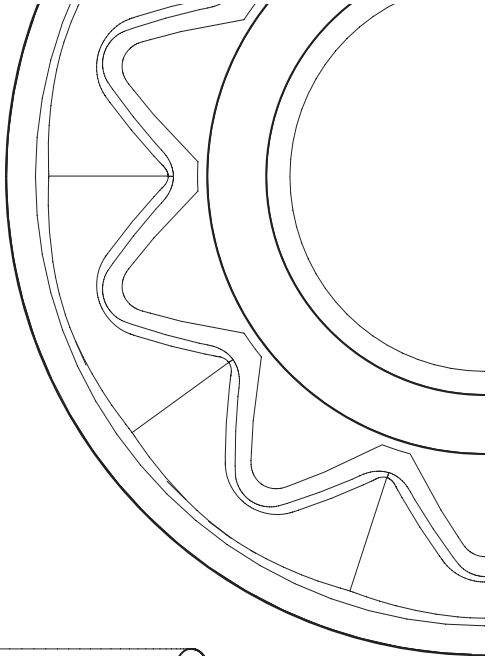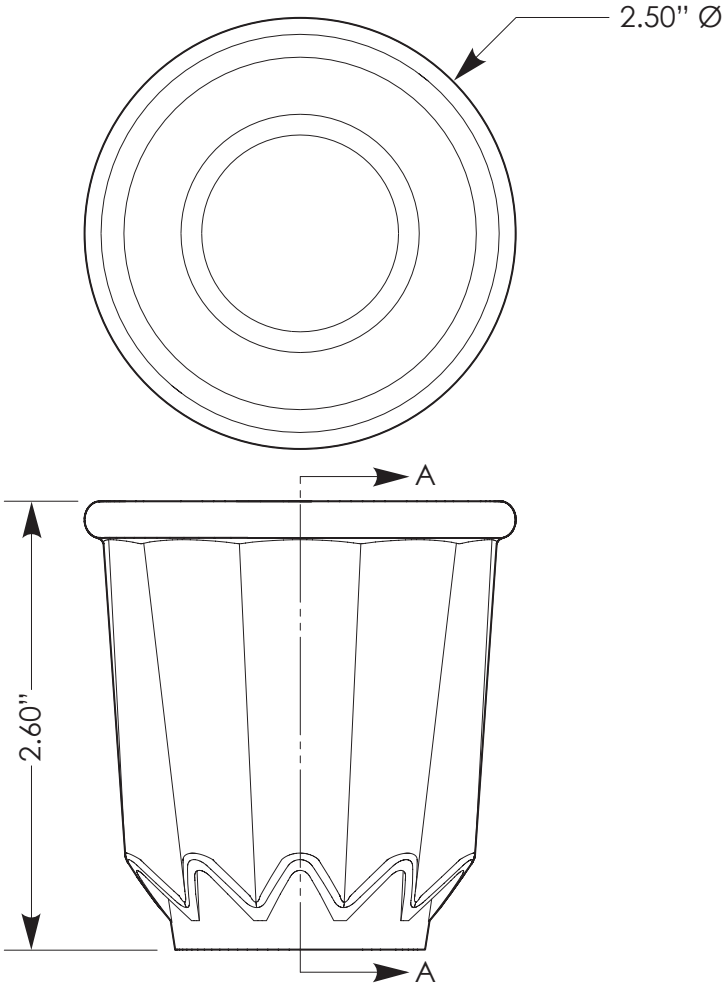
Section A-A

11. Drawings of Corrulain espresso
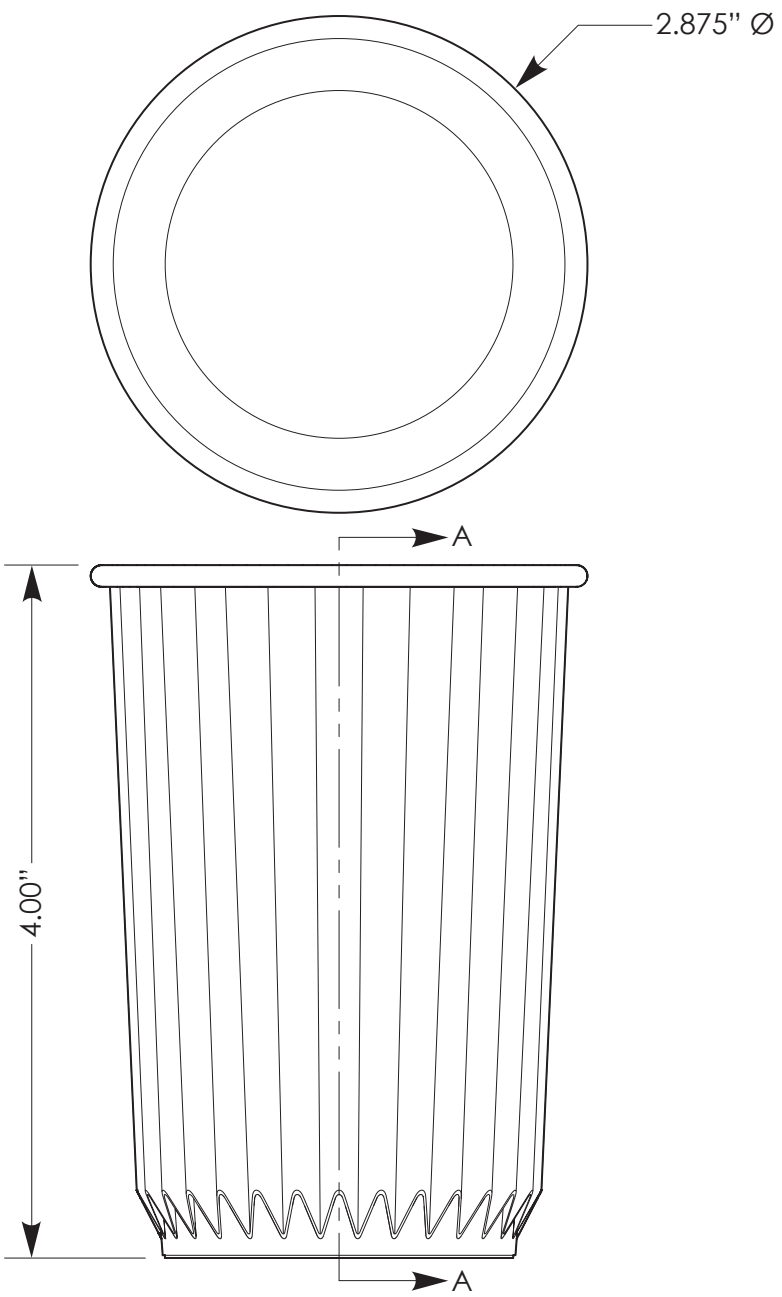
2.875" Ø

A

4.00"

A

12. Drawings of Corrulain
café americano

Section A-A
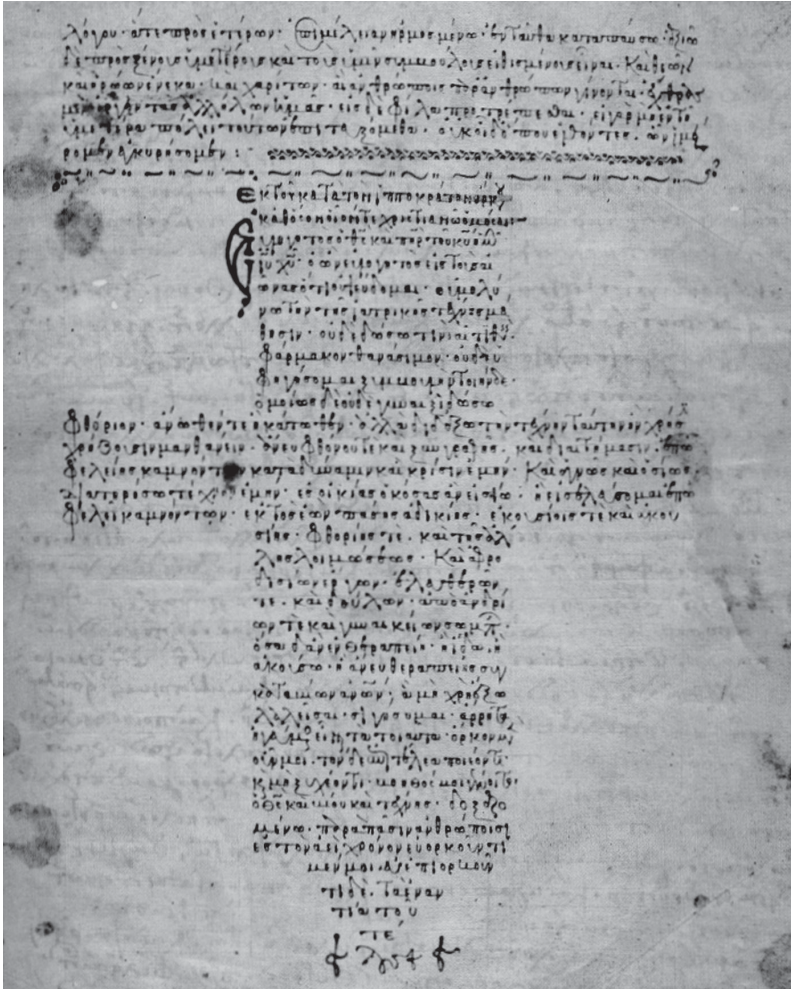
13. Image of a Byzantine manuscript of the Hippocratic Oath (public domain).

essay: the doctor/patient relationship
or
"first, do no harm"*

A Patient walks into a Doctor's office. The Doctor asks, "what ails you, patient?" The Patient replies, "I have a head-ache, and I will pay you to remove my appendix." The Doctor pauses, and recalls the Hippocratic Oath, "...I consider for the benefit of my Patient and abstain from whatever is harmful or mischievous..."

A similar potential conflict of interest arises in the profession of Industrial Design (ID), if we are to consider a broader understanding of the relationship between User/Designer/Client. Who is the Patient in this *triumvirate?* Who is the Doctor? Where is *our* context?

The profession of ID is generally perceived as a service profession. We serve our Clients and we serve the Users of our products. Perhaps we should seek to redefine that understanding of service. Within our Design process, there are points where we receive feedback. The Doctor similarly performs tests and solicits feedback from the human body of the Patient to diagnose a condition or problem. The Doctor then attempts to remedy the diagnosed problem. The feedback for Designers ranges in scale from particular critique of a curve, or form, or a drawing, to a manufacturer suggesting an alternative process, to a global climate change.

In the case of the Doctor, it is vital to analyze feedback properly, to assure a

correct diagnosis and effective treatment. However, we as Designers are only recently beginning to pay attention to the *unsolicited* feedback we receive at the largest scales.

If we are to consider the solutions Design has historically provided as parts of a whole, as *the industry of manufacture* in our *built environment serving our Clients and Users*, we may further see a need to reconsider our role within the *triumvirate* due to feedback from our environment. We may conclude that it is our ideas, our products, and our solutions that are a less then optimal fit to our context to serve our Clients and Users. Our global context is beginning to harm both our Clients and the Users. What is crucial to recognize is that we can fix this problem — now.

So, do we need to establish a core ethic that includes our context? Does Design need a Hippocratic Oath to protect the environment? Is this a question of governance? Do we intend to police ourselves?

William McDonough often states that outright regulation is not a means to uphold or insight the tactics presented in *Cradle to Cradle*, or in a greater sense, Sustainable Design as a strategy ("The Next Industrial Revolution"). I tend to agree with McDonough, that the addition of *dictum* to demand an *ethos* would likely do less to stimulate integrated solutions, and more to confuse the issue. It

enables assignment of specific responsibility, rather than bringing us closer to the realization that it is a collective responsibility. Mandating an ethical code of conduct for Designers will likely result in greater confusion, and less constructive dialogue.

