

© Rich Gold 1993 – 2002
Silicon Valley, California
rich@richgold.org
www.richgold.org
draft version 0.9

Dedicated to Marina LaPalma and Henry Goldstein

The Present Press

**Note: You must change the following *preferences* in
Adobe Acrobat Reader 5.0 to view this book correctly:**

Under *Edit* (or under Right Arrow above slide bar) go to *Preferences*.

In *Preferences* Check all of the following:

[x]Smooth Text [x]Smooth Line Art [x]Smooth Images

Do not use *Adobe eBook Reader* to view this book. It does not allow these settings.

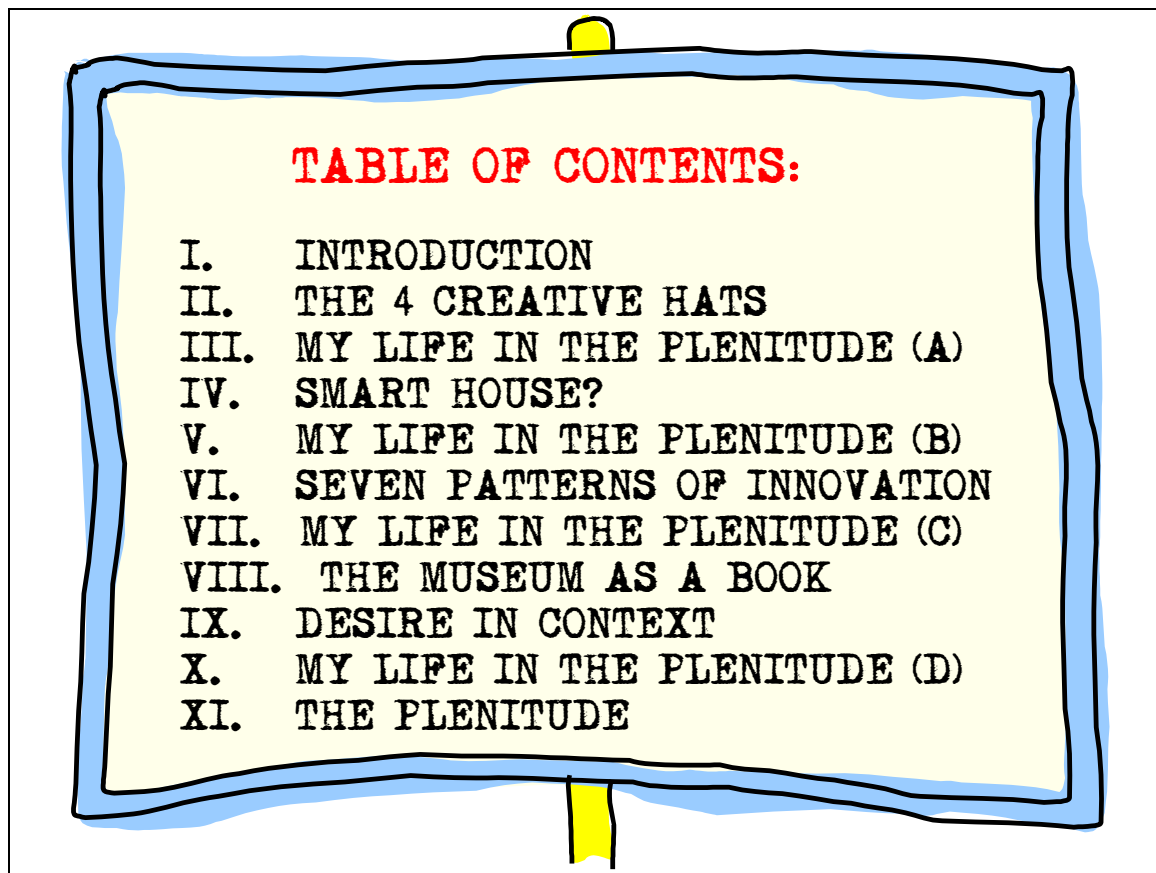


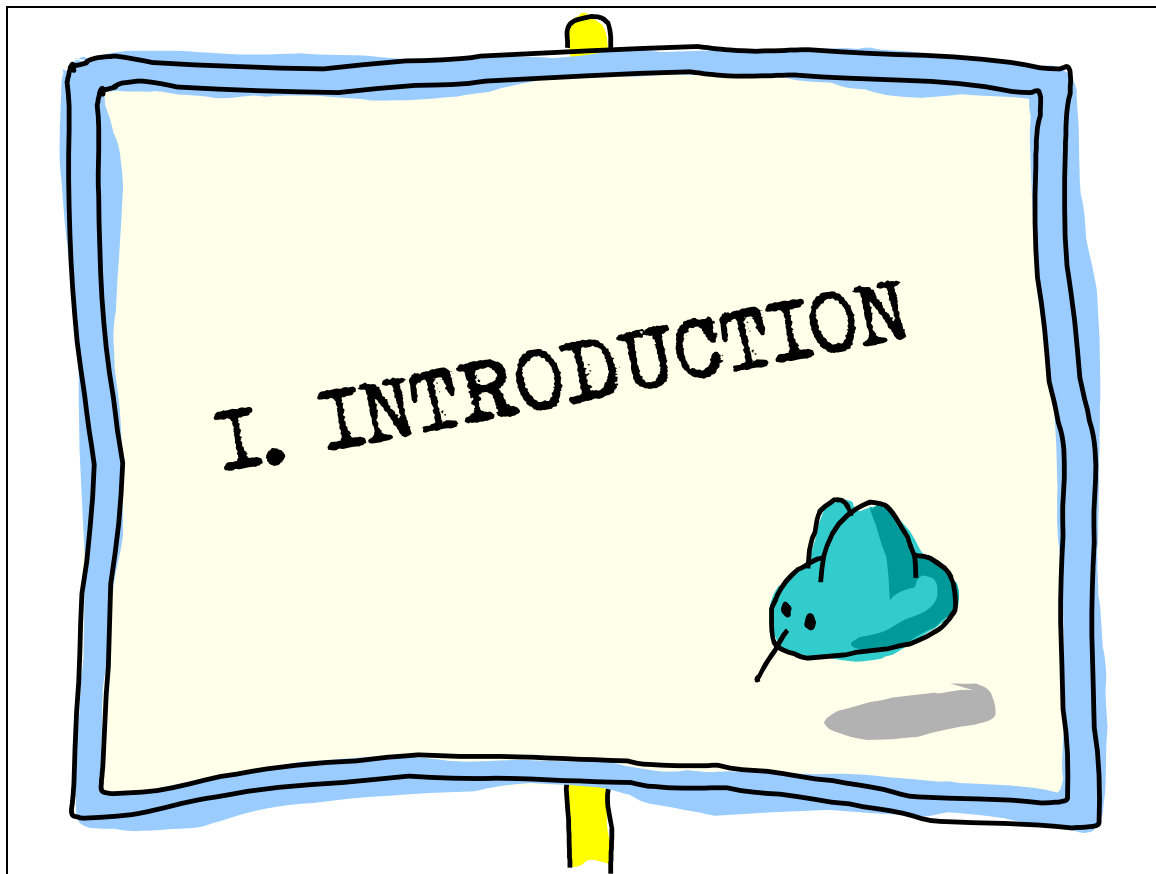
TABLE OF CONTENTS:	
I.	INTRODUCTION
II.	THE 4 CREATIVE HATS
III.	MY LIFE IN THE PLENITUDE (A)
IV.	SMART HOUSE?
V.	MY LIFE IN THE PLENITUDE (B)
VI.	SEVEN PATTERNS OF INNOVATION
VII.	MY LIFE IN THE PLENITUDE (C)
VIII.	THE MUSEUM AS A BOOK
IX.	DESIRE IN CONTEXT
X.	MY LIFE IN THE PLENITUDE (D)
XI.	THE PLENITUDE

I think this is a good place to note that throughout this book I make heavy use of a font I got off the web called MOM'S TYPEWRITER. Frankly, I've got a font Jones and spend way too much time routing about the web looking for new fonts, not unlike how driftwood artists scour the shores looking for new bleached branches.

Christoph Mueller designed MOM'S TYPEWRITER by scanning in the output of his mother's old machine. One of its charms is that it has neither a *zero* nor a *one*. Just like real old typewriters you are supposed to use an upper case "O" and a lower case "L" to complete the numerics. Fine, except that it makes automatic page numbering impossible. Whenever I use MOM'S TYPEWRITER it reminds me that every technology has a proclivity.

Chapters III, V, VII and X together form the autobiography of my life and are included as proof of what I say elsewhere in the book about the Plenitude. This autobiography is, as many readers have noted, too plenitudinous itself. It can certainly be skimmed, skipped, or flipped through.

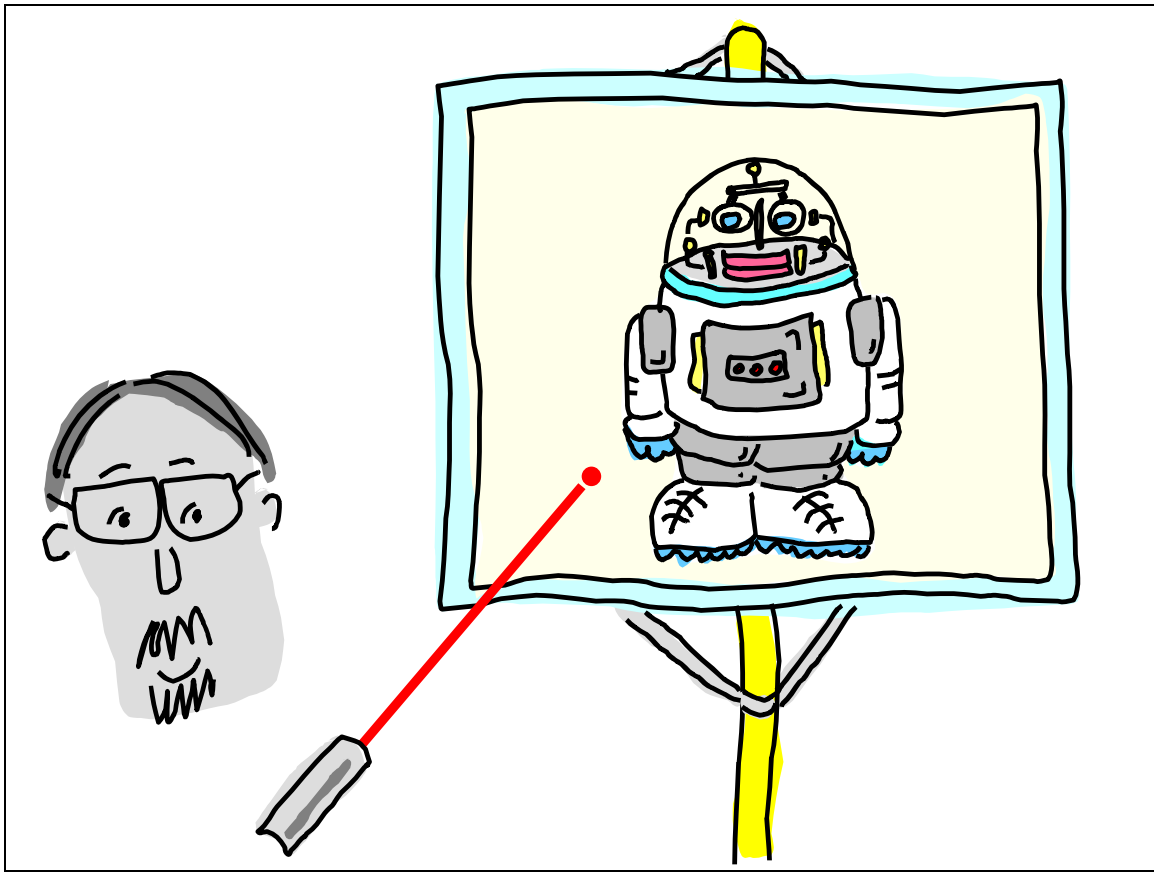
What the autobiography proves, BTW, is that the Plenitude exists because it is joyful to make.



Perhaps this is also a good place to point out that all the slides in this book, except the ones in the chapter called *Smart House?*, were produced directly in PowerPoint. For me PowerPoint is more than a presentation tool, it is a thinking tool. I push the various drawing and text objects around in the white rectangle based on thoughts, and the resulting arrangements create yet newer thoughts. In most cases I design the slides first, the notes, the words underneath the slides, for instance these words, later.

The images in *Smart House?* were drawn using an amazing program called *Painter* which does a pretty good job of replicating natural media. By using my pressure sensitive Wacom tablet I can draw in water color, ink, pastels, oil, chalk, whatever. Its kind of like the visual equivalent of an electronic organ with multiple stops. Oh yes, it doesn't smear.

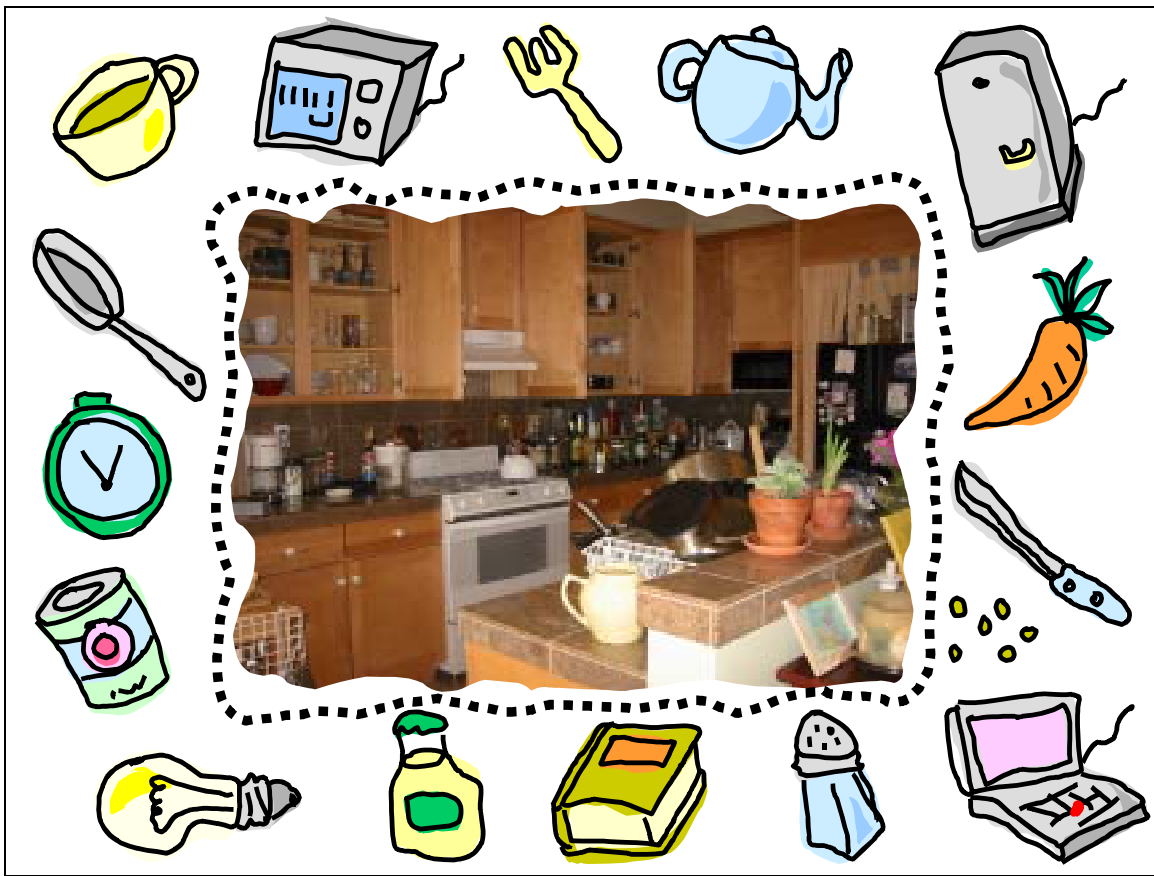
I use also use the Wacom to draw my cartoons directly in PowerPoint. I color the figures using a separate layer and not with "fill". My father, who is a printer, once pulled me aside to tell me that my registration was off. "Dad," I had to say, "it takes me *hours* to achieve that effect." I started out in life trying to get as far away from the printing business as I could. I was half way through my stint at Xerox before I realized how thick the ink in my blood actually was.



During the last ten years I have found myself giving hundreds talks. While most audiences think of them, I suspect, as slightly odd business presentations, I think of them as toned down performance art works. I have given them to sailors in the Coast Guard, to scientists at IBM, to artists at the Adelaide Arts Festival, to designers at the Aspen Design Conference, to civic leaders in Sheffield England, to the PTA in Palo Alto, to the engineers at the MITRE think-tank, to academics at MIT, to CEOs at The World Economic Forum. I've certainly racked up the frequent flyer miles. In these talks I stand before a large screen and narrate the slide which is projected on to it. A button is pressed, the image changes, and I narrate the next slide. And so on. Sometimes I spend several minutes talking about a slide, more often, I give each about thirty seconds or so. That's a lot of slides for an hour long talk.

This form of literature is called (by me, at least) “verbally augmented epigraphic writing” and is practiced by generals in front of colorful war maps, coaches in front of chalk-diagrammed black boards, designers with illustrated flipcharts and art historians with 35mm slides of old masters.