If we are to look towards the Natural systems of our environment for guidance, we may conclude that Nature does not explicitly say *no*. Trees do not regulate the wind which passes through their leaves, nor does the worm regulate any relationship it has with the soil. The concept of evolution works to *find* the better solution, not by *demanding* it. Nature is reflexive; it analyses its context, feedback from prior iterations, then creates a prototype. The prototype is tested, and *that* feedback is included in the next, *better*, iteration. Perhaps Designers can learn from Doctors, fostering more considerate relationships, and begin to apply the power of a *Natural* design method.

Note: it is a common misconception that these words appear verbatim in either the early Greek or modern versions of the Hippocratic Oath. The dictum "First, do no harm" is often attributed to Hippocrates, as translated and interpreted from a passage in Epidemics, Book I, Section XI which reads:

"Declare the past, diagnose the present, foretell the future; practice these acts. As to diseases, make a habit of two things — to help, or at least to do no harm."

arte-
fact
two

lb

mass at a height (potential energy)

acceleration (gravity)

torque (kinetic energy)
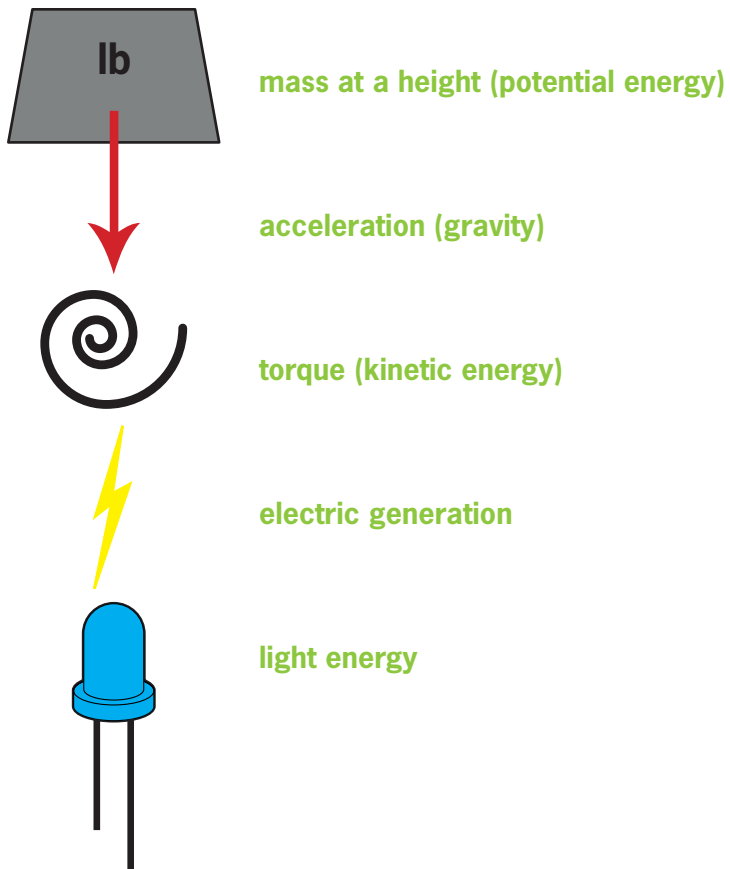
electric generation

light energy

Gravia is an LED-lit floorlamp energized by people. To light Gravia, the user places a mass approximately 48" above the ground, that, in falling, powers a mechanism, generating electricity. Gravia harnesses the potential energy imparted by the user, rather than relying on any existing electrical infrastructure.

The design goal of Gravia is to provide light in a room (600-800 lumens – roughly equal to one 40 watt incandescent lightbulb), over a period of 4 hours, using people to generate power. The estimated life cycle of Gravia's mechanisms are greater than 200 years, if used 8 hours a day, 365 days a year. An interesting reconsideration of lifetime arises with this fact. The LED's, which are generally seen as long-lifetime devices, become short-lifetime components in comparison to the drive mechanisms.

The acrylic lens, when paired with the narrow-band, high-output LED's also provides insight towards alternative views of lifetime. The LED's produce a slightly unnatural blue-ish light. As the acrylic ages, it becomes slightly yellowed and crazed through exposure to UV light. The yellowing and crazing will tend to mitigate the unnatural blue hue of the LED light. Thus, Gravia will produce a more natural color of light with age. It is predicted that the acrylic will begin to yellow within 10-15 years in an interior, domestic application.

14. Previous spread: rendering of Gravia

15. Opposite: diagram of Gravia concept

The precedent for this lamp lies within horology – the science of keeping time. Gravia recalls the types of 'grandfather clock', 'hourglass' and 'wind-up clock'. User input provides the potential energy for these devices, and maintains a cycle of timely upkeep for the life of the object.

Gravia is also metaphor for an understanding of social activism. The mechanism of social activism may be understood as a flywheel, where each participant in society is not necessarily required to provide all of the energy to power a movement, but instead, contributes with others, bits at a time to accomplish positive change.

16. A rendering of a lit Gravia in a corner condition

17. Diagram of Gravia's mechanisms

mass is drawn downward by the force of gravity over a period of 4 hours

downward motion is converted to torque through a high-efficiency ball-screw

input torque from the ball-screw is overdriven at 1:160 by a harmonic drive gearhead

output from the harmonic drive gearhead spins a rotor comprised of a set of 12 high-strength neodymium magnets

the rotor spins within a stator housed in the base creating electricity which is rectified and stored in a capacitor bank,

the stored electricity powers a set of 10 high-output LED's that fire into the acrylic lens, creating a diffuse light source

front view

side view

top view

aluminum end cap

brass weights (5 x 10 lbs)

high-efficiency ball-screw

acrylic lens

aluminum housing:
overdrive, generator
and LED's

rubber o-ring base

58"

16"
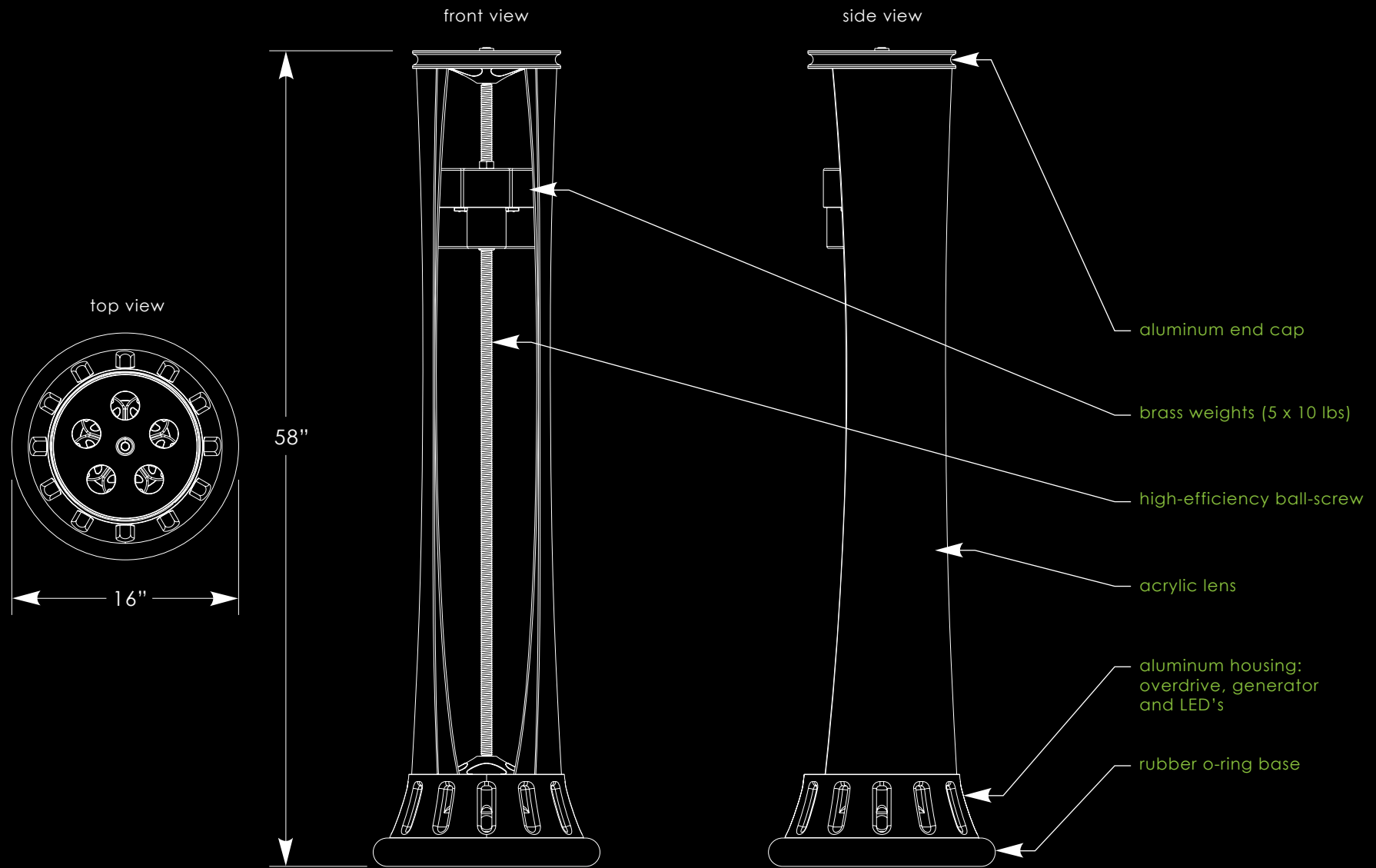
1

To reset the GRAVIA lamp, the user begins by removing the aluminum end cap and placing it on a level surface.

2

The user then places each brass wieght in the end cap, one at a time. The end cap provides a safe and sturdy storage spot for the brass weights while the lamp is reset.

3

Once all the brass weights are nested in the end cap, the user then removes the ball-screw by gently lifting it upwards.

user experience: resetting the GRAVIA

4
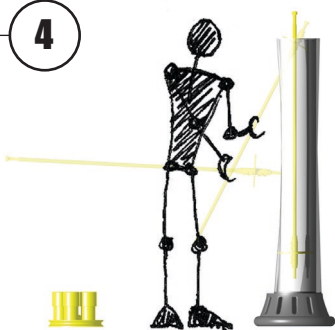
As the ball-screw moves clear of the harmonic drive gear head, the user rotates the ball-screw so that the weight sled is at the top of the lamp.

5

The ball-screw is then gently lowered back into the gear head, where it engages the splined input.

6

One at a time, the brass weights are placed back into the weight sled. After the 5th weight is replaced, the sled will begin is delicate return towards earth, powering the lamp.

7
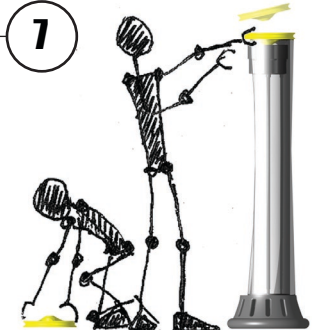
The user completes the resetting of the lamp by replacing the aluminum end cap.

At any given time, the lamp may be 'turned off' by removing one of the brass weights.

On May 1st, 2007, the Gravia floor lamp was submitted to Urban Re:vision's Re:volt online design competition. As part of a multi-competition effort including Re:route, Re:store, and Re:connect, Re:volt sought alternative means for powering a single city block. Winners of the competition were released on May 15th, 2007. The Gravia floor lamp received an honorable mention.

In preparation for potential public disclosure through the competition, the Gravia floor lamp was also issued provisional patent number VTIP:07-052, through Virginia Tech Intellectual Properties. This experience provides for a brief insight on the nature of *prototypes*.

The patent process may be understood as a practical peer review of a prototypical object. If an idea is subjected to the questioning of, and investigation by professionals in related fields, the idea gains practical relevance. In hindsight, the knowledge and experience in the patent process is, to me, fundamental to an understanding of Designer as Inventor. Thanks to this process, the *idea* of Gravia was deemed practical, innovative, and potentially lucrative.
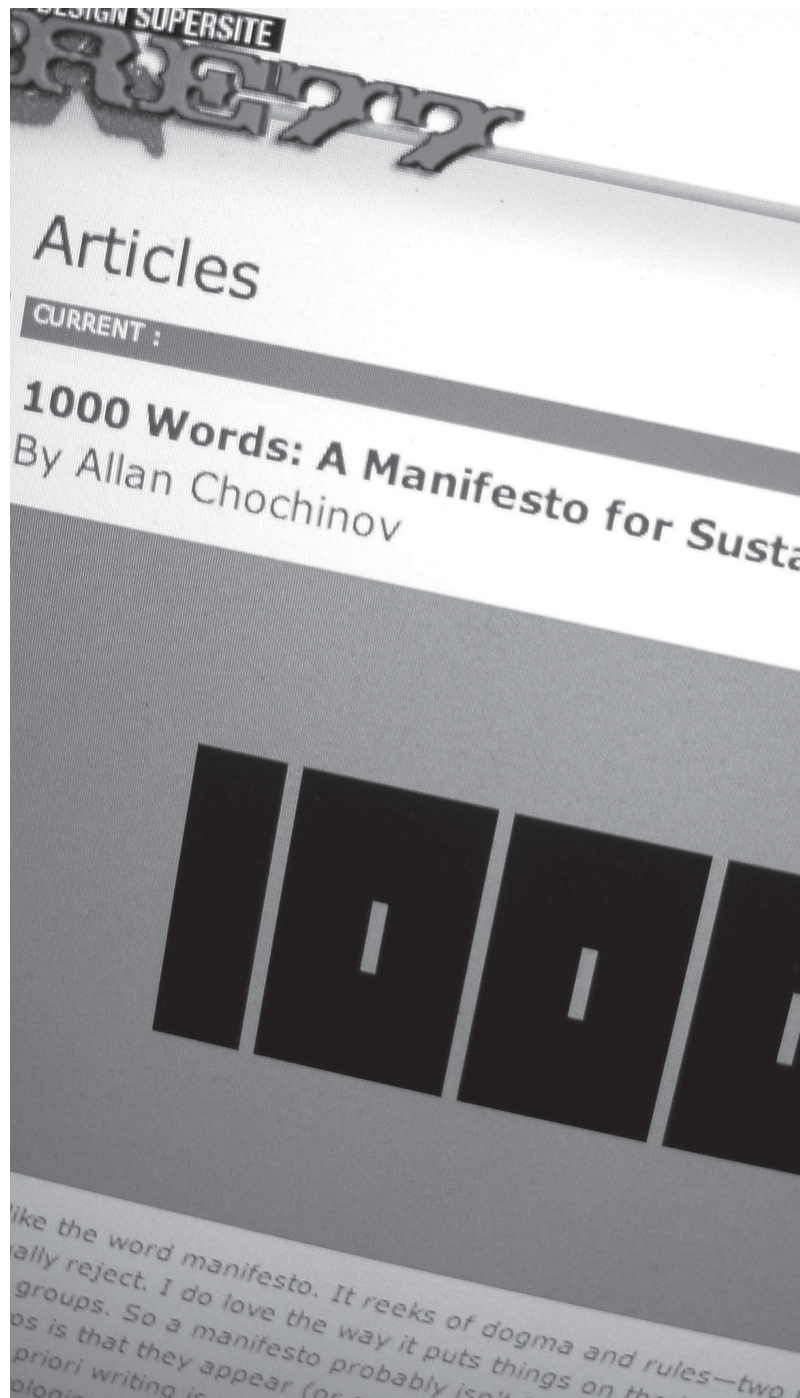
On November 15th, 2006, I attended the Design2.0 conference and panel discussion held in Boston, Massachusetts. Presenters at the conference included Allan Chochinov of Core77 and the Pratt Institute, Bill Cockayne of Change Research, Natalie Jeremijenko of UCSD and NYU, John Maeda of the MIT Media Lab, and Jason Pearson of GreenBlue. This conference represented a congealing, or crystallization of sorts for many of the *bigger* questions and ideas I had uncovered during my thesis research.

During the panel discussion and concluding remarks made by Chochinov, it became apparent to most in attendance that the profession of ID is entering a shift in paradigms. It was stated on more than one occasion, and by more than one speaker or audience participant that, in a general sense, Design as a profession and as a process, has done much to establish its relevance; that it is effective at solving problems with innovative solutions.

But, as Chochinov summed up the discussion, *Design needs to grow up*. Simply (perhaps brashly) stated: We know how to make things cool, but now it's time to make things better. This, in effect, established relevance for my own work. I understood that the trajectory of my work would be to provide insight for anyone seeking to

20. Image of Chochinov's online *Manifesto*

positively change the applied art of Industrial Design to better function within contexts. It was even more mind-bending to casually chat with professional designers, who work for Big-Name firms. Several expressed that what was said during the afternoon and evening of the 15th had caused them to rethink their careers, and more-so, their relationship with Design. One went so far as to say "this is why I need to quit". I have no idea whether he did or not. Needless to say, my mind was racing, and continues to do so.

In April of 2007, as I was hip-deep in 'doing' my thesis work, Chochinov published *1000 Words: A Manifesto for Sustainability in Design.* What first occurred to me were the similarities of sentiment between Chochinov's and my own writings in support of my thesis work. Much of what I had shared with my Committee up until that point was functioning in parallel with Chochinov's work. Yet another point of relevancy, and interesting, to me, was witnessing two people converge in Boston, diverge, and then six months later converge in thought. These threads had been growing in two different places, at different paces, and essentially unknown to each other.

As Chochinov states in his introductory paragraph, manifestos, while being potentially "self-evident" may help clarify complex issues by "put[ting] things on the line," (Chochinov). Furthermore, they expose themselves to what might be less constructive, and more *de*structive criticism. Prior to the release of Chochinov's *Manifesto*, I had similarly questioned a label, or description of my work: *polemic*. When the word polemic first came up, I too became a bit uneasy with the ramifications. I do believe that Designers all-too-often use the academic environment

to push (perhaps in an overly rhetorical fashion) big ideas, rather than researching, considering, analyzing and *applying* them. Big ideas will work not because they are vociferous, but because they actually work.

I decided that to help support the notion that Design can, and should function without *Sustainability* being an addendum, I should try to refrain from using the words *Sustainable* and *Green* as adjectives to describe my thesis work. Truly, there is no *Green* Design, and I should not attempt to *greenwash*. My thesis work is not attempting to further delineate, assemble borders, or itemize Design, but instead, support broader understandings, in hopes that the ideas become part of a collective understanding of *Good* Design. I hope to contribute to a praxis.

Despite the similarities between much of my work and Chochinov's Manifesto, there are some subtle differences. As presented in the essay Product vs. Artefact, I believe isolating and investigating these two words may help to clarify our intent to produce *Sustainable Design.* Chochinov tends to blur the definitions, using them interchangeably. Though this becomes an argument of semantics, I do believe that the difference in meaning is important to the discussion. The term *Products* connotes certain properties of the things we make. *Artefacts* tend to connote different properties which align to a more wholesome intent to be sustainable. That is, Artefacts imply a Natural system that is greater in scope than systems of human constructs.

Another point of contention is Chochinov's tenet: Design for Impermanence. Briefly summarized, Chochinov claims that Designers are complicit in "over-engineering" manufactured solutions and therefore

produce objects that are "antithetical to how the planet earth manufactures," (Chochinov). Again, I believe this is glossing-over an important understanding of Natural systems, or Nature in general. Nature certainly produces things of permanence, the planet earth itself being *manufactured* by great cosmological systems which will far outlast any human creation. Geologic systems, sand, pebbles, rocks, fields, shields, plates, etc., are arguably much more permanent than any product or "over-engineer[ed]" manufactured solution we, humans, and more specifically Designers, may ever come up with.

This understanding of permanence and impermanence obviously relies on our concept of time. Geologists often consider 150 years as a ± tolerance of 0.00015 mya (Million Years Ago), when speaking about geologic time. One might consider this quite similar to a Designer's concept of a ± tolerance of .001" in an annular snap-fit, or interference fit part. This is not to suggest, however, that we as designers are ineffectual in the Grand Scheme of Things, but rather it may help us perceive our potential within a larger (much, much larger) Natural system. Sometimes a Designer's Big thing is someone else's Small thing, and all too often a Designer's Small thing becomes someone else's Big thing.

As Designers, as Chochinov states, we are "in the consequence business;" we should strive to consider consequences as big as the earth, and as small as the molecule, as long as 1000 years and as short as a second. Recalling the constantly shifting perspectives of the Charles and Ray Eames' Power of 10 film, we should similarly seek to move ourselves along a *continuum* of scales through our designed solutions.

However, this requires a more abstract concept of time and size in general. The ideas of Big and Small, Long and Short are relativistic. Time itself presents a particularly abstract relativistic scale. One could potentially sum up time as *before now*, *now*, and *after now*. However, if we're to consider how Nature views *time* and *things*, it does indeed manufacture to be both permanent over short times, impermanent over long times, permanent over long times, and impermanent over short times. Furthermore, it is important to realize that considering products in human scales provides a frame of reference, but *absolutely not a frame of perception*.

Despite these differences, Chochinov's final tenet: Context Before Absolutely Everything, is, without doubt, the most important. Context, within this thesis work and all of it's aspirations, is about recognizing similarity and difference. It is about seeking similar models, and applying them to different problems.

Context, in terms of time, is about knowing the *before now*, applying it to the *now*, to positively affect the *after now*. Understanding context is about 'doing Design', and 'doing Science', too. Though it may be easier to understand this general issue by stating Context = The Environment, for the sake of supporting *Green Design* ambitions, I believe this is a treacherous conclusion to make. Truly sustainable *anything* is fully aware of its context or is at least attempting to be so, regardless of what that specific context is; Natural, environmental, eco-, anthropo-, or synthetic, invented, manufactured, or abstract.

"It is a question of the future itself, the question of a response, of a promise and of a responsibility for tomorrow. *The archive:* if we want to know what that will have meant, we will only know in times to come. Perhaps. Not tomorrow but in times to come, later on or perhaps never."