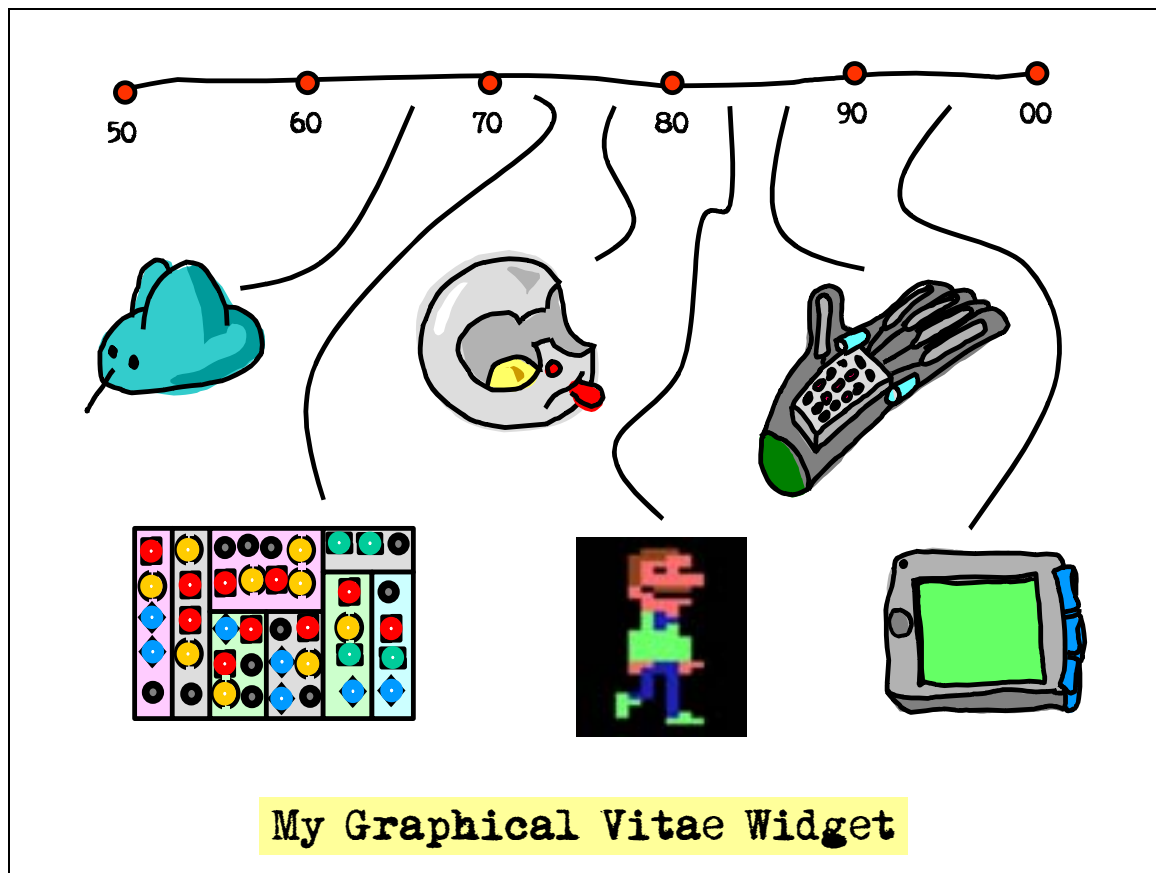
In the last several years my talks have centered on a single theme: the *Plenitude*.



How many things are there in an average room, say a kitchen, say my kitchen? I can easily count a thousand, but the actual answer is fractal. Every appliance, every tool, even every food (certainly if you count pesticide residue) is compound and is composed of tens, hundreds, sometimes thousands of other things. And every day new shopping bags arrive filled with yet more things. The bags were filled at malls and supermarkets, themselves filled with millions of things. It's a lot of stuff.

Some of the stuff is called media and its filled with transient, slightly more ethereal stuff. Some large part of the stuff in the media are words and images designed to get us to purchase the non-mediated stuff (and services to manage the stuff.) While it is true that each piece of stuff satisfies some desire, it is also true that each piece of stuff creates the need for even more stuff. Cereal demands a spoon; a TV demands a remote. The stuff co-evolved and is intertwined and interdependent. Recently some of the stuff has begun to talk to other stuff directly. The kitchen utensils, like an early Disney movie, have begun to chat and dance behind our backs. And all the while, more bags of stuff keep coming in the door.

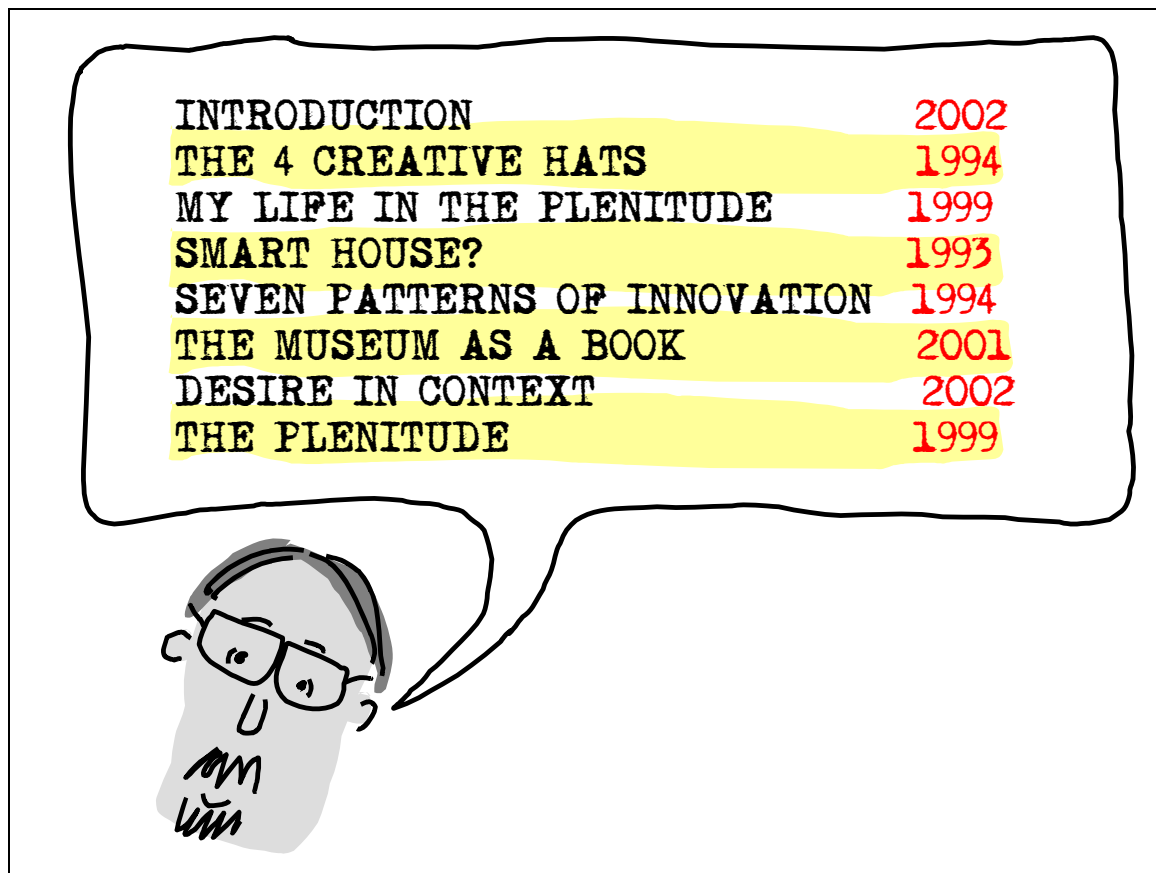
For a long time I called our culture *The Junk Tribe*, but that's both too pejorative and not scary enough. Rather, for reasons I will describe, I have come to call this dense, knotted ecology of humanly-created stuff the *Plenitude*. This book is about it.



I have spent my life making more stuff for the Plenitude. While I will describe my lucky life more fully later in the book, this is a good time to note that it has been a diverse life. It has encompassed making art stuff, game stuff, toy stuff, office equipment stuff, science stuff and museum exhibit stuff. I have also written novels and made lots of electronic music (the later technically interesting, musically suspect.) That is to say, that while like most people in the Western industrialized world I live deep inside the Plenitude, I also helped to make it. Even more unusually, I have done so in the often oppositional contexts of art, science, design and engineering. This book on stuff is not the book of an outsider.

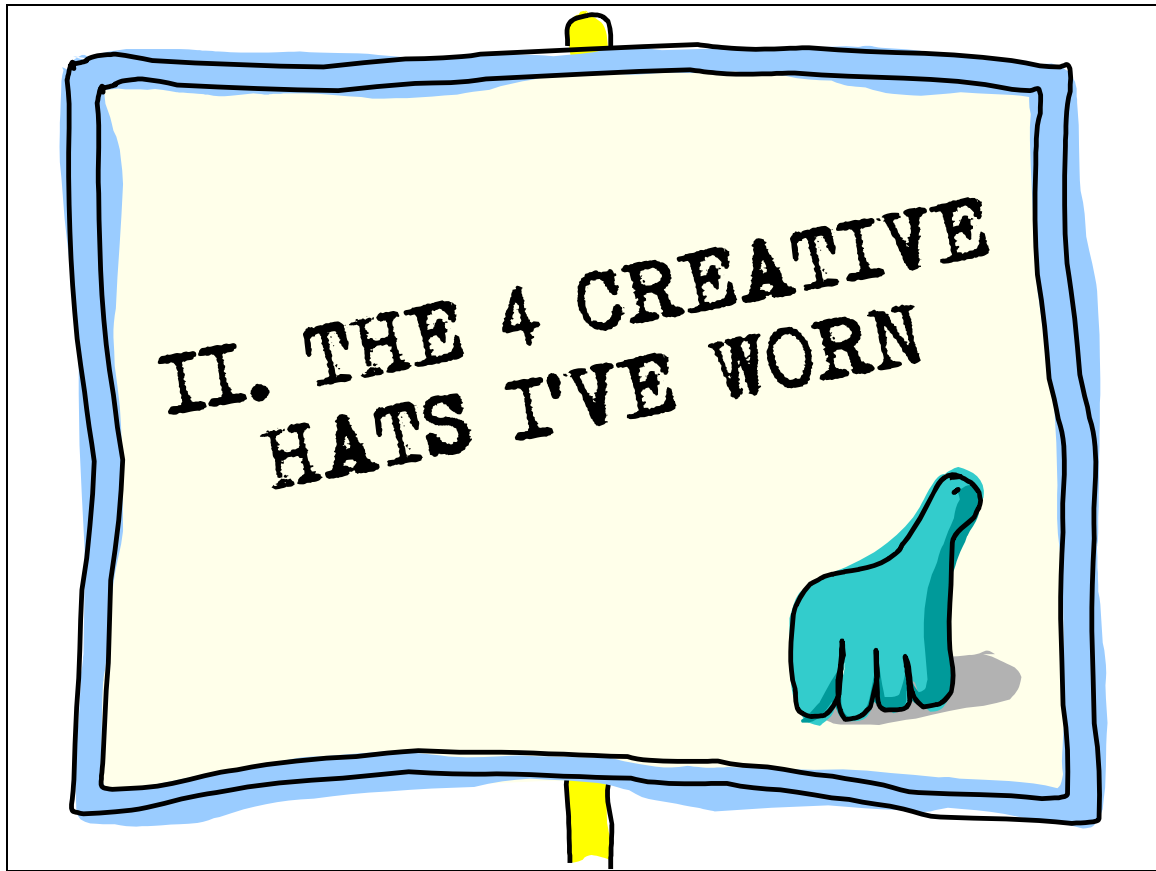
If there is a thread that runs through creations of this lifetime, it is that most of the stuff I have made is an exploration of new things to do with that interesting abstraction we call "computing". My life has been about taking these little chips of silicon and putting them in social situations where they had never been before.

While there are various theories as to how the Plenitude *started*, we know it mostly *grows* because it creates desire for more of itself. But it also grows because it is extraordinarily pleasurable to create. This book looks at both sides: creation and consumption. For me there is great pleasure and desire in both.



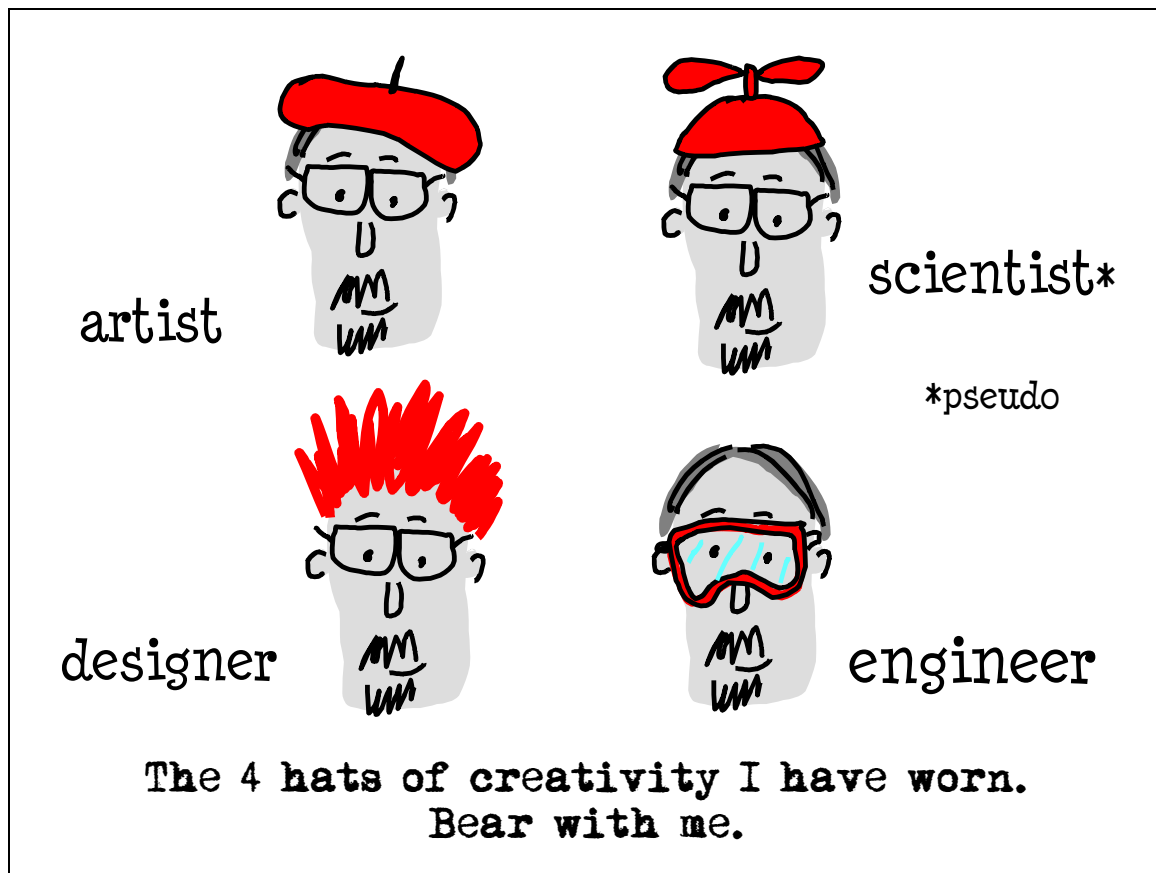
This book is taken from the talks I have given. While not transcriptions, I have attempted to capture something of their sound, look and feel. On the other hand, something odd happens when genres jump media. In this particular case it is clear that narrating a slide from the stage is different than captioning an image on a page. I will attempt to keep in mind that the reader is likely alone in an armchair, or in bed, or on a train, and not in an auditorium on an uncomfortable metal seat part of a group listening to my explanations. Social laughter and groaning are different than private laughter and groaning.

You are just finishing the *Introduction*. *Hats* concerns itself with art, science, design and engineering, the four professions which collectively have created about 95% of the Plenitude. *My Life* traces, well, my own life through these four professions and examines what it is like to help construct the Plenitude. *Smart House?* is a series of questions on what it means to digitize the Plenitude. *Seven Patterns* explores some common methodologies I have found useful in the creative professions. *The Museum* looks at the specific case of the museum, while *Desire* takes on the specific profession of the engineer. Lastly, *The Plenitude* looks at the Plenitude as a whole: its nature, its physics, its moral stance, its consequences, its future. It asks, given all this, how we should act, knowing it is hard to even make a living without making more stuff?



Creativity is highly prized in our society, it has as the marketers say, *high positive valence*. If you want to compliment a mother tell her that her daughter is “very creative.” If you want to praise a child, tell them that their essay was “very creative.” The United States partly bases its dominance of world on its supposed creativity (it invented rock and roll after all) while other emerging countries, while good at manufacturing, fear that they are not creative. They hire American consultants to become so.

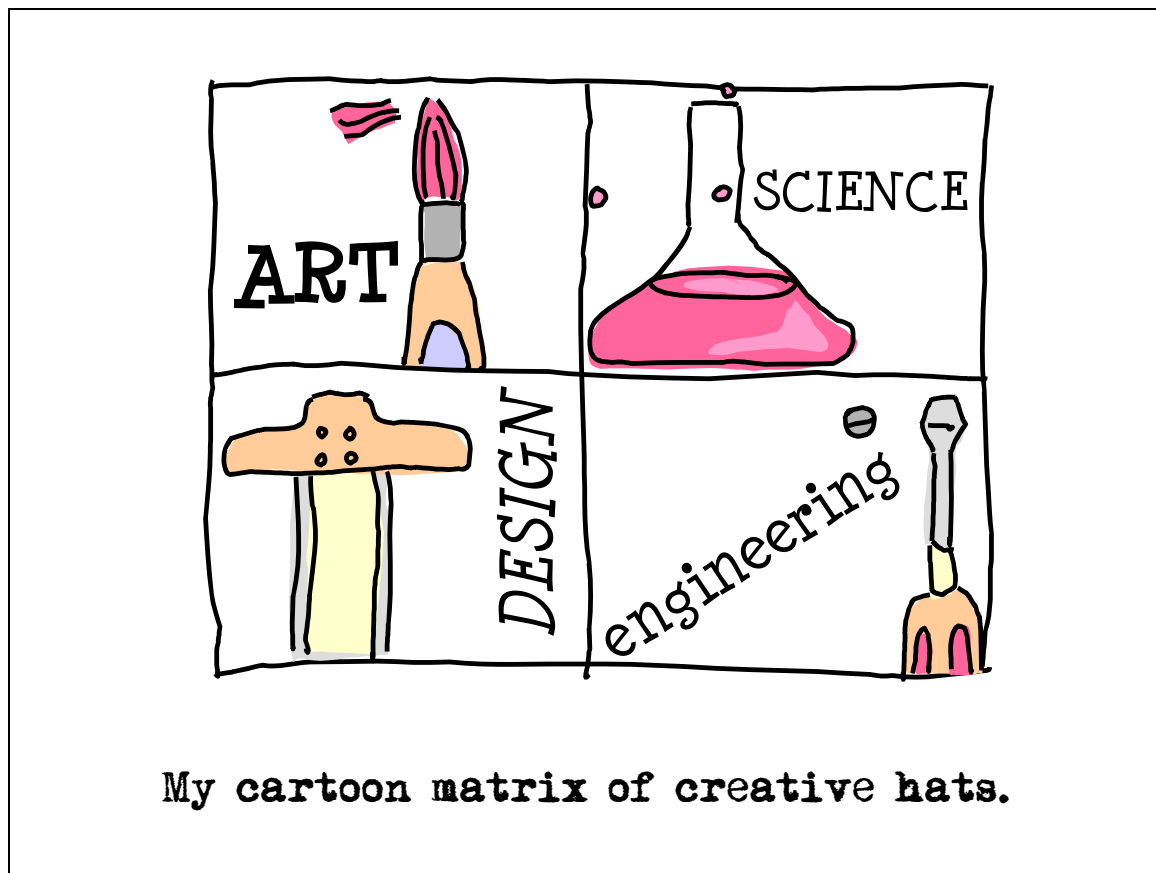
Creativity, in this context, is not just creating things (factories do that), its creating new things, things which have never existed before. From there the definition gets tricky for certainly every kid’s Crayola drawing is new and different, and every mom and dad will see it as creative (that’s why we give them crayons.) So we will narrow the definition a bit: creativity is making something new which also opens up a new category, a new genre, or a new type of thing. There are other definitions of the word, there are whole academic commissions set up to find other definitions, but this is the one I am interested in: the creation of new stuff that create new categories of new stuff. It turns out that there are different methodologies for such creation, well-worn paths which we have turned into professions complete with unions and uniforms. Let me call them *hats* and I have worn four of them.



It is probably unnecessary to mention that where others might observe complex shadings and infinite textures I see the world as a cartoon. This is one of those cartoons.

During my life I put on and took off four hats of creativity: artist, scientist, designer and engineer. I think of each one as quite distinct with its own methods, world views, precedents, predecessors, style of dress, interior decorations, histories, vocabularies, alliances, likes, dislikes, prejudices, tools, techniques and demeanors. I can walk into an office and know immediately if it is a designer's office or an engineer's office. I instantaneously know if it is an artist's loft or a scientist's lab even if they are filled with the same digital tools. Actually it is only with great effort that I have begun to think of them as *hats*; in some real way, for me, they are states of *being* as different as alligators and elephants.

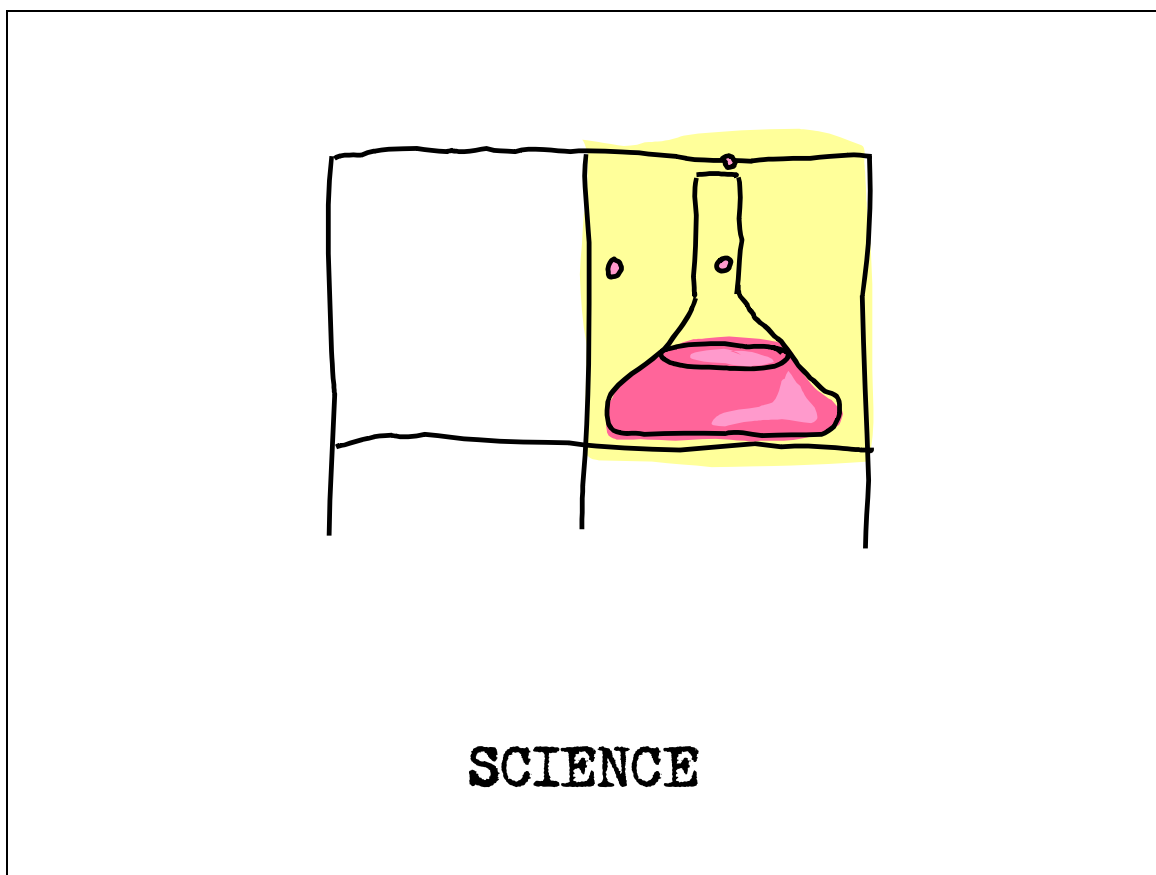
In my life I have sometimes worn one hat, sometimes another. Sometimes I pick one up after the other like a circus clown. Occasionally I put two or more on my head simultaneously. I found that all of the hats can be creative, innovative, productive, even revolutionary in both the political and marketing sense. That said, I also find each hat to be a hat in trouble.



I usually represent the four hats of creation using this two by two matrix. I have been known to talk for an hour about it, digging myself deeper and deeper into the hole of unsustainable definition. In the end nobody likes to be put in a square in a box, particularly creative people. Particularly a cartoon box.

There are many creative professions not represented directly in this two by two, for instance those of mathematician, architect and politician. Like all personal paradigms I can fit them in, though I am equally certain that their two by twos would be different than mine – after all, mine came from a life lived and not a culture observed. The mathematician would be placed at the very top left corner of the science square. The politician would be situated between design and engineering. Architecture is a kidney-shape encompassing the central corners of art, design and engineering.

I often get people pointing to very specific points in the matrix and saying, “I’m right here.” I have also heard people say, in that post-modernist tone, “But *who* is putting on and taking off the hats?”



In the upper-right hand corner is the hat of Science. This is the newest hat of the four, but if we look at its attributes we see that it has had clear precursors in the hats of alchemy, wizardry, mathematics and a certain kind of physical philosophy. As a precursor image you may picture a sorcerer in a robe with a pointy hat, perched on a stool in a flask-laden lab with bubbling fluids and giant books of formulae. Or picture Pythagoras surrounded by scrolls and compasses calculating out the relations between the sides of triangles. Now picture a contemporary scientist in a white lab coat, amidst a tangled lab of tubes and wires, staring at a green monitor attached to a scanning tunneling microscope, staring at, amazingly, images of atoms. The purple robe and the white lab coat are not identical, but my guess is that the Medieval alchemist would easily recognize the woman in the white lab coat as one of his own.

While there is no good way to define science (or any of the hats really) we can say, in general, that when someone wears this hat they seek to understand the basic laws of nature and express those laws as mathematical equations. This implies many things. It implies, above all, that the wearer of the science hat believes in a nature that *exists* and in a nature that *has* laws. The difference between science and alchemy is where those laws are placed; the later believing that they are in the *super-natural*, the first that they're in *nature* itself. But this might be no difference at all.

The idealized scientific method, which provides a generalized ethos for the hat, starts with an insight, called a theory, derived from studying previous scientific work and from personal vision. This vision part is important. Scientists become famous, much like artists, based on their visions. Experiments are conceived of, and then executed, which test these visions. These experiments are observed and the resulting data is reworked into a series of equations and placed within a peculiar form of literature called a *paper*. The paper is peer reviewed *by other scientists* and hopefully published. Once published yet other *scientists* may try replicate the results. Slowly, but surely, the equations become part of the edifice of scientific belief and indistinguishable from the belief in the real world, or for that matter, truth itself. And yes the process seems primarily comprised of scientists. Science is not a democracy.

Given this definition scientists would seem to create only equations and papers, which would hardly qualify science as being one of the big four creative hats. And indeed for precisely this reason many scientists do not think of themselves as being like, or being in the same matrix as, designers and engineers. Heaven forbid.

But the world is far messier than the ideal, for not only do we think of scientists as having created everything from rocket ships to cures for cancer; from genetically modified corn to atom bombs, but so do the scientists themselves. In some cases these inventions were the goals of the scientific enterprise, in others they tightly intertwined with the discovery of the laws which they exemplify. While the scientist may care most deeply about the laws of nature than these physical inventions (say the cure for polio) they are both the justification and the proof of the scientific enterprise.

People wearing the hat of science also create rooms full of very clever, and very cool, test equipment. This equipment is to science, I think, as the guitar is to rock and roll only you can't buy it at Guitar Center. There is much cleverness and invention in these beautifully engineered experiments. They alone qualify the scientist for a hat in the Plenitude.

Seen this way science is amazingly creative. Indeed, their enthusiasm for new stuff threatens to overwhelm us. It may be, that without science there would be no Plenitude. It is, after all, the equations that flow from the scientist's bench that give the engineers their huge head-starts, their big hints, allowing them to make the goods which fill our shopping centers.



While I passed over the different sub-hats of science, for instance I didn't mention the differences between applied and fundamental science, or the distinctions between natural and artificial science, for art I am compelled to do so. That's what happens when you get an MFA (Master's of Fine Arts) as I did. Suddenly these sorts of things matter.

There are three kinds of art hats to be found in the Plenitude (in my cartoon eyes.) First, there are *Fine* artists who, as symbolized in this slide, wear berets. When wearing the beret, artists work from within themselves, from their visions. They try to express themselves and their ideas, and the resulting art is but a representation of those ideas. Beret wearers seek a kind of artistic integrity (and they often use the word *integrity*): a kind of truth where the art they produce is equal to the visions. *Comprising* the vision is seen as a form of evil. They study the world and art history and immerse themselves in the ongoing, somewhat esoteric fine art *dialog* (which unless you are an artist you barely know is chattering away.) From these inputs, *the process which is themselves*, outputs the art you see filling museums, galleries, books, magazines and expensive mansions.

When this method works, when the beret is really cooking, the art produced has a semi-magical, *transcendent* quality about it. Just as alchemists would recognize scientists, shamans would recognize the fetishes of contemporary art (and vice versa.) Art often exists under separate laws from the other stuff of the Plenitude. For instance, in many states it is illegal to destroy a work of fine art, one assumes because, like scientific equations, they are intended to have a validity beyond the moment. There have even been serious debates about whether soldiers should risk death trying to save works of fine art. Or whether people can remove or alter a public sculpture that inconveniences or offends them. Or whether it is right for one country to own the art works of another. Not the sorts of questions one asks when talking about, say, *Swatch Watches*.

The basic economics of the beret goes like this: Those who wear it make their living (if they make a living) by producing a small number of objects which they sell for large amounts of money usually to the corporations, governments or the wealthy. In the not-so-distant past they were also funded by the Church. That is, fine artists are supported by the most powerful, elitist, influential forces in our culture. Oddly, of course, the beret wearers often see themselves as outsiders, or even antithetical to the power elite. (A Google search on *subversive art* turned up 80,000 entries.) It is traditional for artists to see themselves as agents of change attempting to bring down, or at least alter, or at least awaken, or at least *offend*, the ruling structures. But while articles about artists in the front of art magazines present a new world, the gallery ads in the back appeal to the old, established world. Precisely because art transcends, it becomes valuable as an economic hedge against all forms of calamity.

To accomplish this remarkable sales feat, selling cloth and paint (or interactive gizmos, or whatever) for large sums of money, the artist must convince the patron that they, at least when wearing the beret, are of a special nature, that they embody a unique process. It is not uncommon for artists to claim that they were *born* artists, that they have always been artists, that they can't be but an artist. They are not like accountants who could have chosen to be a dentist instead.

Like the scientist, the artist is steeped in the history of art (past and present) and in the world as it is, both political and material. From inside this now prepared self emerges the artistic idea or vision, which when realized, well or poorly, is the *work*.

These works are evaluated by the artist's peers (and near-peers including curators and critics) and are judged good, or bad, or coyly *interesting*. It is not democratic. While adventurous patrons may buy an individual work or two, it quickly becomes the artist and their oeuvre *as a whole* that becomes valuable, the works becoming only exemplars of the process and the vision. And it is only when patrons begin buying the artist, however long that might take, that the artist and the data points of their work becomes part of the Plenitude's art edifice. Sometimes the trust fund runs out first.



Second, there is the *Popular* art hat, here represented by the baseball cap, which I picture being worn by movie producers. The baseball cap wearing popular artist cares not so much about their own inner vision, but about the emotions the people who watch and listen to their art. As Britany Spears says, “I was born to make you happy.” They, or at least their managers, follow the top 100 charts with a magnifying lens; they study the weekend box office numbers like an accountant. They will do, and this is a major distinction from beret wearers, *do user-testing!* To the beret wearer this would be an outrage for it would be the loss of integrity, not to mention vision. But not to the true baseball cap: the deep feedback loops between themselves and the audience are as important as the work itself. In this sense, the baseball cap is democratic, anti-elitist and human. The idea of producing art that confuses or repels, not unknown to the beret, is to the baseball cap deeply offensive.

The economics of the baseball cap art is more or less this: These artists make highly replicable works, large volumes of which they sell for small amounts of money, say seven dollars a pop. Or \$15 for a CD. The baseball cap produces besides movies: rock and roll, television, video games, most mall-based clothing and most books. The works themselves are often very expensive to produce. A movie, for instance, might run to hundreds of millions of dollars. The artists are not supported by

corporations so much as they are part of the corporations, and they rely on the corporation for manufacturing, advertising and distribution.

The baseball cap is an artistic hat that probably could not have existed much before the mid-nineteenth century. Now, of course, popular art constitutes some large percentage of the Plenitude both in the number of individual works and the work's multiples which run into the billions. At its best, it is world encompassing and far more inclusive than most other art, and is the art type most indicative of our time. In a thousand years it is quite unclear if it will be the Beatles or Steve Reich who will be remembered most clearly, but my guess is that it will be the Beatles.

At its worst, the audience-artist feedback loop that sits at the heart of popular art can produce a kind of mind numbing, full surround cacophony that constitutes a form of contemporary pollution. When my desires are instantly amplified by focus groups and blared back out through youthful pop artists, the car radio can become an unbearable torture.