Jaques Derrida, 1998
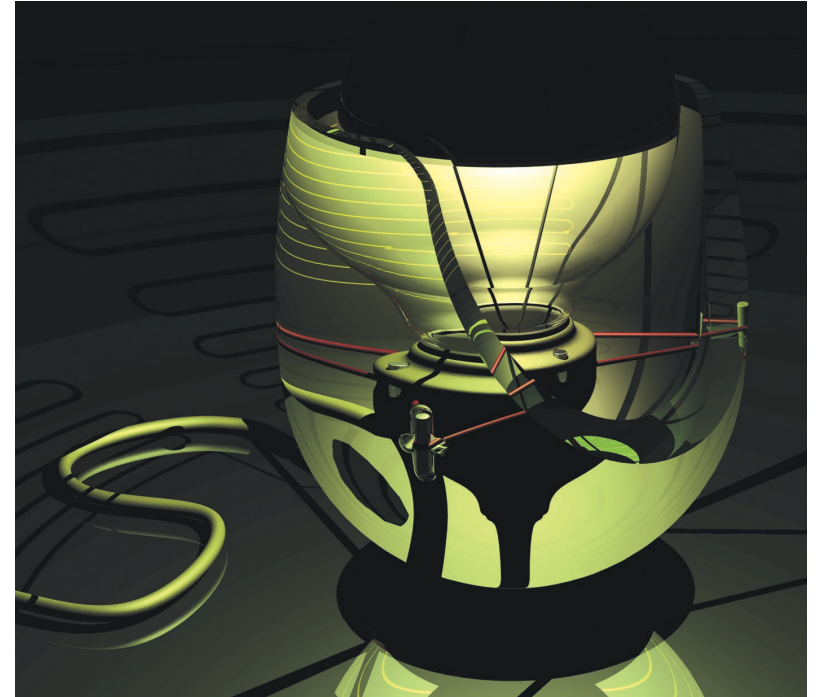
arte-
fact
three
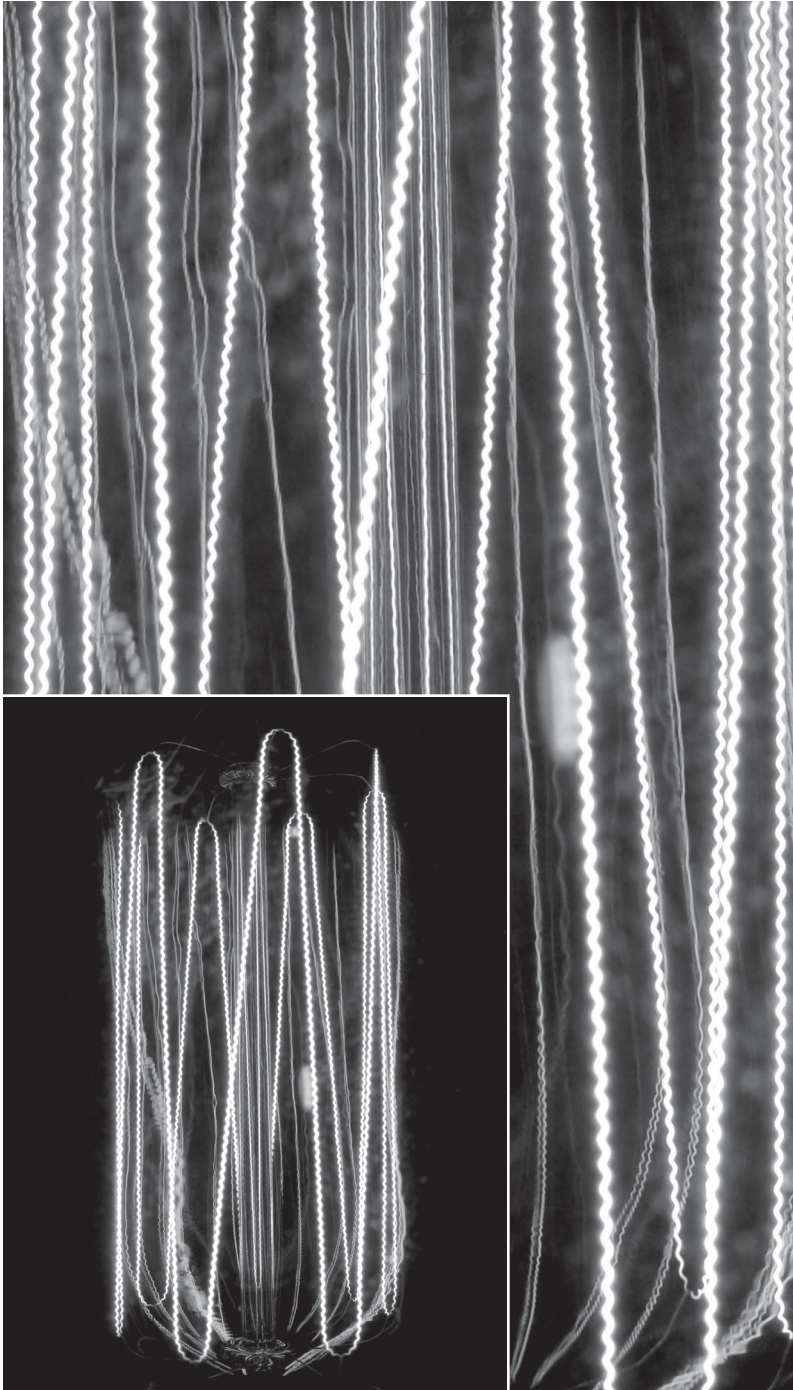
concept: Rhecordic

The Rhecordic lectern lamp is a small device that functions discretely. The conceptualization of the lamp arose from a desire to archive spoken words. When considering *what* exists for a minimum of ten years, and looking towards one-thousand years, it became obvious that manufactured products we typically use are seldom necessary. Their *functions and utility* die before the product is, itself, unable to function. The stock in trade over these *big* time periods are ideas, languages, and cultures.

Ideas, languages, and cultures, can be connected through the human ability to speak, or communicate. The *vitality* of things that exist over big time periods is possible in part through human communication. The archive of human ideas, languages, and cultures through history is, in one sense, The Greatest Story, a story that connects every human and bridges the *before now*, to the *after now*.

The connection to *where* these ideas are disseminated from, and enter into this Great Story, becomes important to this concept. Rhetoric must take place somewhere, and likely in association with material objects. The typical object associated with spreading rhetoric is the lectern. Lecterns therefore symbolize the transferal of the Great Story, as a place where communication begins.

21. Previous spread: Rendering of the Rhecordic lectern lamp

22. Opposite: Images of a coiled filament
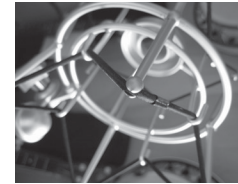
Precedence for the third artefact lies within the *archetype* of microphone. The goal of these devices is to convert sound, or vibrations, into an electrical signal, which is amplified and recorded by some mechanism. The Rhecordic lectern lamp shares the same function, however, it attempts to do so through different means.

Incandescent light bulbs are a dying technology. In an effort to minimize energy consumption, incandescent bulbs are being replaced by LED's and compact fluorescent bulbs in many domestic applications. The technology of passing electricity through a filament to create light *will become history*.

It is interesting to note, however, that the incandescent light bulb, while being inefficient, can be a very long-life object. When underpowered (e.g. providing a 40 watt bulb with 3-5 watts) the life of the bulb can be greatly increased. Filament light bulbs are also sensitive to vibration. The greater the force of the vibration, the shorter the life of the bulb's filament. Therefore, another means to increase the longevity of an incandescent bulb is to isolate it from vibrations.

The Rhecordic lectern lamp exploits these traits. The minute vibrations of the filament present when someone speaks near the bulb (within a few feet of it) can be measured as the electric resistance of the filament changes. These changes in resistance can be processed, but rather than converting them back into sound waves, they may be interpreted as *words*.

Similarly to some microphones, the need for the Rhecordic bulb to be isolated from lectern-borne vibrations becomes paramount. Therefore, the Rhecordic is fitted with a shock-isolating mounting system which recalls those used in highly sensitive audio recording mics.

23. Opposite:
Images of a cardioid microphone and isolation mount

24. Above:
Details of a cardioid microphone and isolation mount

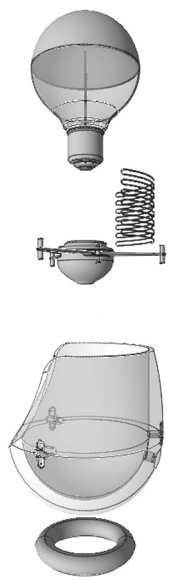Once the air-borne vibrations affect the bulb, and mechanically transfer to the filament, the changes in the resistance are processed and interpreted by a small integrated circuit located in the base of the bulb socket. Along with the resistance signal processing components, a miniaturized wireless communication device broadcasts through an antenna embedded in the glass sconce. The signal is then passed to the Rhecordic web archive.

The exploded view to the left shows the top-silvered incandescent bulb, the base (with the antenna to the right), the glass sconce, and the elastomeric thermoplastic foot.

Pictured below is the base containing the bulb socket, the processing circuit and the broadcasting circuit. The base is made of an elastomeric thermoplastic, and is suspended by and isolated through the red elastomeric cord. The isolation cord is fixed through six steel pins. The steel pins may be removed with no tools; by gently unloading the isolation cord, the steel pins will release from their seats.

Not only will the Rhecordic lectern lamp act to archive *our* stories, it will also act as a discrete archive of a technology — a once great idea to energize a filament to create light.
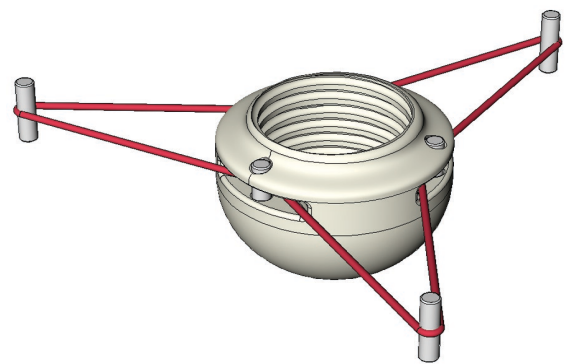
25. Above: exploded view of Rhecordic elements

26. Right: rendering of bulb base element
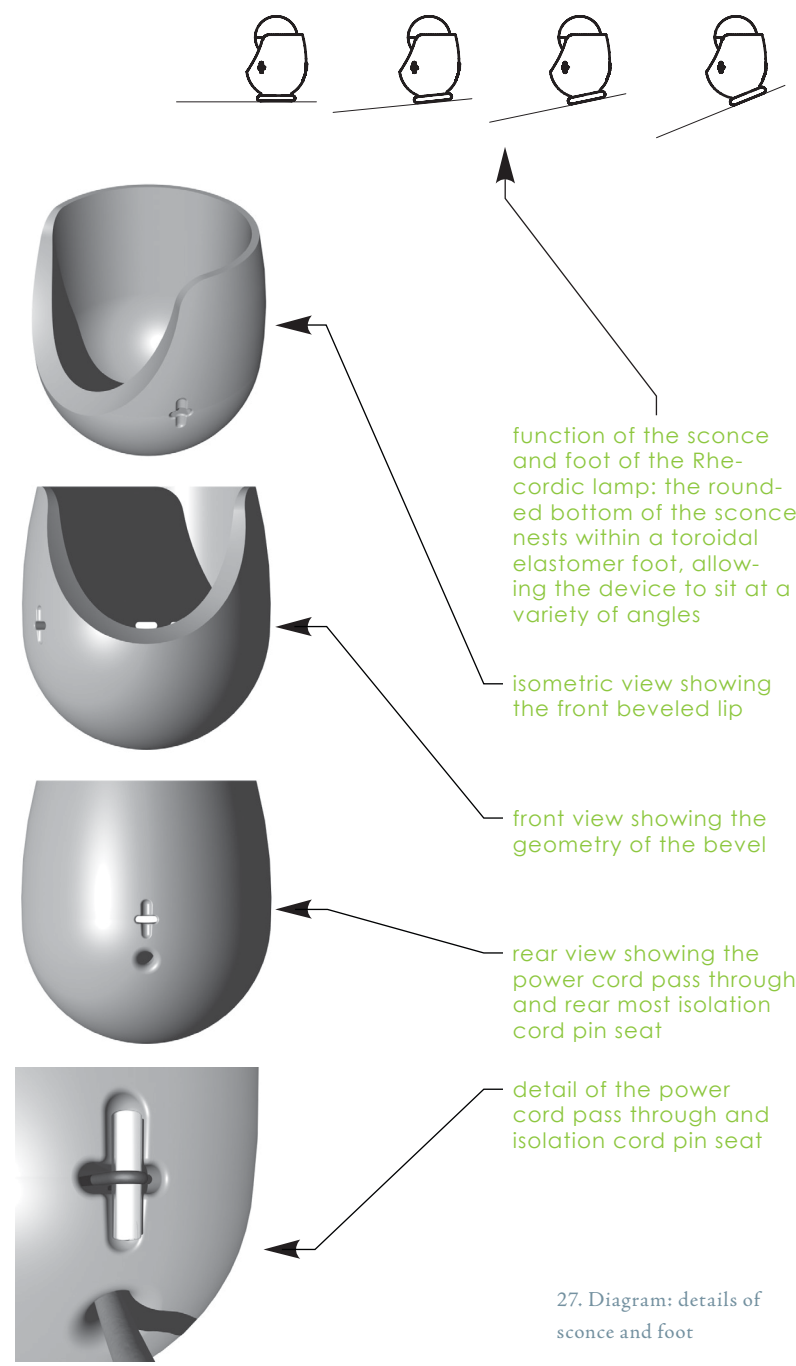
function of the sconce and foot of the Rhecordic lamp: the rounded bottom of the sconce nests within a toroidal elastomer foot, allowing the device to sit at a variety of angles

isometric view showing the front beveled lip

front view showing the geometry of the bevel

rear view showing the power cord pass through and rear most isolation cord pin seat

detail of the power cord pass through and isolation cord pin seat

27. Diagram: details of sconce and foot

6"