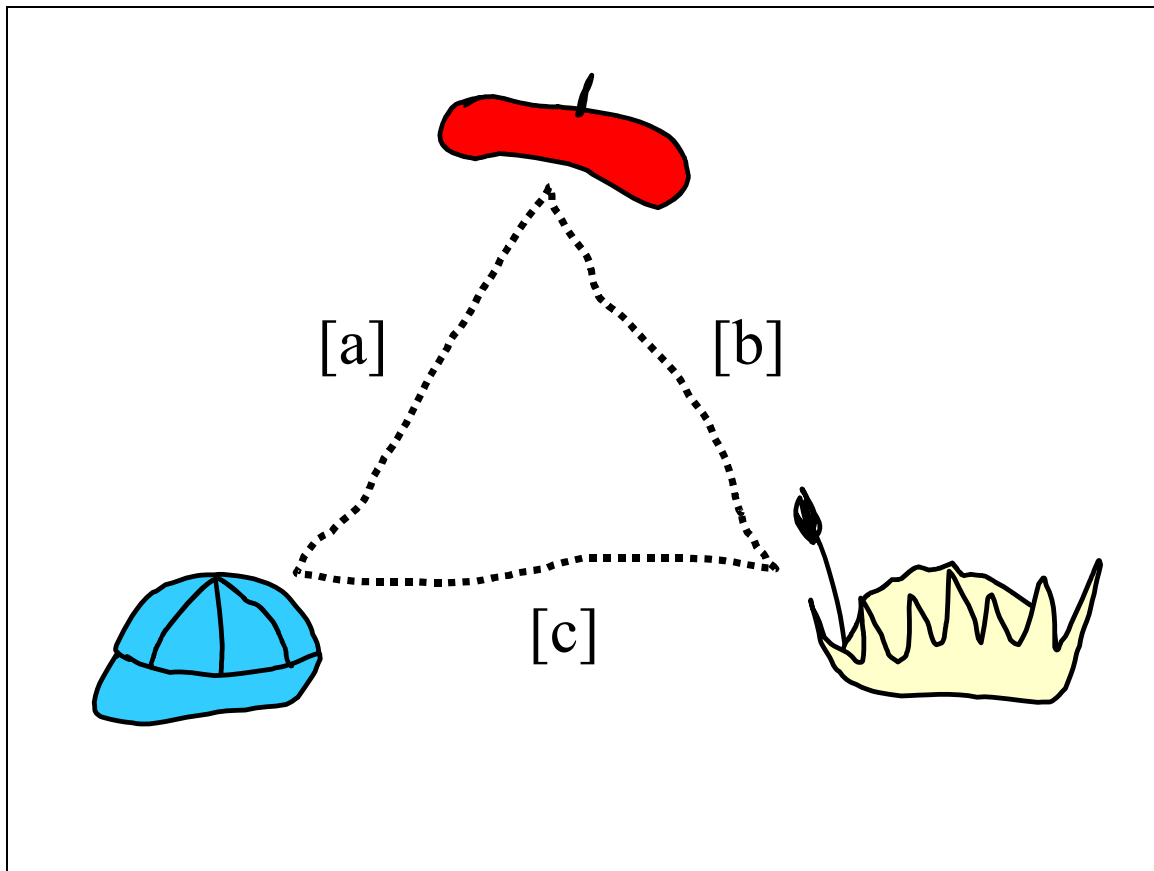


Lastly, are those artists which we might call *Folk* artists, here symbolized by the straw hat of the farmhouse, banjo strummer. This is a particularly unfair image, I must admit, for folk art ranges from people who make furniture in their garages to, well, small groups of teenagers who make rock and roll in their garages. Here's my definition: Straw hat artists make art for themselves and for their friends. Straw hats engage in art making not because it will last forever, or because it will please a million people, but because it is fun, enjoyable and satisfying to make and because it is a way of interacting with, and strengthening, the bonds between friends and family. Up until recently, when the first great washes of the Plenitude crashed over the populace, what we now call folk art was then simply called music, or dance, or drawing and was the vast majority of art produced. It is still produced in some quantity, though it gets drawn like a magnet either to popular art (the rock band in the garage almost immediately thinks about selling their CDs) or to fine art (the weekend painter almost as a reflex imagines their work in a gallery.) Or Martha Stuart simply turns it into a kind of user configurable corporate product. The inability to make art simply for its own enjoyment is one of the great losses, let me go further, is one of the great tragedies, of the Plenitude.

The economics of the straw hat of art are this: It is almost always a financial loss. It costs money to do it. There is rarely money exchanged, or at most, only small sums between the maker and the consumer. It is, as the anthropologists say, a gift culture and it is to a large extent gone. Hakim Bey, the contemporary philosopher, calls it *Immediatism*, art that is done for immediate pleasure and for the immediate company. It is difficult for many reasons, one is that fantasies of making money over power it quickly. Another reason is time – or rather, the lack of it. There is never enough time, and in a crunch out goes the folk art. Q: What takes up the time? A: The rest of the Plenitude.

For instance, it is fairly rare these days to go to somebody's house and have them play music for you. Yet only a hundred years ago this was the most common form of music in our land. We further denigrate such activity by using such phrases as *weekend painter* or *vanity-press author*. Even home cooking, a true folk art form, has been greatly replaced by *home style meals* you can buy in a supermarket. Straw hat street art, such as rap and break dancing, gets so rapidly pulled into baseball cap art, that by the time it reaches the Minnesota suburbs six months later it is already a popular art and not a folk art form.

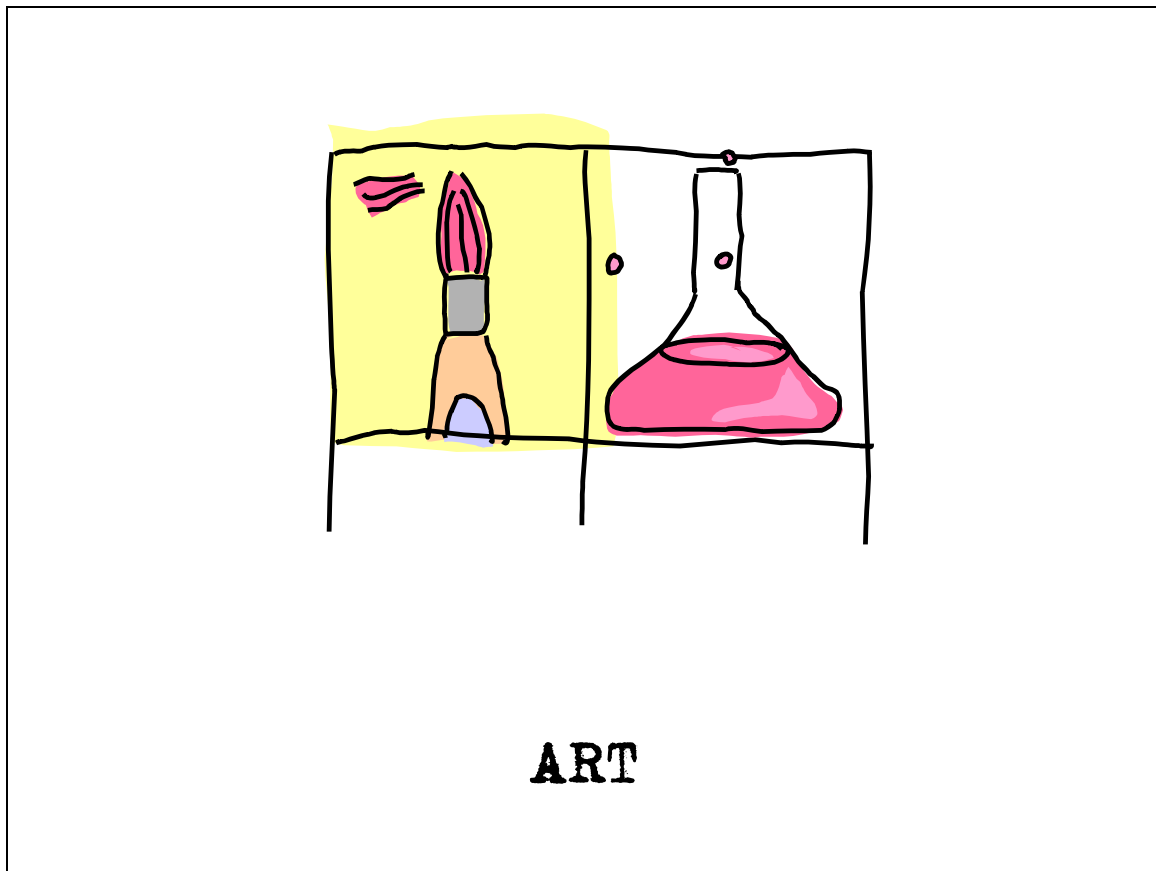
It is common, in densely worded papers, for contemporary cultural theorists to claim that folk art still exists, but at the edges of popular art. This runs the gamut from making new houses for The Sims, to writing Kirk/Spock homo-erotic stories (and posting them on the web), to re-mixing pop songs, to re-cutting Star War movies, to inventing strange rituals in EverQuest. It hard to argue with this, but it is also hard not to be a little cynical, particularly when the companies producing these pop art works are banking on such folk interests. I do believe that that truly beautiful explosion of graphic arts in the mid 90s which occurred on the web, was mostly folk art. It certainly didn't make money. It was just immediate fun to do for you and your unmet friends.



A more legitimate way of presenting the three hats of art is to say that they form a triangle and that any given artist (or work) can be placed somewhere in that triangle. Some artists are very close to one vertex or the other but most are somewhere in the middle. It might be useful to look at some of the artistic types that exist on the edges. Here two data points:

(1) Rock and roll is generally thought to be a popular art form with its genesis in the folk art forms of blues and country [c] while Dick Dale says that his surf music was the combination of rock and Lebanese folk music. There are certainly fine artists who experiment with rock and roll (e.g. Laurie Anderson) [a] and rock stars that toy with fine art (The Beatles' Revolution #9). Fine art composers have often dug at the folk art well (Stravinsky comes to mind) [b] while much piano playing at home is actually of Bach. And of course, Bob Dylan re-writes folk music [c] and then his songs are sung around the camp fire as if they were as old as the hills.

(2) There are more unusual cases, for instance, there is a sense in which young cutting edge painters are folk artists. Some large percentage of them are the sons and daughters of the upper classes of our society. If their works are purchased they are bought, essentially, by their parents and if they are not, they were done only for the enjoyment of their friends. Together, just about the definition of folk art.



As a recovering artist (or perhaps *post-artist* is a better term) this is my definition of the hat of art. By *artist* I am referring here to *fine* artists; I will get to *popular* artists in a little bit.

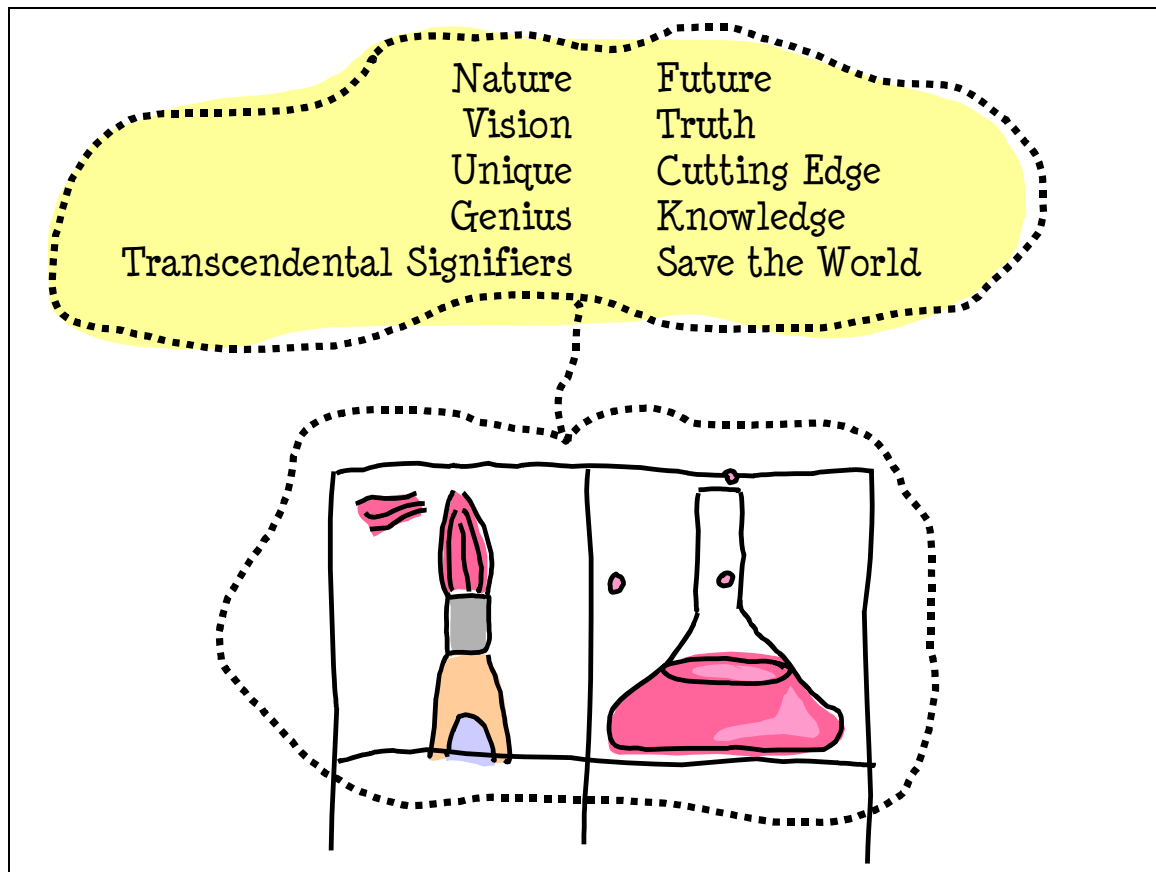
With the beret of fine art on, a creator looks inside him or herself for inspiration. The art flows from personal vision and from a unique sense of self. Many artists talk about being *born artists*, and that they *have to do art*. To many artists, art is more a calling than a profession, though one still needs to be trained in it, and there is certainly a business side. While the art vision flows from within the artist, what the artist is representing are certain deep aspects of the world. These can be from nature or human nature, or they can be cultural, autobiographical, linguistics, historical, political or even religious. And these artistic insights are intended to be deep, for art produced in this fashion is intended to last millennia. One of the prime values to the owner, the patron who buys it, is the monetary benefits that accrue to unique objects of long lasting value. Kind of like man-made diamonds.

In one sense then artists are like the scientists, looking for, dare I say it, *truths*, even if only personal ones. As in science, the work exists within a complex dialog with peers, a hermetic language pretty much impenetrable by the average citizen. One difference from the science world however, is that works need to be unique from

artist to artist, for the value is much about the uniqueness of the individual. Replicating art does not prove it.

Stuff made with the art hat on can be enjoyable, insightful, funny, ironic, beautiful, entertaining, enlightening, inspirational, deep, motivational and/or soul wrenching. I have been almost brought to my knees by a few pieces. There is, of course, way too much of it. One might ask what art colleges think they are doing graduating that many art students. None-the-less, it is an extraordinarily useful hat to put on from time to time even for the non-artist; even the hats of design and engineering need the deep infusions of vision that the beret can provide. Without artistic personal vision stuff tends to asymptotes to commodity. Lesson for corporations: The kids will be off buying somebody else's sneakers without a little art.

Many artists believe that wearing the beret is antithetical to the Plenitude, if not its antidote. Or at least a refuge from it. They believe that art's close ties to the ruling classes are just a ruse, kind of a trick pulled over the patron's eyes to get money. This is not my belief. I believe that Western fine art is almost a perfect reflection of the society that produces it. From the love of the new, to the cult of the individual, from the commodification of the aesthetic surface, to the elaborate laws of intellectual ownership, from the concepts of continual revolution and change, to the belief in modernity and post-modernity – art and society are not just reflections of each other, *they are the same*. Of course they are the same. What a weird civilization it would be if the art was not of it. There is even an argument, flimsy perhaps, that our civilization's base capitalistic concepts first arose in the art world, and were then appropriated by the rising bourgeoisie. The Plenitude is what you get when you cross the art with the corporation. If we are heading towards global destruction, the principles of Western art are not the life preservers, they're the ship that's taking us down. Note to self: this *is* a flimsy argument.

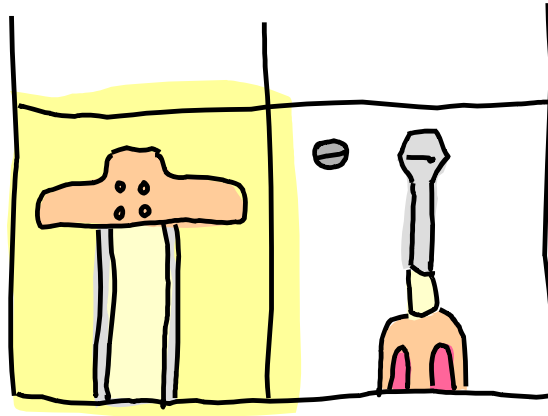


There are many similarities between the hats of art and science. They even share a common progenitor: Leonardo Da Vinci. When one listens to artists and scientists speak one hears many of the same words, though often with different shadings or even reversed meanings. But the territory, the frame, is the same.

Both artists and scientists talk about *nature*, it is the central object of study for the scientist. Artists ping all around the concept from post-modern denial of its existence, to making it the central theme of their work. It comes up in various battles, or as they say in the lofts: it is a *site of contention*.

Both artists and scientists speak of personal *vision*, of having visions and working from visions, which are different than mere *ideas*. They think of themselves as *unique* (for the artist this is the bankable commodity.) Both hats contain a concept of *genius* – its what the Nobel prize is all about, and it is what Picasso is referred to in art literature. The art community might make noises about there being “an artist in all of us” but all artistic homunculi are not equal.

They both speak, in other words, in *transcendent signifiers*, giant words that by their nature are outside the world. They both speak of the *future* (and claim to precurse it); they both speak of *truth* (sometimes about finding it, sometimes about denying it); and they both talk about *saving the world*, sometimes from each other.