4.25"

40 watt, top-silvered incandes-cent bulb, limited to 3 watts

elastomeric thermoplastic foot

glass sconce

elastomeric isolation cord

bulb base and circuit housing

isolation cord retainer pin
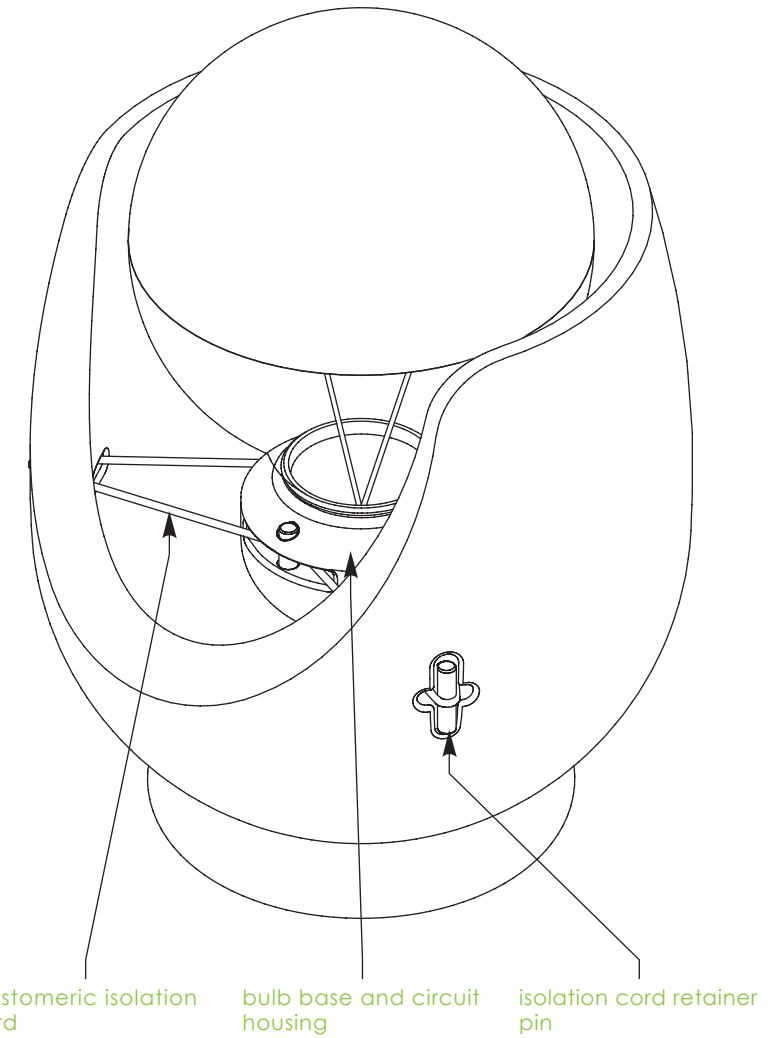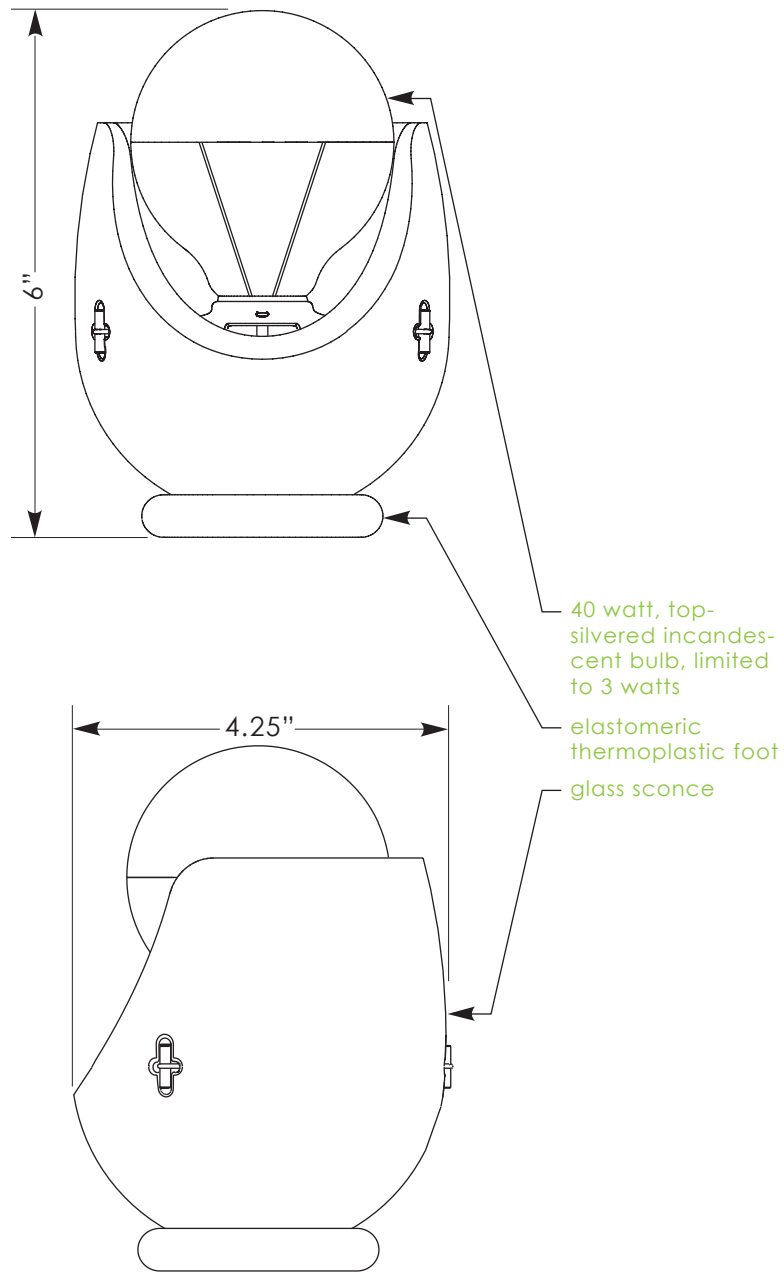
concept: Rhecordic archive

By sustaining a *great* dialogue, the Rhecordic archive attempts to *open* history. It functions to provide new meanings for the icons associated time. Through the lamp itself, the incandescent light bulb is given new life as an idea which has survived decades and is sustained for hundreds more years. The archive of dialogue, aims to exist for thousands of years.

The Rhecordic website is made possible by an anomaly. There exists no on-screen dimensional limit (beyond the actual file size) of a single web page. This presents an interesting condition as it provides for a very tangible visual expression of very big numbers.

Theoretically, you could scroll forever on the Rhecordic page. The archive of the words, visualized in threads, as transferred from the lectern lamp, could very well go on forever if given an opportunity for unlimited digital storage. Will there ever be an end to digital data storage?
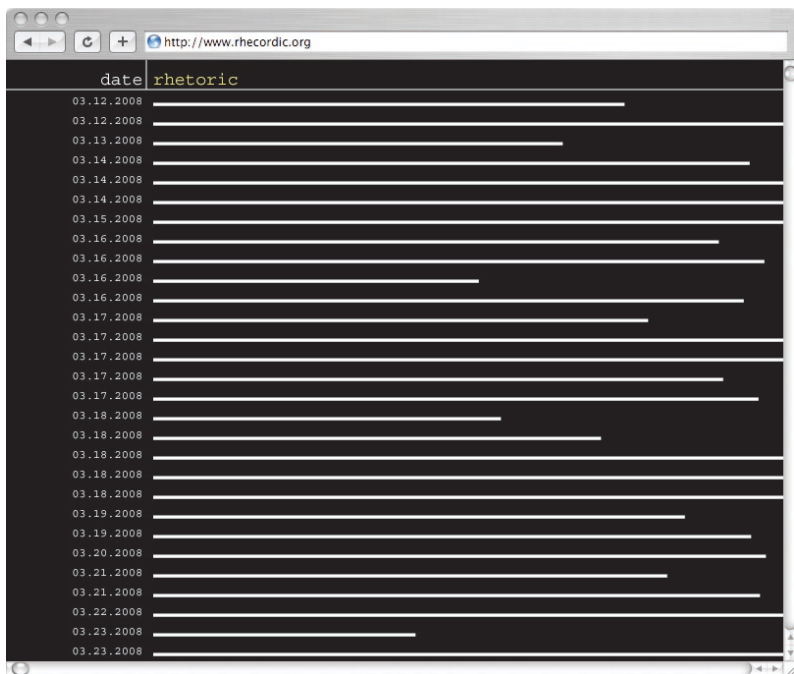
29. Image of the Rhecordic Archive (1 of 6): The vertical axis shows incremental time. Each word-thread is marked by the date when it was recorded. The horizontal axis shows each word-thread, where each 4 pixel by 4 pixel white block represents a single word.
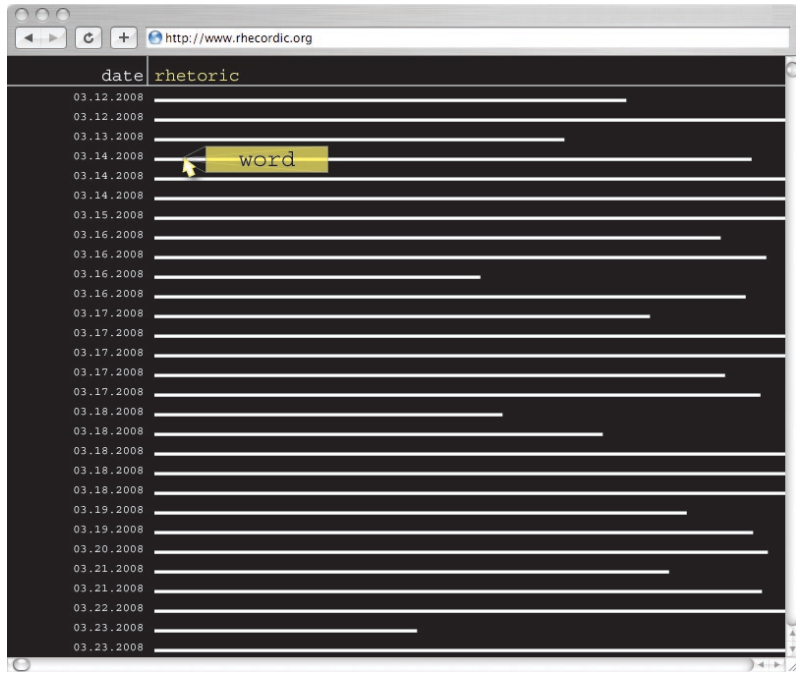
30. Image of the Rhecordic Archive (2 of 6): By hovering the cursor over a thread of words, each single word would become visible. The user may read each word-thread by slowly moving the mouse from left to right, watching each word pop-up in close proximity to the cursor.
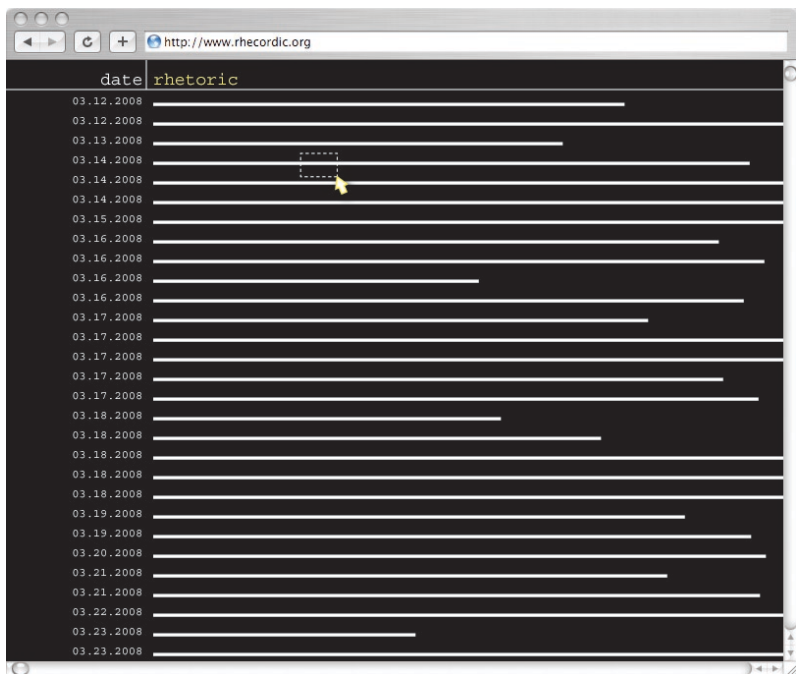
31. Image of the Rhecordic Archive (3 of 6): By dragging a box over several words, a phrase or sentence becomes visible on the release of the mouse button. This provides a means for investigating idea-threads, where a particular sentiment, or notion is the piece of the archive to be studied, rather than a single word.

a phrase, or sentence
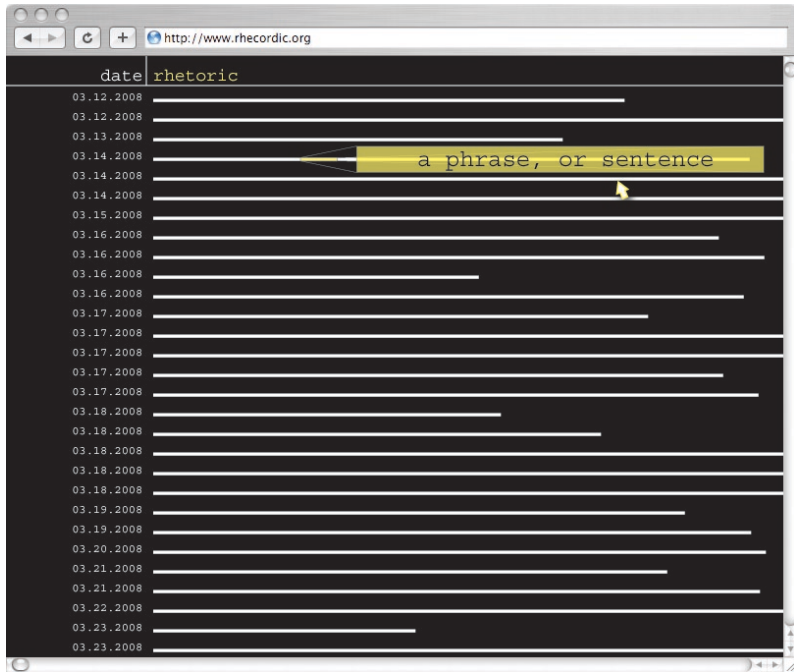
32. Image of the Rhecordic Archive (4 of 6): When considering several words together, the power of the Rhecordic web archive becomes visible. The archive begins to allow the user to witness context. The history of an idea can be traced, visually, to it's inception or first mention, and each connection becomes highlighted. The strength of the system is that it makes connections based on similarity and commonality. However, by hovering over the archive near similar idea-threads, difference might be seen by inspecting the surrounding words.

multiple sentences, paragraphs.

Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Vivamus vestibulum auctor nibh. Quisque nec tellus quis turpis ultricies elementum. Aliquam volutpat sodales dui. Proin accumsan ornare urna. Morbi et neque ac erat
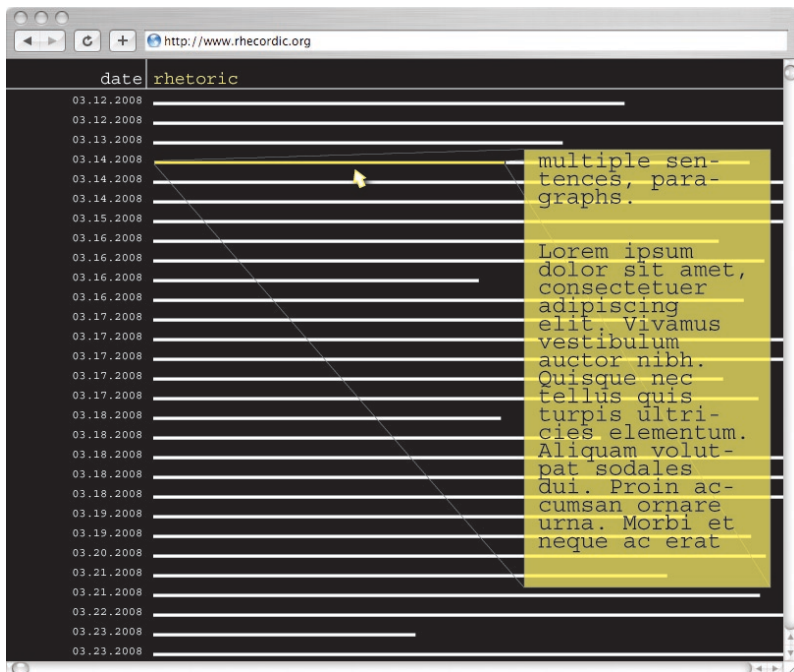
33. Image of the Rhecordic Archive (5 of 6): An example of a highlighted set of idea-threads. This provides a secondary method for reading large passages, rather than reading word by word.
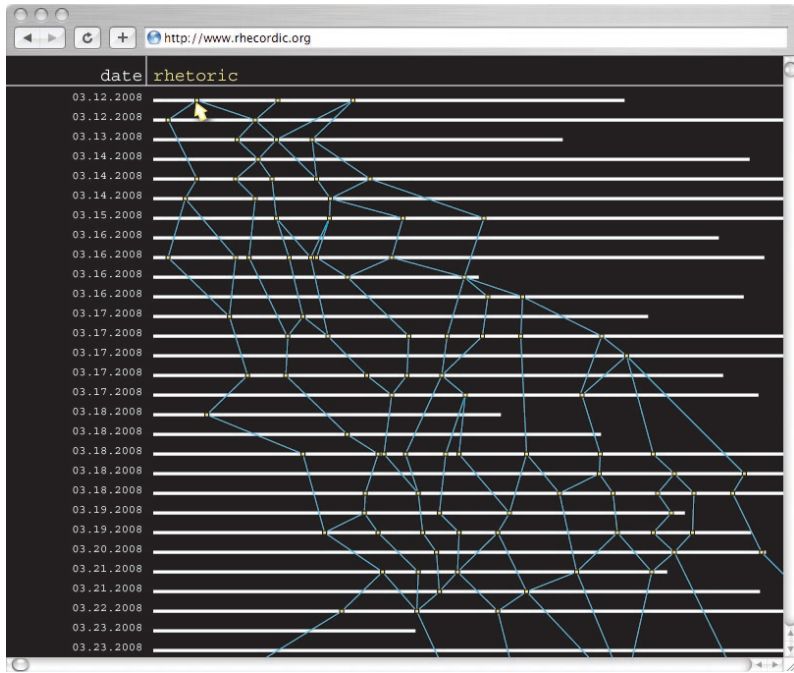
34. Image of the Rhecordic Archive (6 of 6): By double-clicking on a single word, each occurrence of that word becomes immediately threaded. Users are afforded the ability to examine single words, phrases, sentences or entire passages within the archive. Interconnections become the predominant visual statement, over single gestures. In a sense, the dialogue present in the archive becomes an overlay of singular monologues.
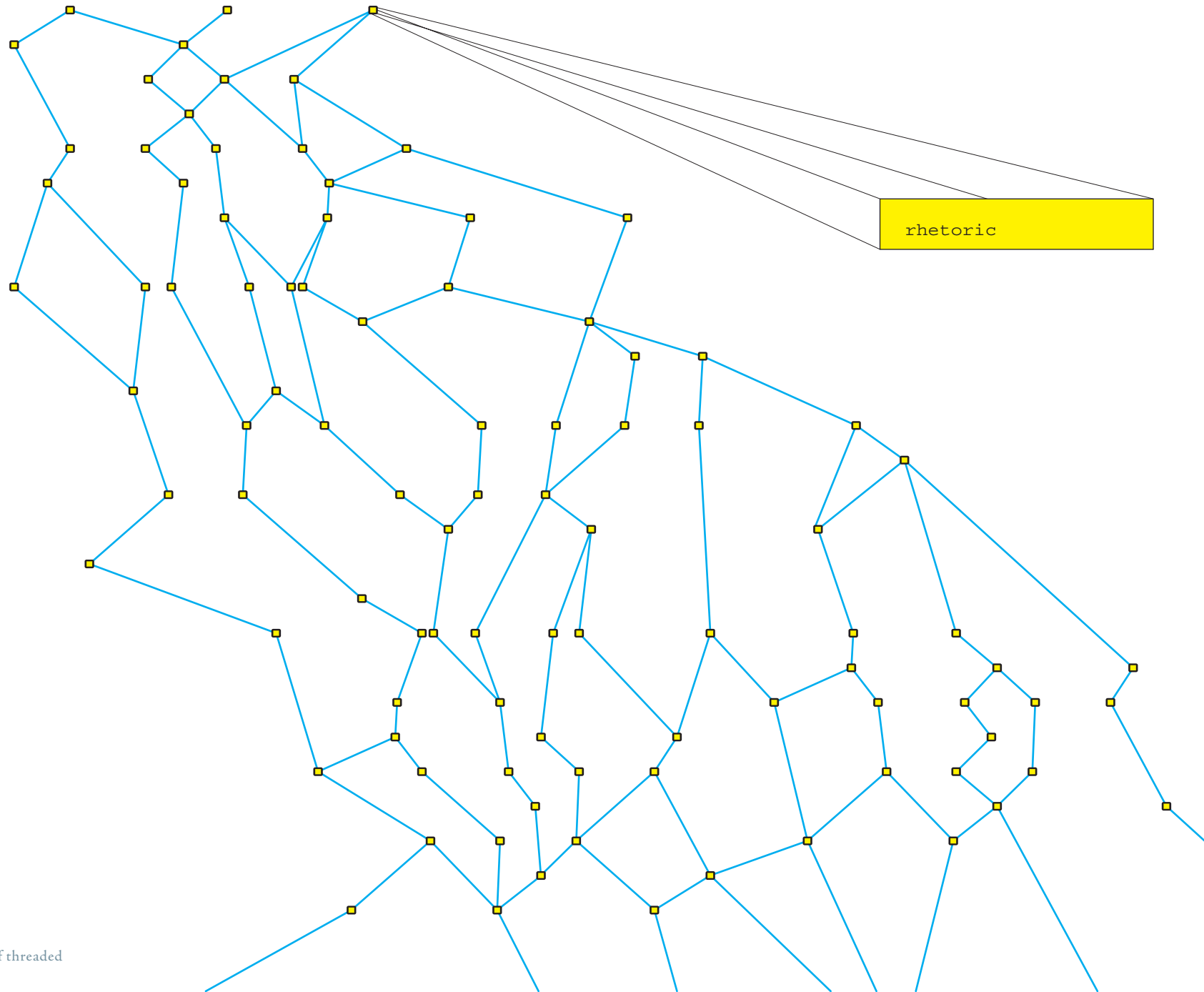
rhetoric

35. Diagram of threaded
rhetoric

conclusion:

... looks like it's going to be a pretty nice day today. I love long, lazy Sundays. The Bialetti slowly burbles away on the stove, should be done in 3 or 4 minutes. I don't think I could *ever* get tired of that chocolatey smell. Reminds me of Paris —so long ago— we should really look at going back soon, maybe for our 10th anniversary later this year.