DESIGN

In the lower-left hand corner is the hat of Design. As I travel around the country presenting this little 2 by 2 matrix I have found that that many corporate executives don't distinguish between those who wear the hat of art, and those who wear the hat of design. They certainly don't know that when the hats are tightly worn, the wearers hate each other. Maybe hate is too strong a word; we might say that the methods represented by the two hats are more or less diametrically opposed to each other and cause procedural friction. Woe to them who mistakes an artist for a designer and asks for a little more green in the painting to match, say, the couch. And woe to the designer who forgoes the opinions, desires and needs of his users and clients to rely only on his own visions and dreams.

For an artist *user-testing* is a joke. For a designer it is fundamental. If an artist looks inward as a way of seeing the world, the designer looks outward towards others. An artist paints a painting, stares at it, and says, "isn't it beautiful, it expresses my inner vision perfectly." The designer paints a painting, stares at, then turns it around to the audience and asks "Do you like it? No? Then I'll change it." When it works, when the designer can hone in on the audience's wave length, it is an amazing and beautiful trick. It has created most of the bounty around us.

All cultures are designed, of course. It is through design that we can distinguish the

arrowheads of this tribe from that; the houses of this civilization from that one; the utensils of one ancient nation from the next. But the hat of design, as we think of it today, separated out as it is from other employment, is new. You can actually get a degree in design and figure out what you will design later on. Should I design dolls or websites? Cars or advertisements? It is the story of my life.

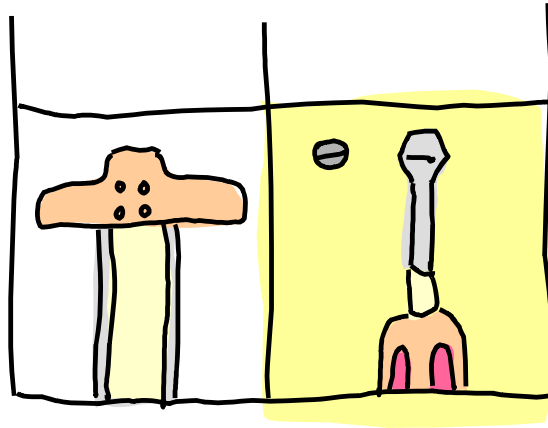
The designer speaks a language quite different from that of an artist. *Precision* is a word designers often use, as is *brand* and the ubiquitous, ambiguous *user*. Design which doesn't communicate with the user, or satisfy the user's needs, is considered poor design. Design that is messy at the edges, or that gets in the way, or that needs to be fought with (as art often requires) is considered poor design. Design is functional and usually serves a purpose, even if it is simply to entertain, beautify or sell something. It can be used to communicate, makes something easier or more comfortable. It is often used simply to say, "I care about you."

The wearer of the design hat often thinks of the wearer of the artist hat as a navel gazer since the viewer is ignored, or even ridiculed; while the artist thinks of the designer as somebody who sold out; who couldn't make it in the much less commercial, semi-mystical, realm of art. There is much less *transcendent signification* in design than in art. It is not above the world, it is of it.

The artist is more revered in our culture than design (they teach art, and not design, in grade school) but it is the designer who has had the much greater influence within the Plenitude. When design is revered it is usually the design and not the designer which is honored, for unlike the artist, the designer is often anonymous and can be switched out at the whim of his employer. Oh, did I mention that designers have employers?

This modern hat of design flows in great measure from a peculiar aspect of the Plenitude which is so important and vital that it is actually embedded in law. Every new thing, every new hunk of stuff, must be different from every other thing. In many cultures, when you tell a story, that story is the same as the story your parents told you. And that their parents told them. Every knife you fashion is just like the knife the your elders fashioned, and their elders. But in the Plenitude, this is illegal! It is called Copyright Infringement! In the Plenitude every story, every novel, every movie, every knife, every car, every cereal, every toy, every napkin, every napkin holder must be different than every other, to pick one, napkin holder. And it must be different this year from last year. It must be new and improved continuously, and if the oatmeal itself can't be improved, then the packaging must be.

If art looks at the deep fundamentals that should last five hundred years then design looks the trends which must be novel this month, and need only last this season. Design looks at fashion. For the designer, in a real sense, when the car is sold, their job is done. The cumulative effect is to produce the glory of the Plenitude, which is not so transitory. The designerly Plenitude, as a whole, is our culture's greatest art.



ENGINEERING

In the lower right corner is the last of the four hats of creation, that of engineering. It is the hat of problem solving, of rules of thumb, of simple machines (pulleys and gears) and complex ones (flying buttresses and rotary engines), of numerical tables, of equations, and of books of regulations. It is “necessity is the mother of invention” and it is “do no harm” (first of all, the bridge should not collapse.)

The things that engineers build are bounded by constraints, from the laws of nature to the laws congress imposes on fuel mileage. The job of the engineer is to get the world of molecules to act in ways that will solve *engineering problems*. People need light at night, now there’s a clear problem. That’s an understandable desire. Engineers want their problems in the form of a clear *spec*, so they know when they have succeeded. Engineers believe that within the fixed bounds of the laws of nature, there is the solution to almost every problem. Finding it is the job. Once we wanted to fly, we flew. Once we wanted to get to the moon, we did. And now that we want warp drives, we will engineer it. To the engineer it is not whether it is solvable or not, it is whether it is a *hard* or an *easy* problem. They differ by how long it will take to find the answer (and how much money it will require.)

The hat of engineering is very related to the hat of design. Both work from need and desire. Both are concerned primarily with the user and the world, or the “real

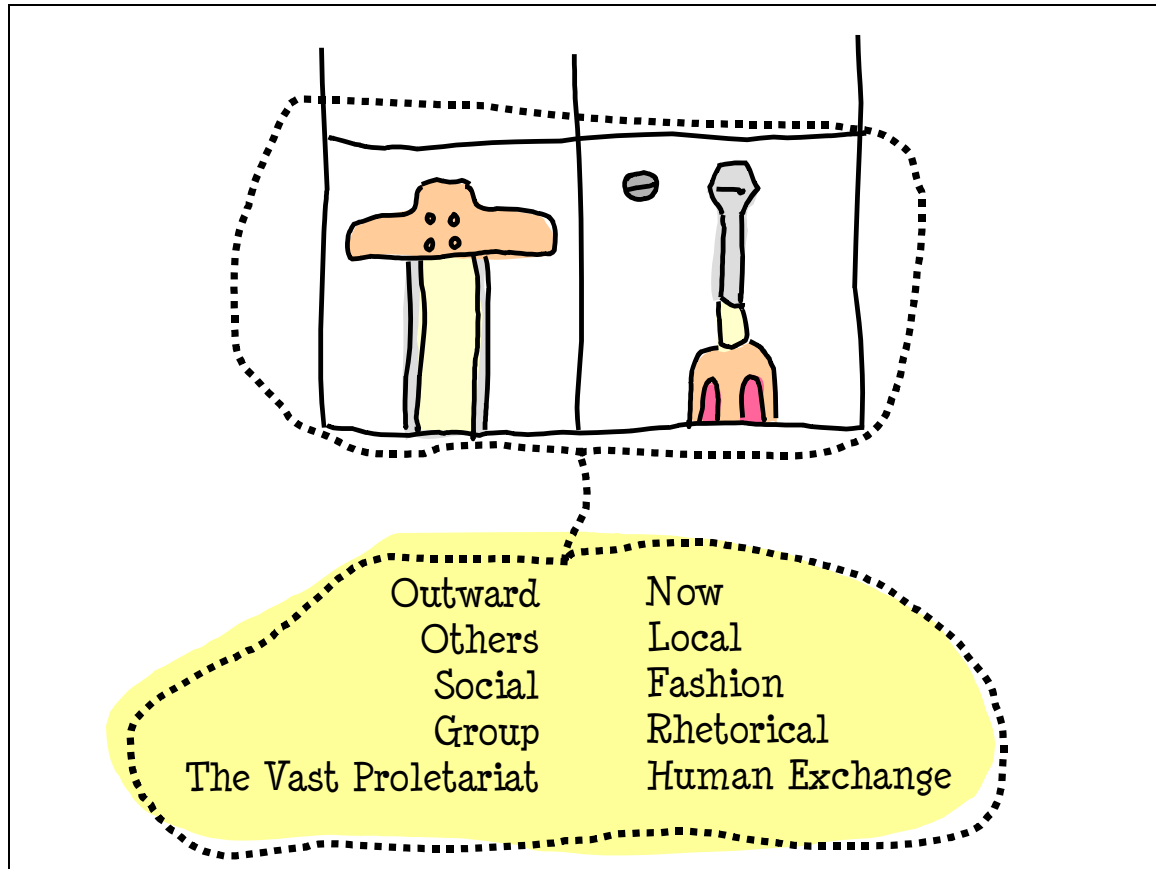
world” as they like to say. Unfortunately, in most companies design is pitted against engineering, a battle which tends to reduce the effectiveness of both. I think this is caused by a misunderstanding by both engineers and management who see the hat of design as the hat of art. They think that designers work from inner vision and not problem solving.

Engineering’s relationship to science is more complex. Engineering is the oldest hat of the four creative hats. Egyptian or Roman engineers (pyramids and aquaducts) are almost indistinguishable from contemporary ones in their methodologies and basic world view. Of course their tools have changed, as have their books of formula, rules of thumb, exemplars and equations. But these are always on the march. Engineering, without science, might well have created the entire Plenitude, though a somewhat different one and it would have taken longer. From the cathedrals of Europe to the airplane and the car, from Chinese porcelain to the sailing ships of Europe, from the ziggurats of Persia to the cultivation of grain, all were created by people wearing the hat of engineering and not the hat of science.

Science, as seen from the eyes of the engineer, does two things: it presents new equations about how the world works that speeds finding engineering solutions. In today’s world, without these equations, you will surely be left behind. Second, and more interestingly, science creates new desires and needs which engineers must then solve. Science fiction rests on new science, but the worlds presented in science fiction are pre-artifacts that the engineers will create.

One of the interesting ways that engineering differs from science is that while science is a hat of laws, engineering is a hat of violations. Engineers spend much, if not a majority, of their time engineering out the exceptions. Most of the stuff in a high speed printer is there to take care of the jam which occurs only once for in every thousand pieces of paper. Much of why a car is built the way it is, is to prevent or minimize, the accident that will occur only once or twice (or never) in its life time. There are those who believe that all of science will eventually be a single, beautiful equation. Not so for engineering. To the engineer all is local, unique, different, problematic, ready to violate every known law. The engineering library always threatens to burst the library’s doors.

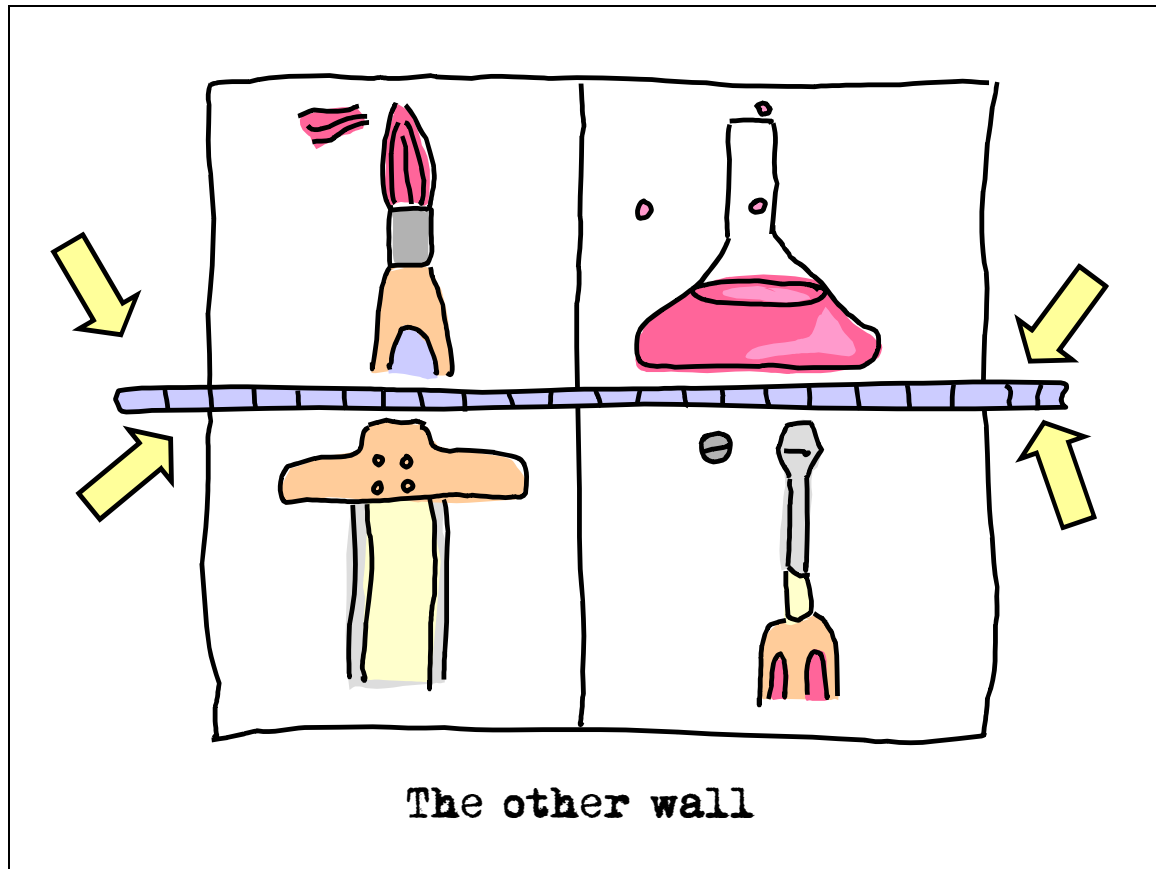
Engineering forms the backbone of invention of the Plenitude. If you want to make sure your child has a job in the future, have them become an engineer. If you go back into the past using a time machine and you want to insure your survival, bring along an engineer and not a scientist.



Design and engineering are much more related to each other than art is to science; in some product creation, such as furniture, they are barely distinguishable at all. Both design and engineering look *outward* towards other people. It is not good design or good engineering unless other humans like it, buy it, use it. It is irrelevant whether it satisfies creator's vision. It is *social*, it creates the physical artifacts by which we interact with each other, by which we communicate to each other. Your designed clothing is a visual language perpetually speaking; your car is a socially negotiated piece of metal to get you from one human to another. Design and engineering are created with the *vast proletariat* in mind. Even the exclusive Paris fashion shows up in *Vogue*; the limited edition Ferrari in *Car and Driver*.

Sure, we might treasure design/engineering efforts from two hundred years ago, but it was created for the *now*. What is good design/engineering today could be bad tomorrow. What is good design in this country, in this part of town, could be bad in that. Engineered crops in this country could be (and are) illegal in another.

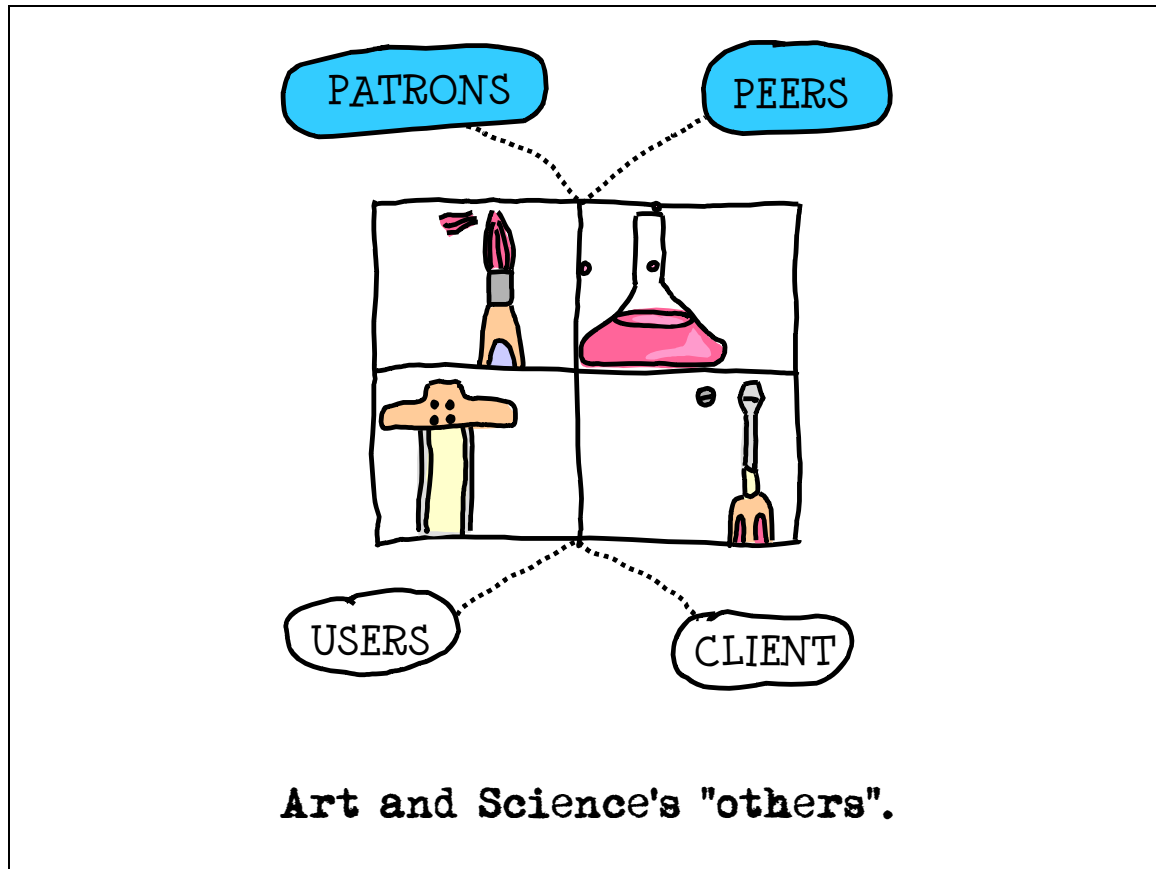
Design and engineering are *rhetorical devices* in the sphere of *human exchange*. They form the physical language a culture speaks. It's a dialog that talks about everything from how we will house the elderly to how we shake the salt.



Most people think that the largest schism in our culture is between the arts and the sciences (as expressed by C.P. Snow's *Two Cultures*) in other words the vertical line in the diagram. But in my cartoon model, the biggest schism is between art and science at the top, and design and engineering at the bottom.

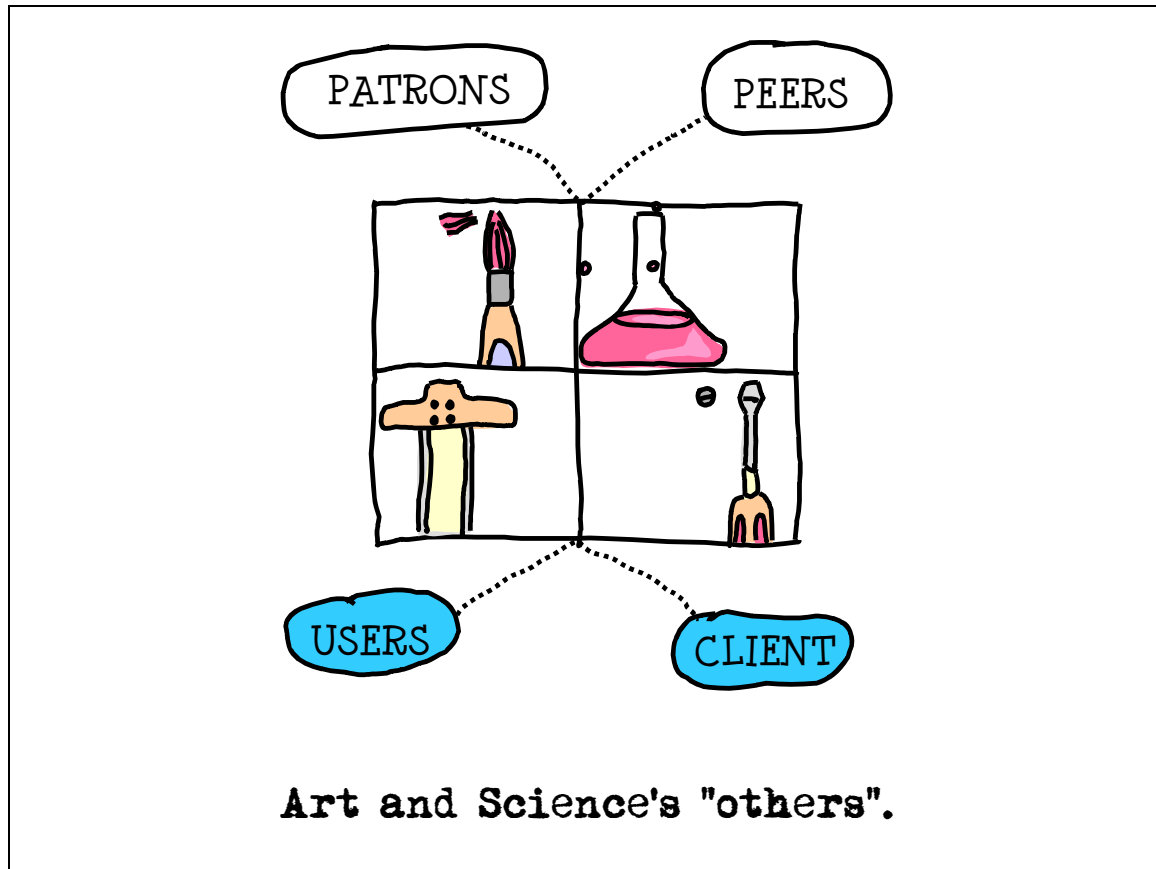
If a company has a scientific research center there is a name for the horizontal line: it is called *The Wall* and it is notoriously difficult to get something over the wall. It is difficult for the scientist to hand off his or her work to the engineer. There is a similar wall in the design world. For instance, a truly great toy inventor is an artist: the toy comes in a vision and is pursued in that way visions are pursued. It didn't arise from user testing. But when a company takes it on as a toy to manufacture it must go *over the wall*, where to the horror of the artist-inventor, it gets mangled by the in-house designers. It's a war.

Our culture is divided in two, but not as Snow thought. It is divided horizontally by *The Wall*.



All professions have “others” which are other professions or other groups to which they are deeply related. One of the big differences between art/science and design/engineering are their others.

For the artist and the scientist, the others are the *Patron* and the *Peer*. In the science world, the peer is a built-in and overtly expressed part of the process called *peer review*. A scientific truth only becomes true when one’s peers (not one’s neighbors or the congress or a company) agrees that it is true. For the artist it is really other artists and the related profession of the critic. The patron, is the means by which artists and scientists get funding. In today’s world such funding usually flows from governments, businesses or the rich. Universities also figure in here as the Church used to. Patrons usually care more about the artist /scientist, than the specific art or science they are doing. That part is up to the vision of the artist and scientist. What’s particularly odd is that while the patrons are the most powerful institutions on the planet, artists and scientists often see themselves as outsiders. There is something almost pathological about the anti-establishment artist trying to have their worked presented in patron sponsored museums.



For design and engineering the others are the *User* and the *Client*. The client is the person who presents the designer or engineer with the *problem* and pays the designer or the engineer their fees. The client gives the little red checkmarks saying the job has been done, the spec has been satisfied. The user is the person who actually engages with the artifact that has been designed or engineered. For instance, in the graphic arts, the client is the person who orders a poster to be designed, who says its OK (or that the letters should be bigger, or whatever) and who pays the money when it's done. The user is the person who sees the poster on the wall and hopefully acts on it by going to the concert. There is much debate in these communities between client-centric vs. user-centric design/engineering, but in either case, the interactions between the user and client are important and can produce wondrously delicious ideas.

Design without art, or engineering without science, both quickly asymptotes to commodity and in the globalized world, if you are producing commodity you are dead. Learning to cross the wall and making peace between the peers, patrons, users and clients, for a corporation, is the most important lesson I know of.



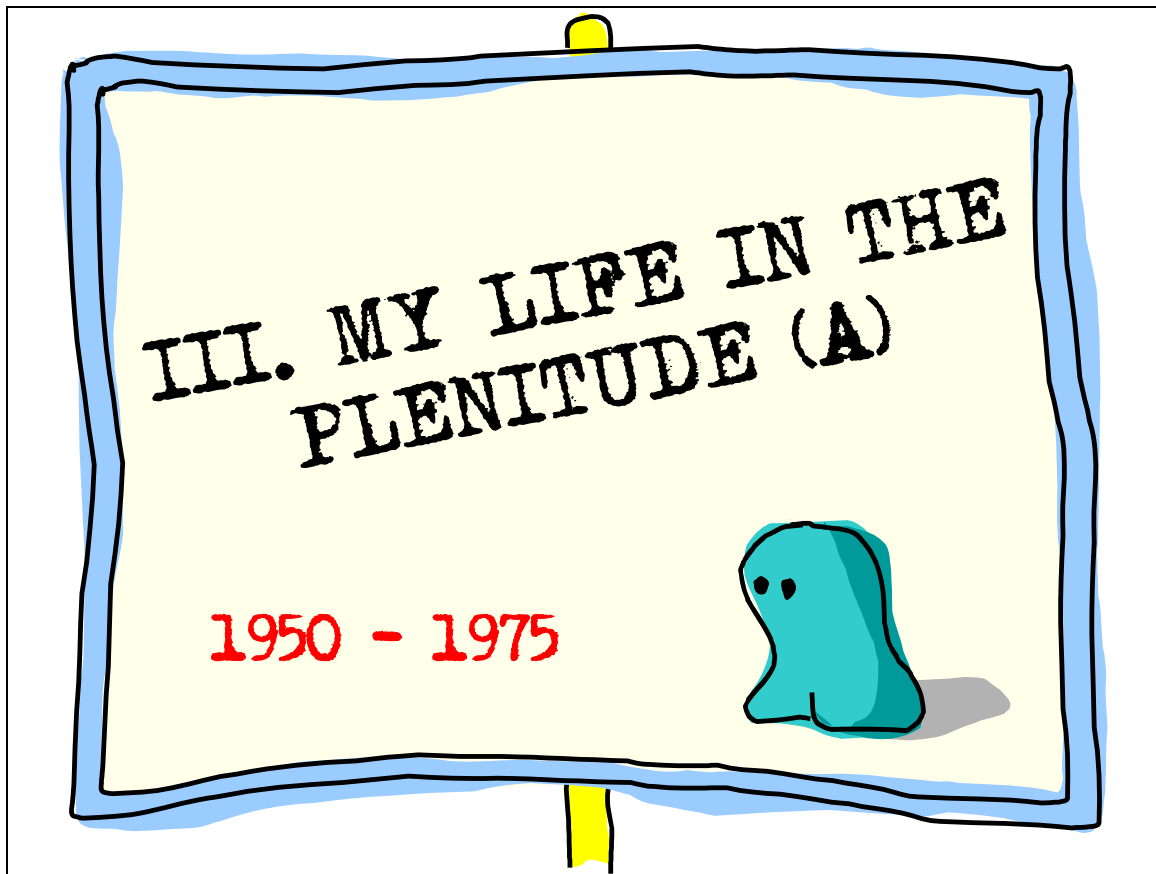
**But, please remember, these are just
cartoons. It is how I see the world, not
how it is.**

For many years I ran a program at Xerox PARC, a scientific research center, that brought in artists to work with scientists. The program was called PAIR (PARC Artist in Residence Program) and it was quite successful, perhaps because artists and scientists are very similar. I then brought in designers to work with the scientists. This was much less successful. I believe that it was because scientists thought of designers as very close to marketing and that marketing is about lying. And science is about truth. There could be no larger difference.

And so, while yes, each of us spans all four cells of the matrix, they are not the same either. You will seldom mistake an art conference for an engineering one. The designers studio is rarely confused with a scientist's lab.

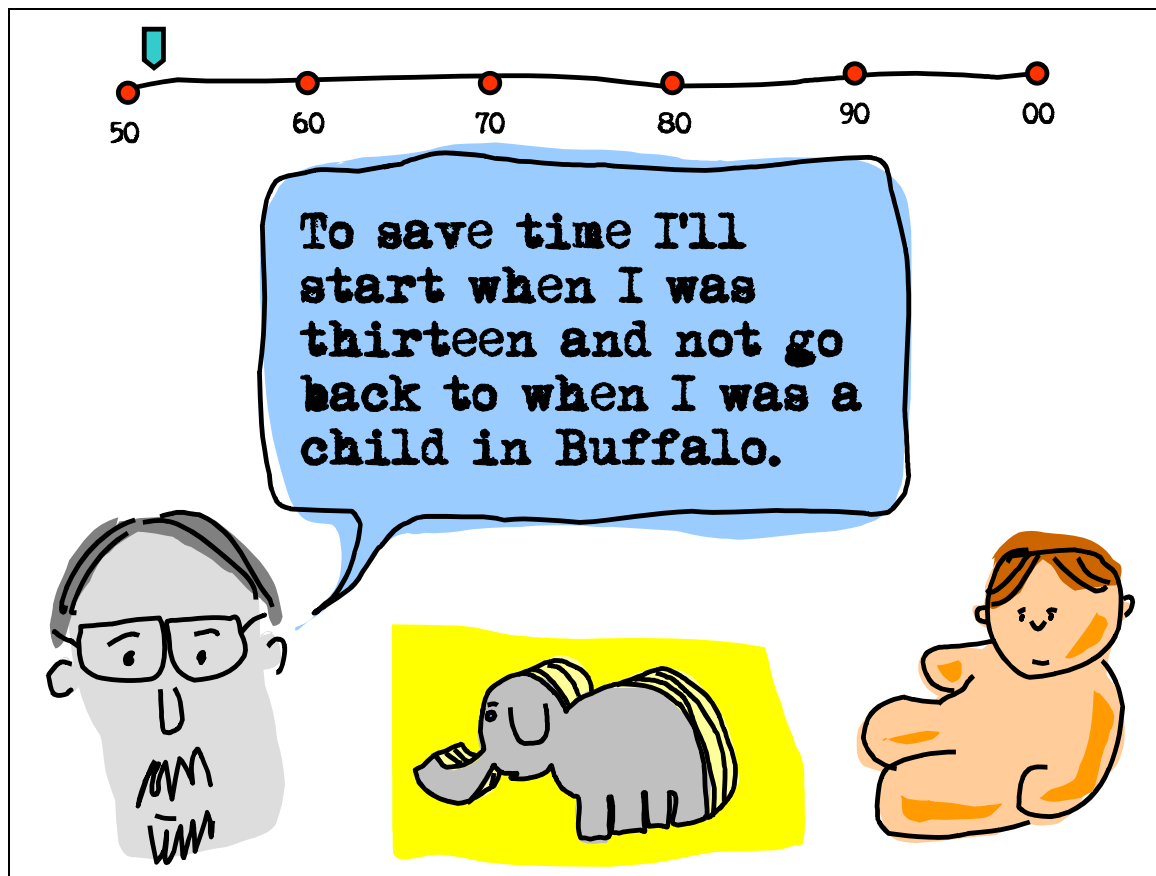
Though having said this, it is just these confusions I find most interesting.

And its been the story of my life.



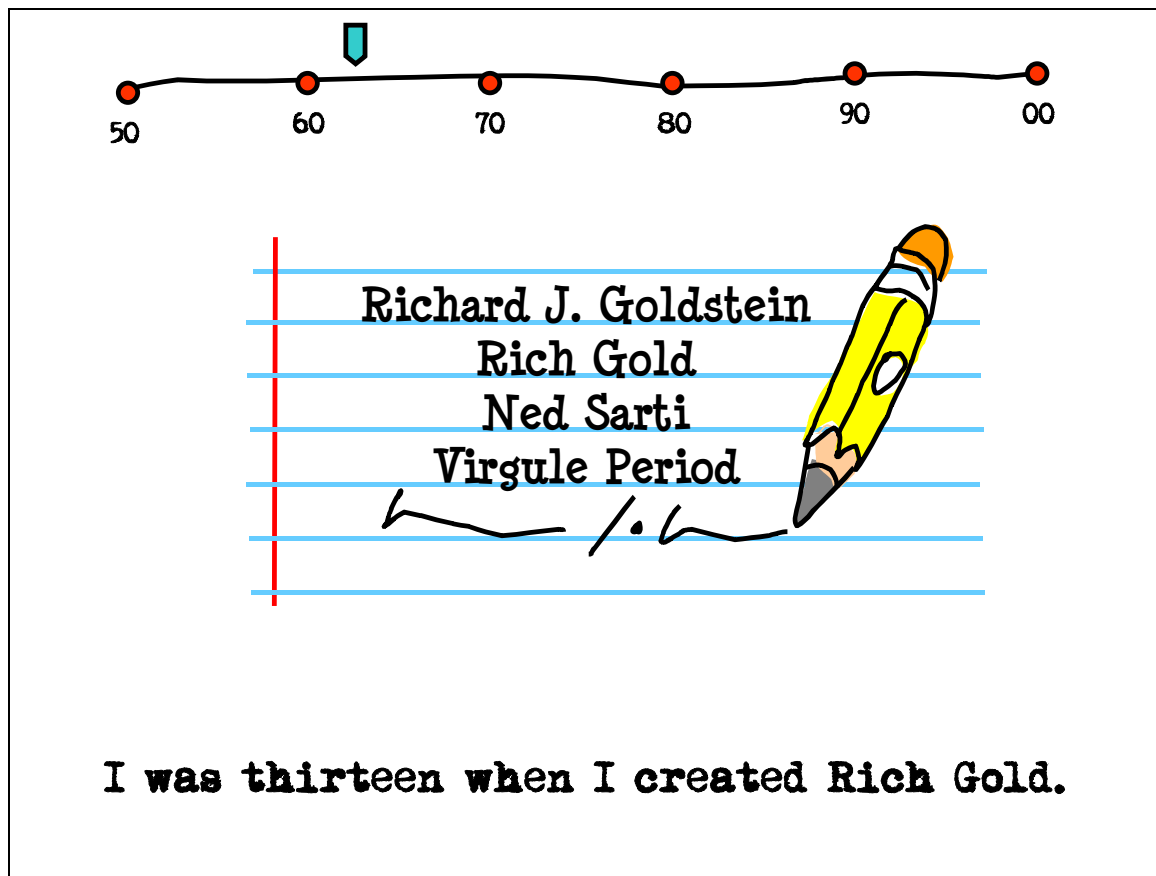
For most people the Plenitude is an envelope that surrounds and buffers them from the rest of the galaxy. Going out at night and seeing the stars directly is not only unsatisfying due to ambient light, but hardly a competitor to what's on TV. For large numbers of people helping to construct or maintain a small part of the Plenitude is how they pay for their homes, cars, clothing, vacations in Anaheim. How else can you make a living? A smaller number of people have jobs which would be called *creative* in the broad sense: inventing new stuff for the malls and multiplexes, the new and improved, the must-see. And a really small percentage of people have jobs where they are tasked with making new categories of things, things which may require new stores, or new laws, or new manufacturing plants, or which change how a family spends its Saturday night.