I get two old, stained espresso cups out of the cupboard and place them on stove's warming-burner, grab the e-reader and pull up today's *New York Times*. Flip through a couple pages... interesting...

Apple Inc. plans to announce this Tuesday...

"Well, it's about time..."

"What's about time?"

"Check it out, babe, Apple said they're going to move to distributed bio-print for their entire line within the next 6 months!"

"Wow! It *is* about time... you worked on that, what, 3 years ago? Finally we'll be able to print that new workstation we need."

"Yeah, I know.. just a second, coffee's ready now...

You know, I can't believe we've had these little cups for so long..."

Though many of these sources are not explicitly quoted in the body of this book, an annotated list of references is provided. The function of this bibliography responds to an *irritant*. While researching other theses, I often found myself wanting more from the collective back-matter. I wanted a more in-depth glimpse into the researching and reading habits of the authors. Therefore, I have chosen to provide annotation, and to include works that while not directly quoted, were quite influential in the studies surrounding this body of work. In a way, the bibliography is partially *threaded*, to show breadth in knowledge of surrounding issues, and depth in a specific issue.

Benyus, Janine M. *Biomimicry: Innovation Inspired by Nature.* New York: Perrenial, 2002.

Benyus presents the case that Nature may provide the answers to some of our most pressing technological questions. This science of Natural process reveals the true power of models that surround us, where examples for accomplishing any task are already given, if we learn to study at the proper scales, and in within relevant systems. The greatest benefit of Biomimicry, is that the products of its applications can truly benefit everyone, and everything. Biomimicry provides a framework for every system we humans can invent, and in every case presented, Benyus shows that the connections between human problems and existing Natural solutions are inescapable.

Beukers, Adriaan, and Ed van Hinte. *Lightness.* Rotterdam: 010 Publishers, 1999.

A look at "the inevitable renaissance of minimum energy structures," this book discusses the potential for a specific understanding of weight and mass in relation to energy consumption in built structures. It relies on the notion that anything man-made may be considered a structure. By considering the interrelationship of design, the environment, materials research/science, functionality and energy conservation, the authors survey existing man-made structures and Naturally existing analogs in reference to lightness.

de Botton, Allain. *The Architecture of Happiness.* New York: Hamish Hamilton an imprint of Penguin Books, 2006.

Allain de Botton investigates an often overlooked or misunderstood concept of the built environment in this book. The power of our

surroundings with respect to our enjoyment of life is largely disregarded as a question of aesthetics. Beauty, as de Botton claims, is not a self-indulgent exploit. de Botton suggests that only through a rigorous questioning of beauty in the built environment, can we realize that our surroundings should exist as constant reminders of the true extent of human potential. Essentially, de Botton argues that without a humanistic understanding of the philosophies and psychologies which frame our built environment, the places where we work, recreate, and generally live, will never satisfy our desires.

De Graaf, John, Wann, David, and Thomas H. Naylor. *Affluenza: The All-Consuming Epidemic*. San Francisco: Berrett-Koehler Publishers, 2001.

Affluenza, defined by the authors as, "a painful, contagious, socially-transmitted condition of overload, debt, anxiety and waste resulting from the dogged pursuit of more," provides an understanding of over consumption in America. Paramount to this understanding of this condition is the notion of the social epidemic, as discussed in *Freakonomics* and *The Tipping Point*. The authors suggest that the condition of Affluenza present in the United States is not necessarily an explicit function or byproduct of an economy, but rather a socially generated and unsustainable cycle of living through buying. The ideal for growth at any cost, as explained by the authors, has alternatives, and in conclusion, novel ideals and solutions for sustainable living are proposed.

Derrida, Jaques. *Archive Fever: A Freudian Impression*. Chicago: The University of Chicago Press, 1998.

Originally presented as a lecture on June 5, 1994, Derrida deconstructively analyzes the notion of archive, and considers its relationship with religion, time, technology and electronic media. He argues that the pubic archive exists as a collection of private and personal effects, and following, the archive becomes a paradoxical entity. Derrida creates a clear reading of archives themselves, as well as the act of archiving.

Dreyfuss, Henry. *Designing For People*. New York: Simon and Schuster, 1955.

Henry Dreyfuss' manifesto on the ethics and practice of design is a compilation of cases, introspective history, and advice. Dreyfuss asserts that design exists ultimately for the benefit of people, and proclaims a specific anthropocentric view of the applied arts. With this comes a realization that design, at its core, is a public service.

Forty, Adrian. *Objects of Desire*. New York: Pantheon Books, 1986.

Adrian Forty argues, in this book, that design in concert with industrialism has precipitated the vast increase in the variety of objects available to consumers – the greater the variety, the greater the potential for desirable things, or things that satisfy some need. Forty also argues that the economic system of capitalism has contributed to the marked decline of craft and trade, where artisans respond to social processes, which in turn function to provide individualized satisfaction of individual desires. Industrialism, therefore, has replaced actual satisfaction of desire with a sort of mass-satisfaction, similar to concepts presented by Klein in *No Logo*. Forty asserts that design, with its aspirations to satisfy human desires and exist within a capitalist economic system, may be a more powerful tool than it is largely given credit for.

Gladwell, Malcolm. *The Tipping Point: How the Little Things Can Make a Big Difference*. Boston: Little, Brown, 2000.

In this book, Gladwell introduces the notion of a social epidemic; how ideas, behaviors, artifacts and messages spread though groups like viruses. Integral to the spread of a social epidemic are three personality types: the connector, the maven and the salesman. The connector is a social personality that brings people together, introducing otherwise disparate people on disparate paths. This human-to-human contact affords the exchange of information, or the persuasion towards certain conclusions (who you know). The maven exists as a purveyor of information, the walking encyclopedia, of sorts (what you know). The third type is the salesman, one who acts as a great persuader (why you know). These three types work in concert to bring about change, though it is interesting to note that no specific intent to incite change may drive any or all of the three types' actions.

Hawken, Paul. *The Ecology of Commerce: A Declaration of Sustainability.* New York: HarperCollins Publishers, 1993.

Paul Hawken presents a radical critique of the capitalistic system of economy from the perspective of resource use and conservation. He argues that the American culture of business which functions within a capitalistic economy must redefine it's metrics, and in doing so, seek to include and embrace ecological and social growth in addition to pure monetary growth. Hawken considers the idea that wealth need not be measured only in dollar amounts, and that the value of enterprise should include systems which are typically ignored by commonly accepted economic measures.

Hawken, Paul, Lovins, Amory and L. Hunter Lovins. *Natural Capitalism: Creating the Next Industrial Revolution.* New York: Back Bay Books / Little, Brown and Company, Time Warner Book Group, 1999.

Written as a pragmatic exploration of theories published earlier in *The Ecology of Commerce*, this book calls for a new model for creating wealth, promoting humankind, and sustaining the resources of our environment. A major tenet of this work is the notion that future business success (and even greater success of humankind in following) lies in a new responsible approach to resource management; one that regards Natural and human resources as infinitely valuable capital. The applications discussed present inspiring examples of the next step in energy use, conservation, transportation, food, and the built environment.

Kelly, Kevin. *Out of Control: The New Biology of Machines, Social Systems, and the Economic World.* New York: Basic Books, 1994.

In this book, Kevin Kelly considers the consequences of highly complex technological systems, and proposes the dawn of a new era where the birth and growth of these systems shifts from existing as a human construct (a made thing), to an autonomous, Natural system (a born thing). The further one researches and considers grand technological machines and systems, the closer they resemble living organisms. Kelly provides numerous examples across scales from nano- to mega- and beyond, which highlight key growth models and their analogues to preexisting natural systems. Kelly summarizes these models in his "Nine Laws of God."

Klein, Naomi. *No Logo: Taking Aim at the Brand Bullies.* Toronto: Knopf Canada, 1999.

Klein argues that the idea of corporate brand has grown to control almost every facet of human existence, especially as the mega-global corporations spread from national to multi-national exposure. Consumers exist in unwilling effigy, full-size dolls ensconced in pure brand, eschewing any individual expression of self in a contradiction of supposed self-expression. We buy and wear and use to define our individuality, but become defined (and therefore more like the rest) merely by what we buy and wear and use. Klein exposes the extent of brand, from wearing it to the near-slave-labor used to produce the goods that promote it. By looking towards the finite material source of a brand (where it's made and who makes it), the tactics corporations use are exposed and the true negative impact on the human resource is obvious. Klein shows the step-by-step manifestation of brand, from marketing opportunity to global hallucination (read: social epidemic). Resistance to the branding of life/existence is growing, and Klein provides several examples of alternatives, including down-shifting and culture-jamming.

Lasn, Kalle. *Culture Jam: How to Reverse America's Suicidal Consumer Binge – And Why We Must.* New York: Harper Paperbacks, 2000.

In this book, the author proposes that little exists outside of the notion of brand. No longer does society share in an identity, but rather in a great marketable brand. By controlling the flow of information through brand, the power within the system lies with those who sell, or market things. No longer is a brand a corporate construct pertaining to the products themselves, but social system constructed though brand. By controlling brand, however, corporations define and set greater agendas, well beyond the reach of the general utility of artifacts. The book provides insight towards shifting the power from the brands (and the corporations who control them) to the consumer. By deconstructing the icons and the marketing that promotes them, the author proposes methods for 'uncooling' artifacts, 'demarketing' celebrities, and breaking the 'media trance' inherent in a television-centric society. If down-shifting is understood as a more passive method for escaping over-consumption, culture-jamming exists as a highly pro-active, and subversive method for turning the power of brand on itself, exposing the materiality and superfluous nature of the notion of brand.

Levitt, Steven D. *Freakonomics: A Rogue Economist Explores the Hidden Side of Everything.* New York: William Morrow, 2005.