What's curious about my life is that I have done all these things while wearing the hats of the artist, designer, engineer and scientist. It has been a lucky life. It is hardly an exemplary life, I haven't landed on 60 Minutes as either a role model or a criminal; my bank account is not full; it is hardly a life to be followed. I present it here, instead, as an *example life*, one that helps us see how and why this dense envelope was constructed. I want to expose *the pleasure of creation* as well as its consequence.



To save some time, and so as not to delve deeply into things I frankly can't remember, I will start my history of creation at the age of thirteen. Before that everything is reconstruction, though often remarkably vivid reconstruction. I certainly seem to remember playing on the den floor, the cold Buffalo den floor, with my book about elephants which was in the shape of an elephant.

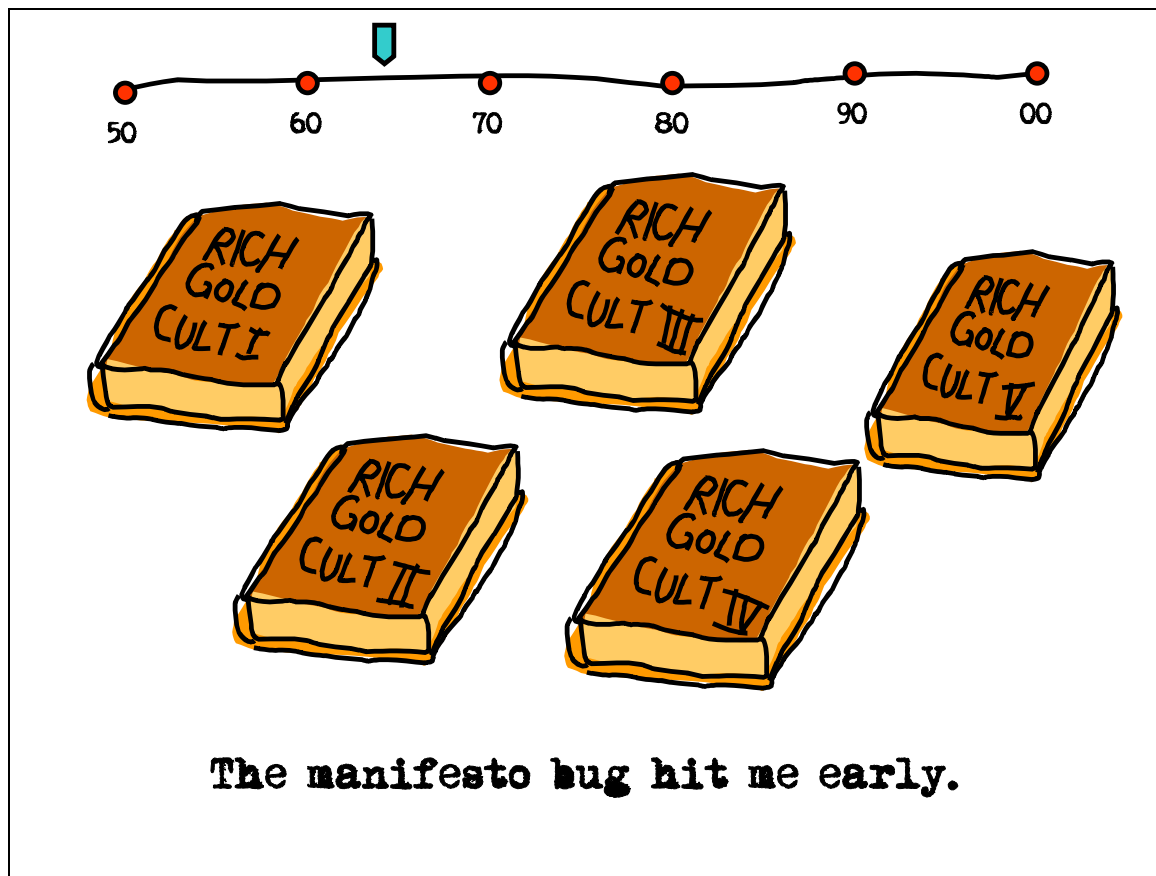
I want you to mentally highlight this elephant book with your brain's bright yellow marker, for we will come back to it later.



I was thirteen when I decided, quite consciously, that I wanted to be a writer. I knew that writers needed a pseudonym. It is interesting when I think back upon it, that this piece of sophisticated folklore had filtered into my suburban, wintry home. I remember looking at my given name, Richard J. Goldstein, and seeing, in that way that thirteen year olds see things, *Rich Gold*. “Mmm,” said my thirteen year old self, “that sounds pretty cool.” Today, it still sounds to me like a thirteen year old’s idea of a good name.

This left “...ard ...stein” which needed to be dealt with. Sometime later, perhaps when I was fifteen, I found a nice anagram: *Ned Sarti*. If Rich Gold was the suburban artist, Ned Sarti was the urban, street poet. More complicated is my relationship to *Slash Dot*, or *Virgule Period*. On my thumb there is a diagonal scar and a single freckle. I don’t remember when I got the scar, but it was before I was thirteen. There it is, on my thumb, Virgule Period, the philosopher.

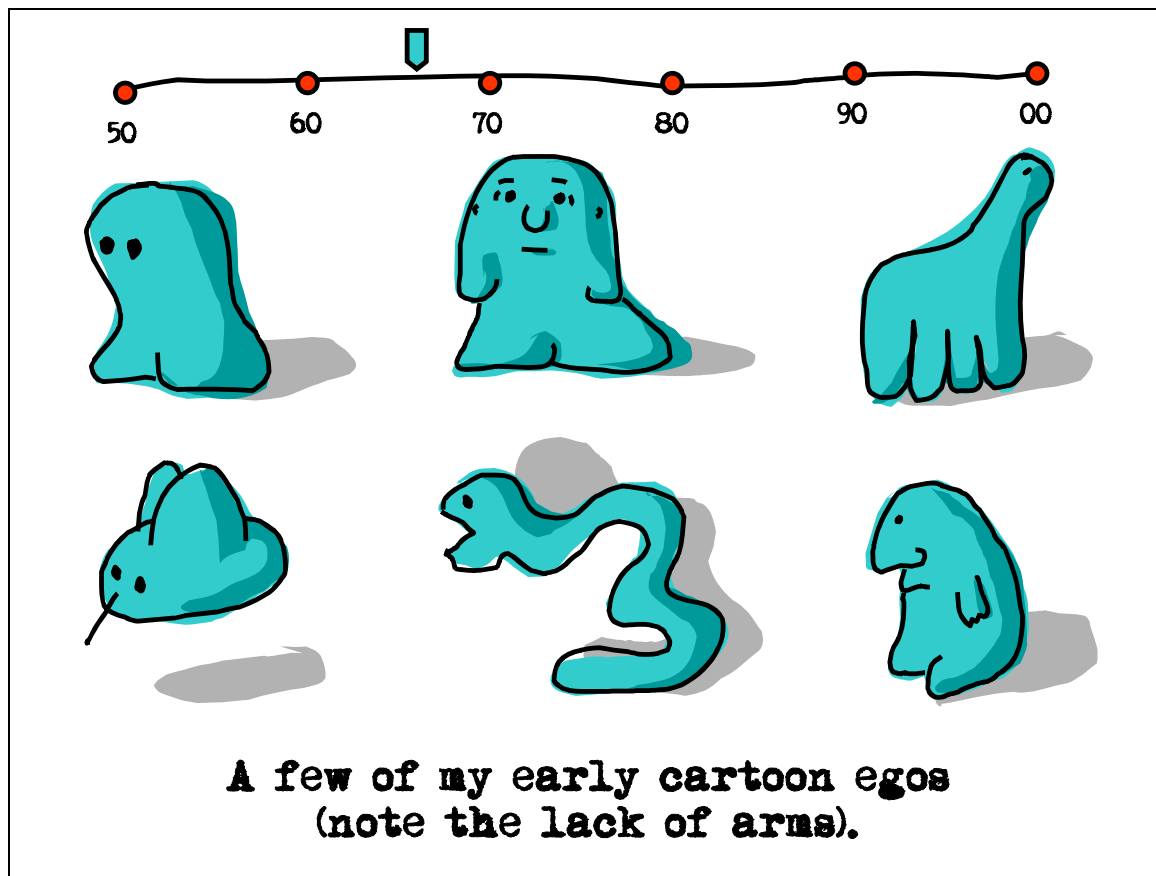
My signature which has slowly evolved over time into some sort of Arabic-like set of lines. The “J” of James has evolved into a Slash Dot. That this is interesting to me indicates exactly how little separates me from my thirteen year old budding artist self. I have simply learned to be not embarrassed.



Perhaps the most unusual thing I remember doing as a teenager was to write a series of philosophical tracts called the *Rich Gold Cults*. I can't imagine that a large percentage of boys do this. For many years, when I moved to a new house, one or another of the cult manuscripts would re-appear at the bottom of a box. At the moment I can't find any of them.

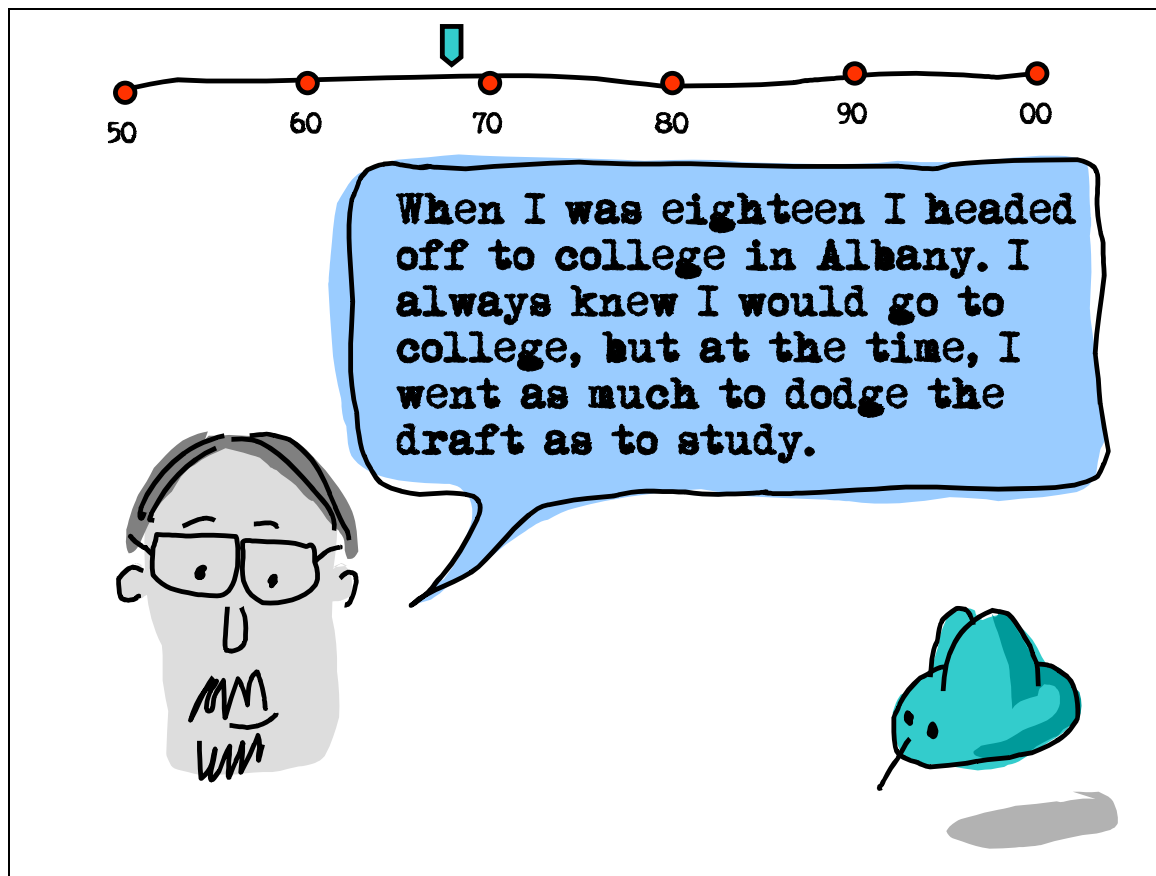
What I remember of them is that they recapitulated most of Western philosophy and that they were annotated with little cartoon-like drawings. Then as now, I was fascinated by the central contradiction of our world view: It doesn't seem possible that the scientific paradigm and free-will can co-exist. Actually it is pretty difficult to imagine a universe where free-will exists as it seems to require super natural beings. But without free will, you can't have science, not in any real sense, for science is dependent as it is on peer review, an activity that make sense only if there *is* free will.

Never mind, its not important here. The *Rich Gold Cults* are buried at the bottom of some long lost box somewhere. As I remember, they were not written in the style of academic explorations, but in the form of manifestos. They were, after all, cults.



The other thing I remember creating during my teen years was a series of rounded, little cartoon-like creatures. I call them cartoon-like, for I never thought of them as cartoons, but as images situated between the words of a graphical language and the figures in simple tribal paintings. I drew them using many different media though primarily with office supplies and kid's art materials. They were works of a kind of mall-based Arte Povera.

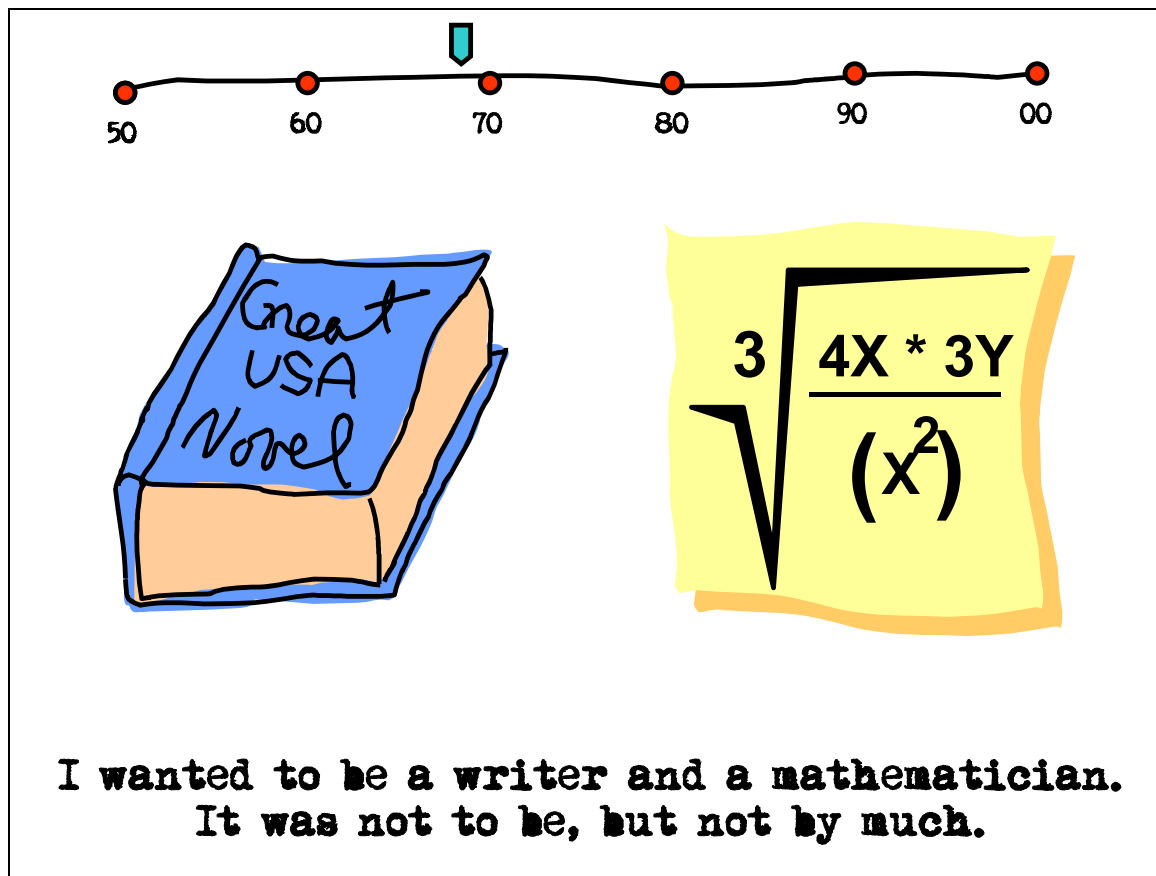
In general, the creatures did not exist within frames, or even in a landscape, they simply floated loose. As I look back on them, the other thing I notice is that they mostly had no arms, or greatly attenuated ones. "That's interesting," you might think. But there is another explanation. It could also be that I simply couldn't draw very well and that arms are hard to draw.