As a study on applying simple principles of economics to social problems, this book focuses on asking the right questions to obtain relevant answers. Levitt and Dubner propose that seemingly complicated social 'mysteries' need not be 'mysterious'. For example, by attributing a drop in violent crime to a drop in violent criminals, attributed to a drop in birth rates in inner cities and therefore fewer people born into a life of social and economic hardship, a connection is made to a single court case, Roe vs. Wade, as a relevant 'answer' to an existing social question (why did crime rates drop in the mid-to-late 1990's?). Using non-typical, economist methods for understanding complicated social interactions, Levitt and Dubner propose many novel 'answers' to many of today's most beguiling social epidemics. Though little time is spent explaining the actual economic methodologies, this book may be seen as a study in causality, or more specifically, determining social causality through atypical methods.

Louv, Richard. *The Last Child in the Woods: Saving Our Children From Nature-Deficit Disorder.* Chapel Hill: Algonquin Books of Chapel Hill, 2005.

Richard Louv presents the case supporting Nature-Deficit Disorder in this book. Louv studies the lives of children with an intent to discover why there has been a large decrease in a general connection with the outdoors. By questioning and talking to both parents and children, Louv attempts to dispel many of the myths surrounding the Natural environment. Louv shows that Nature can provide therapy for many existing physical and social conditions plaguing children of recent history. Louv also proposes an alternative future, where parents and children alike rediscover the joy associated with the wild outdoors.

McDonough, William, and Michael Braungart. *Cradle to Cradle: Remaking the Way We Make Things.*

In this book, McDonough and Braungart issue a call for profound change in the system of Industry. The authors argue that the current paradigm may be described as "take, make, and waste." In what many have called the Bible for ecologically sound product manufacture, the authors propose a new paradigm, completely eliminating waste, and where all products of manufacture may be consumed as nutrients, and where all materials are re-used, not merely recycled.

Manzini, Ezio. *Materia dell'invenzione, The Material of Invention* [English]. Cambridge: MIT Press, 1989.

Ezio Manzini presents an argument for understanding the essence of materiality. By analyzing Naturally occurring systems, patterns, and more generally solutions, the material existence of certain man-made, or invented, objects may be compared and contrasted. The material of invention provides an abstract ideal for man-made things to attempt to be Natural, or harness the intelligence inherent in evolved solutions. Manzini provides countless relevant and enlightening visual studies, as well as a coherent group of guidelines with which to consider the materiality of objects.

Norman, Donald A. *The Design of Everyday Things: Psychology of Everyday Things.* New York: Basic Books, 1988.

Through a partially anecdotal study of ergonomic design processes and principles, Norman explains the human needs that should function as the requirement for technology. Quite often, however, technological application is causation for complex human needs. Norman's methods, or better, his questions, do help designers understand the flipping of the object-user hierarchy to user-object.

Norman, Donald A. *Emotional Design: Why We Love (Or Hate) Everyday Things.* New York: Basic Books, 2004.

As an extension of his previous work, *The Design of Everyday Things*, Norman attempts to add another level of understanding to the human-centered design approach. In considering emotion, Norman introduces three reactions of users: visceral, behavioral, and reflective. Visceral reactions are associated with the sensual, or visual, while behavioral reactions deal with the functional utility of an object. The reflective reaction to an object is based on human projection, or our supposed appearance to other humans.

Papanek, Victor. *Design for the Real World: Human Ecology and Social Change.* New York: Pantheon Books, 1971.

Victor Papanek's book may be regarded as one of the earliest investigations of the relationship between humans, their manufactured products, and the environment. While much of the book is devoted

to cases where products fail to establish a healthy relationship with either their users or the environment, specifically presenting examples of what not to do, Papanek does do much to break down the barriers between scales. Papanek suggests that the outcomes of design activities should seek to engage multiple scales, and prefigures many ideas more recently suggested and investigated by McDonough, Benyus, and Van der Ryn and Cowan.

Papanek, Victor. *The Green Imperative: Natural Design for the Real World.* New York: Thames and Hudson, 1995.

Written as an exploration of the pragmatics of many of the ideas suggested in his earlier work, Designing for the Real World, Papanek shows how humans can collectively implement ecologically sound principles. Papanek provides examples to work towards in this book, rather than examples to never repeat. Covering scales (almost literally) from spoon to city, Papanek provides advice for the planner, the designer, the architect and the consumer to use in an ecologically sensitive manner.

Petroski, Henry. *The Evolution Of Useful Things.* New York: Knopf, 1992.

Henry Petroski, in this book, provides valuable insight to the pragmatic development of the most ubiquitous artifacts. By retracing the historical evolution of specific features of some of the most common objects, Petroski reveals a trait of human irritation, rather than necessity, in the invention of novel ideas. Better things, as Petroski argues, do not evolve from satisfaction of some need, outright, but rather as a response to small failures of human-based utility within successful objects. Technological progress is therefore born from improvements, rather than from a clean slate.

Petroski, Henry. *Small Things Considered: Why There is No Perfect Design.* New York: Alfred A. Knopf, 2003.

Petroski, in a way, continues to investigate the history and process by which some of the most common objects were designed. Though largely an account of the often irrational constraints, which lead to negative consequences, Petroski makes it a point to seek out the most overlooked objects in this book. He presents the case within a framework of

imperfection, arguing, in essence, that the process of Design can never stop. There will always be new problems created by new products.

Postrel, Virginia. *The Future and Its Enemies: The Growing Conflict Over Creativity, Enterprise, and Progress.* New York: Free Press, 1998.

In this book, Postrel argues that there exist two basic modes of understanding the future. First, there are those who understand the future as something to be controlled (stasists). Stasists place limits on possibility in an attempt to retain established means to produce known outcomes. Second, there are those who see the future with limitless possibility (dynamists), and embrace unknown outcomes with the potential to be better than the status quo. Postrel states that creativity (dynamism) demands experiment and therefore a framework of minimal controls must support flexibility, competition and choice. A future fixed is not a true future. Further, tomorrow cannot be managed today, and likewise we should not seek to define the future through today's means.

Postrel, Virginia. *The Substance of Style: How the Rise of Aesthetic Value is Remaking Commerce, Culture and Consciousness.* New York: HarperCollins, 2003.

In a discussion of the role of aesthetics in American society, in both artifacts and the built environment, Postrel argues that despite a great movement towards substance over style (typical to a Modernist approach to understanding form and function), fashion does (and should indeed) have a relevant and rational purpose in defining desires. To deny this is to deny beauty. Essential to Postrel's position is the notion that despite the superficial appearance of the consumption of artifacts based on an "I Like" mentality, there must exist a rational explanation for aesthetics. Simply put, form is embedded in function, that is, part of the function of any object is the exposure and alignment of that artifact with greater values imparted by form. Form has meaning, and if form is to be understood as fashion or style, then the communication of meaning is, in part, a function of the style of an artifact. Aesthetics should be seen as a vehicle for differentiation, and therefore the value of style lies in our desire to make our world different, to suit our inherent individuality.

Thackara, John. *In the Bubble: Designing in a Complex World.* Cambridge: MIT Press, 2005.

Thackara argues that in our world of ever increasing technological applications, devices, things, and gadgets, users are increasingly asking how these objects actually make their lives better. Thackara posits that "technology pushers" (Designers) often mistake technology for an end, rather than a means. Technology must be queried of its purpose before it is implemented. To better fit our contemporary world, Thackara proposes we seek solutions that rely on people more than things. Quite often, a system of human exploits with an intent to fit into the context of daily lives and daily problems will trigger solutions which utilize objects, rather than become overrun by them. Thackara's proposed method focuses on and provides examples of services and systems where responsibility and ethics guide technological development.

Van der Ryn, Sim and Stuart Cowan. *Ecological Design.* Washington, D.C.: Island Press, 1996.

Sim Van der Ryn and Stuart Cowan propose a vision for the future of manufacturing and production that relies heavily on a several design guidelines witnessed in Natural systems. By studying the Natural world, Van der Ryn and Cowan show how Natural processes can positively impact many systems at multiple scales. A set of principles that intend to change the way we conceive our built environment are proposed, along with advice to warn readers of the potential for greenwashing the idea of sustainability.

Chochinov, Allan. "1000 Words: A Manifesto for Sustainability in Design." *Core77* Apr. 2007. 10 Apr. 2007
<http://www.core77.com/reactor/04.07_chochinov.asp>

Chochinov's Manifesto begins somewhat playfully, not necessarily negating its own existence, but rather establishing the notion that despite the perceived combativeness of manifestos, they are useful in productive discourse. Chochinov limits his expression to 1,000 words, supporting the need for manifestos to be brief, if not mildly cryptic. Chochinov presents 10 basic tenets, most of which make pure crystalline sense. Though the article utilizes the word *Sustainability*, the argument should be made that these tenets represent ideals of *Good* Design, at its core, and are not to be confused with a do-gooder/treehugger code of ethics.

"ID Defined." *IDSA* 2005. 17 May 2007.
<http://www.idsa.org/webmodules/articles/anmviewer.asp?a=89&z=23>

This brief article presents the IDSA's definition of the professional field of Industrial Design. It explains an Industrial Designer's core responsibilities, placing emphasis on the human needs, interests, and safety concerns. Within the development of a product or system, the Industrial Designer should be cognisant of and receptive to the marketability, the manufacturing tools and processes, the materials, and potential economic specifications as supplied by the client or clients.

Design e²: The Economics of Being Environmentally Conscious. Dir. Tad Fettig. Prod. Eva Anisko and Midori Willoughby. DVD. Kontentreal Productions. Dist. PBS Home Video, 2006.

This six-part series, originally broadcast on PBS, covers a range of topics, but focuses primarily on the built environment. The Design portion is the first of 8, with future series' including Water, Energy, Food, Transportation, Botanicals, Textiles and Health. The strength of the Design series is that it considers the subject of Sustainability on a world stage. By presenting the potential consequences of massive development in countries and cultures outside the United States, the global ecological situation may be perceived as even more precarious than generally accepted. The series functions, in part, as a call for intelligent minds to become involved in seeking solutions for very big problems.

The Next Industrial Revolution: William McDonough, Michael Braungart and the Birth of the Sustainable Economy. Dir. Shelly Morhaim and Chris Bedford. Prod. Shelly Morhaim. DVD. Earthome Productions, 2001.

This program presents the story of William McDonough and Michael Braungart, and the beginnings of a movement to change the face of industry. It provides several case studies, in the United States and in Europe, which show the basic groundwork for what became the Cradle to Cradle movement. The program highlights the process by which businesses can function positively with Nature while being economically profitable.

image credits:

p. 020 Figures 6 & 7 used with permission of Marcel Wanders Studio:

Bakker, Gjis and Renny Ramakers, eds. *Droog Design: Spirit of the Nine-ties.* Rotterdam: 010 Publishers, 1998.

p 028 Figure 13, taken from public domain:

"Image:HippecraticOath.jpg." *Wikipedia* 2006. 15 April 2007. <http://en.wikipedia.org/wiki/Image:HippocraticOath.jpg>

This book is typeset with a mixture of two typestyles. Adobe Jenson Pro, designed by Robert Simbach, is used for the body text of the document, while Century Gothic, attributed to Sol Hess and the Monotype staff, is used for titles and headings.

Jenson Pro is a serif typeface which recalls Nicolas Jenson's roman and Ludovico degli Arrighi's italic, Renaissance period typeface designs. Jenson provides a strong sense of history, yet still remains fluid, creating body text which is both solid and readable.

Century Gothic provides a sans-serif counterpoint to Jenson's classical face. Century Gothic was developed during the 1930's and 1940's for distributed teaching materials. It is a derivative of Twentieth Century, most commonly seen above chalkboards in American public schools, where it helped many of us learn the A-B-C's. Century Gothic's taller x-height and rounded forms are highlights of this clean, lightweight, but sturdy typeface.