Being the oldest son of a Jewish family there was little question that I would go to college. It never even occurred to me not to go. Where I should go was a different question. The possibilities were limited by my family's income, but I did surprisingly well on the New York State Regents scholarship test (surprising because I wasn't a very good student) and that meant I could go to any of the State's four universities. I didn't want to go to The U. of Buffalo (that would mean staying at home). I had visited two of the other campuses and didn't like them. That left the U. of Albany which I saw for the first time as my father drove me up to it.

Monochromatic in color, its white-columned, low slung, continuous buildings looked like something that should sit in the deserts of Saudi Arabia and not on the wind swept, snowy steppes of the Albany suburbs. Its cold rectilinear architecture would be my physical home for the next four years. Inside the concrete, however, I discovered the warmth of hippie life and the edge of politics.

I also discovered that I was dodging the draft the way most middle class kids were. By getting an education. By the time the war was over there were two kinds of twenty year olds. Ones who went to View Nam and ones who went to college. It was one of many unintended consequences of that terrible conflict.

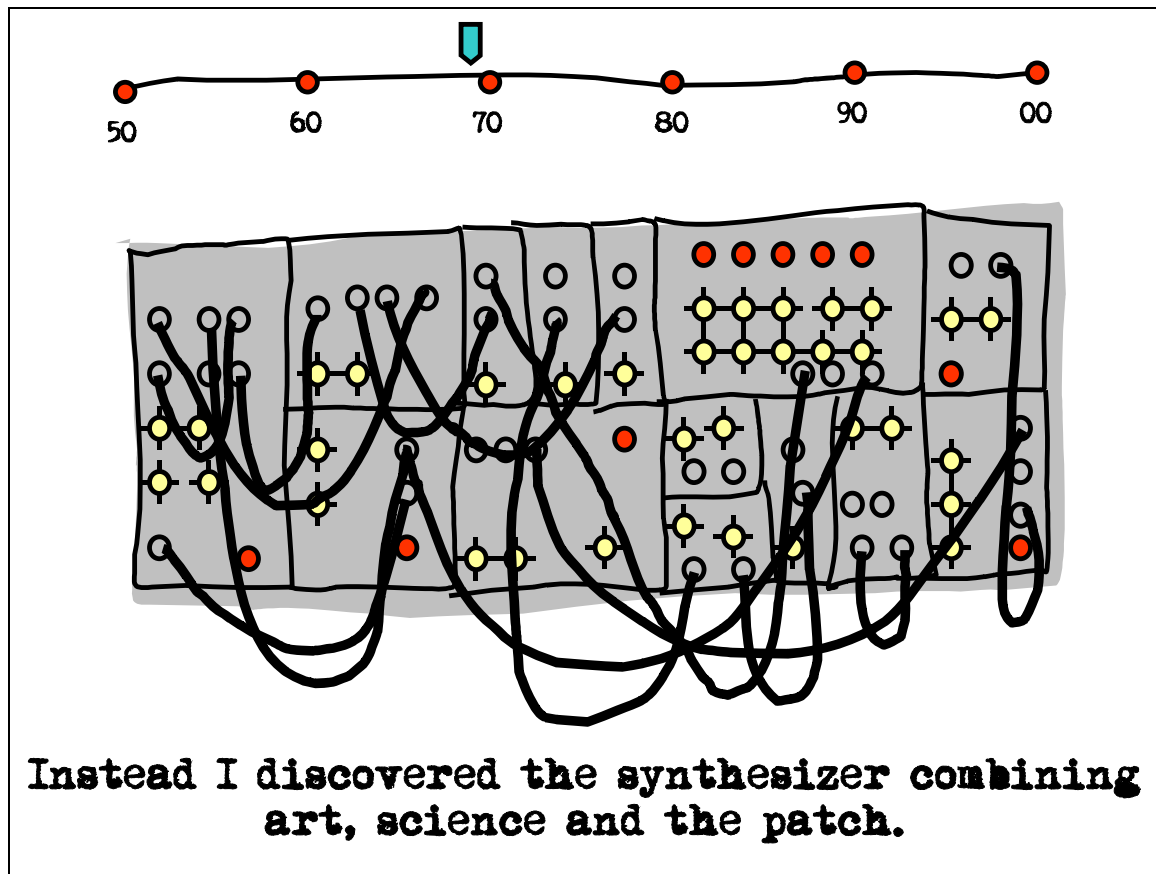


I wanted to be a writer, a novelist. I don't think that it was clear to me at the time that there were other kinds of writing. This desire to be a novelist stills haunts me.

I also wanted to be a mathematician, which was more surprising since I wasn't particularly good at math. What I liked about math was that, at least in my fantasies, I could create a sub-structure to the world. I imagined it was like novel writing and that all kinds of notational fictions could be invented. Like Plato, I suppose, I saw the math being more real than the world and believed that a great equation could alter everything.

The two disciplines I wanted to study were not only located in different buildings on either side of campus, but were located on two opposite sides of the culture and nothing I knew of in 1968 spanned them.

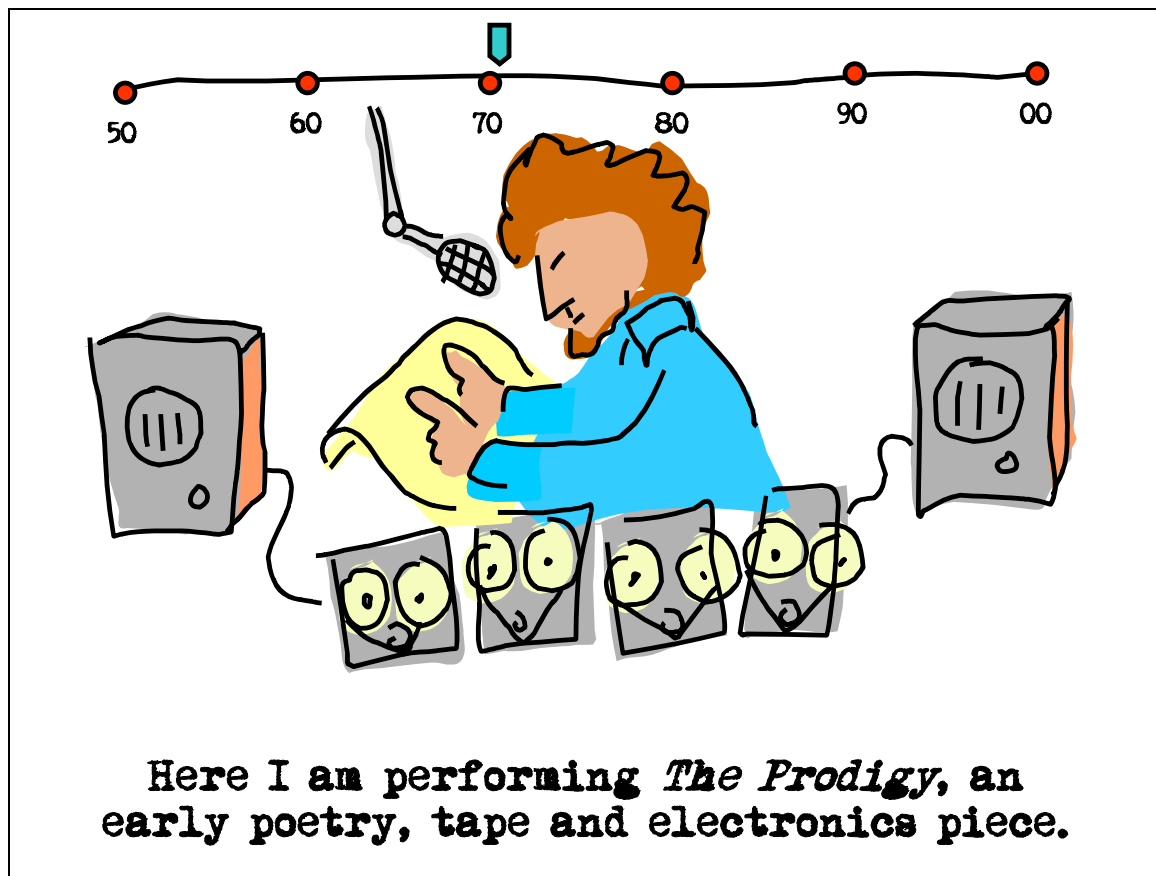
But all that changed in the summer of my first year, after emerging from an interesting year long drugged haze, when I walked into a room and saw something which would alter my life completely. Really, that's how it works. You walk into a room and you see something which changes your life. It's a one way ratchet. You can't go back.



What I saw was the world's largest Moog music synthesizer. It was shown to me by my roommate who was already working in this esoteric field and who had keys to the studio. The Moog was a pile of different modules: there were oscillators, filters, envelope generators, amplifiers, sequencers. Each module had inputs and outputs and the composer connected them together with big old fat patch cords. The idea of the Moog was that you could hook these modules together in various ways and it would make music, unusual music, but music none-the-less.

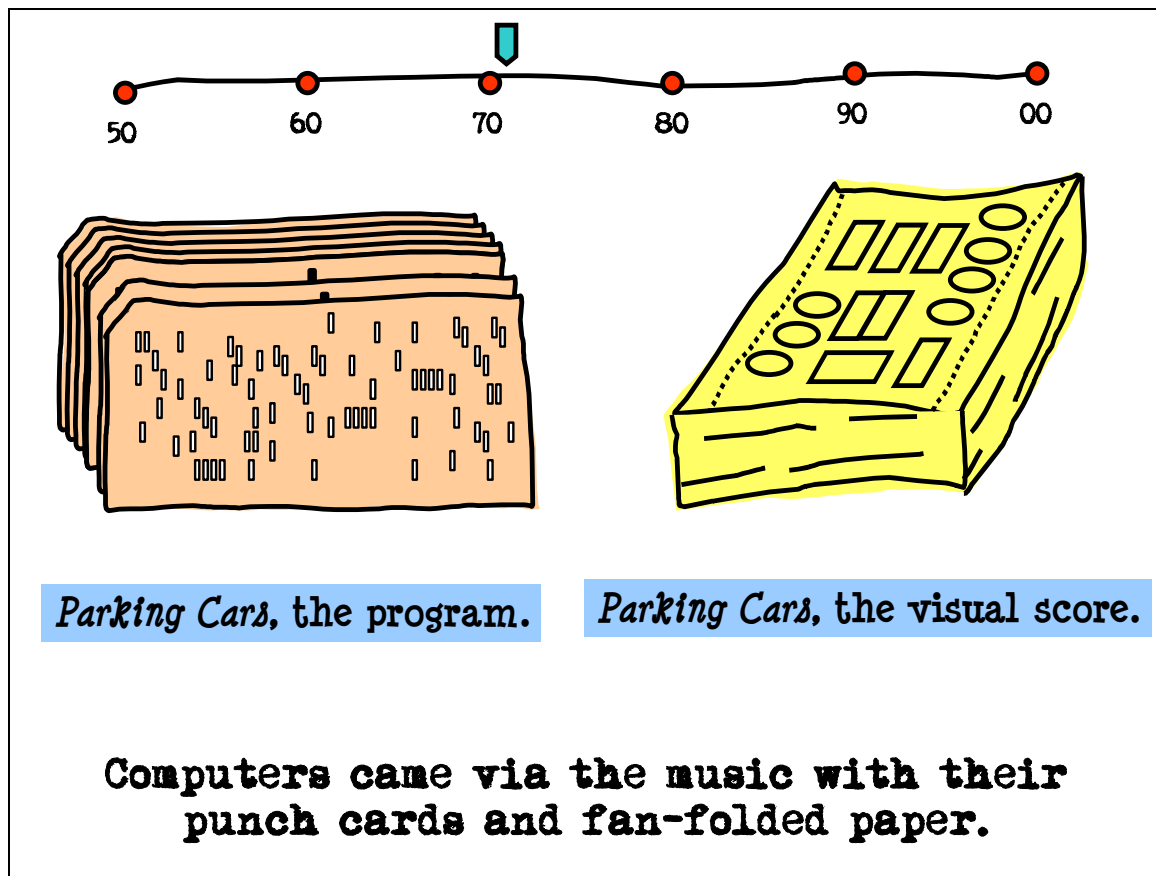
Two things struck me as I was shown around. First, was that here was art and science pushed together in a manner that I had never encountered before. Here were two domains of thought in one place, crashing into each other, fighting with each other, collaborating with each other. The second thing that struck me was *the patch*, that tangle of cords connecting the different modules together, and which was a remarkably interesting abstraction of music, if not life. You could talk, think, debate, conceptualize and argue about the patch. The patch was an active notational system. It was language come alive.

It was about ten minutes into the tour that I decided to devote my life to electronic music. Really, that's what I swore to the professor who gave me my own keys.



Those were interesting times in the art world. Composers and musicians, who had almost always performed in public, suddenly were working alone by themselves, in small rooms packed with equipment and tape recorders. At the same time painters, who had previously worked alone in garrets, were being thrust on to the performance art stage. There was certainly a belief that the traditional forms of music and art could not carry the weight of the new, emerging culture, the one we were creating and inventing with our machines, chemicals and *The Whole Earth Catalog*. It was the first time that I experienced the vertigo one feels when both the content and the genre could be changed, could be authored simultaneously.

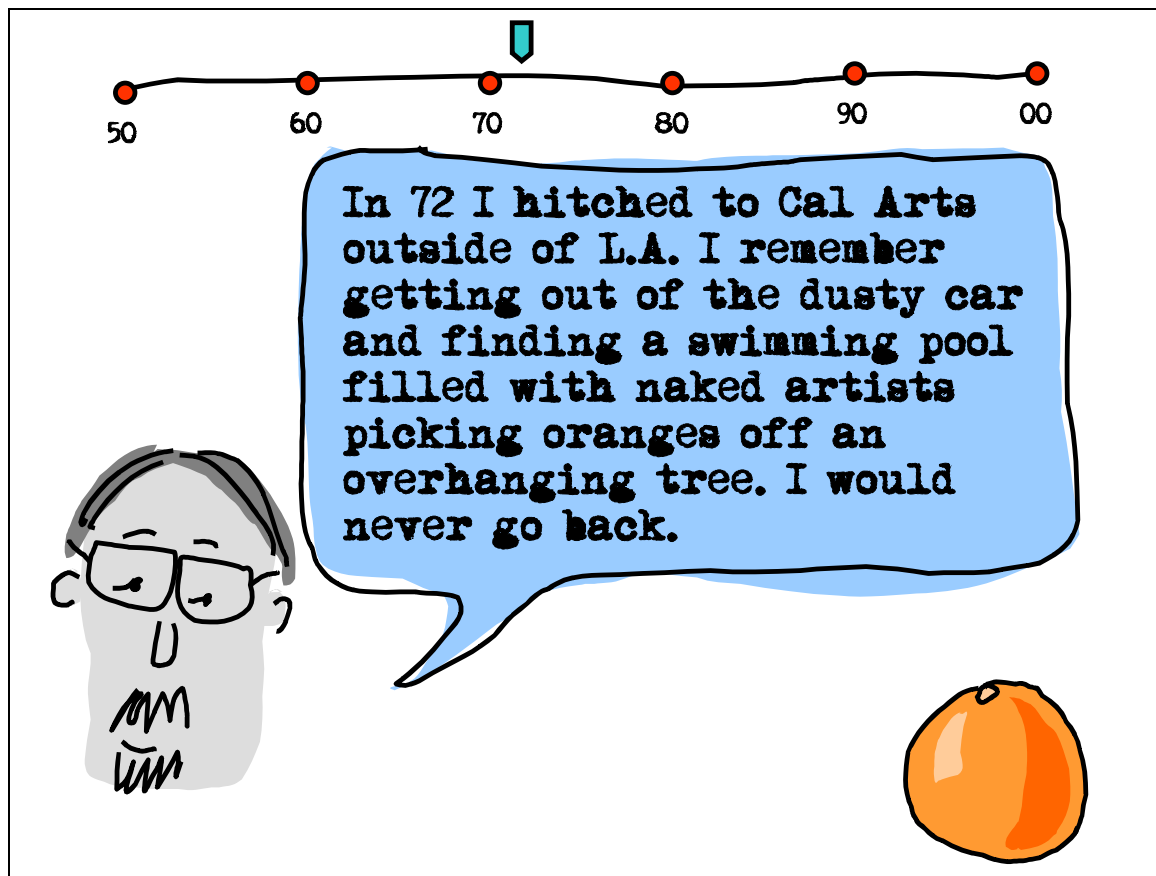
The piece pictured above, *The Prodigy*, was typical of the time. I had mixed together in the studio multiple audio tapes. These tapes played simultaneously through a synthesizer on stage in a semi-automatic manner. Over this cacophony I read a long poem, fragments of which were also on the audio tapes. It was all modulated using electronics into a big, sound soup. At the time this was a new genre and its echoes still haunt the radio as rap and rave. If only I had known then that music needed a beat.



At some point during my education as an electronic music composer I, along with many others, stumbled across computers. It was for my music that I took my first computer science class. At the time computer science was a process of punching decks of cards, submitting these decks through a glass window and getting back a stack of continuous perforated paper some hours later. It was like baking bread.

It is hard to say what I fell most in love with. I was certainly enamored with programming, which even more than patch cords, represented *active* language. I liked that the program I wrote was translated into another language (and then another) then into digital bits and then caused a large, expensive piece of machinery (a printer) to pump out reams of paper. I liked that unlike math, computer programs were *of* the world and not mere descriptions of it. And I liked that at that time you could be creative and inventive, you could do what no else had done: the world was not yet computerized.

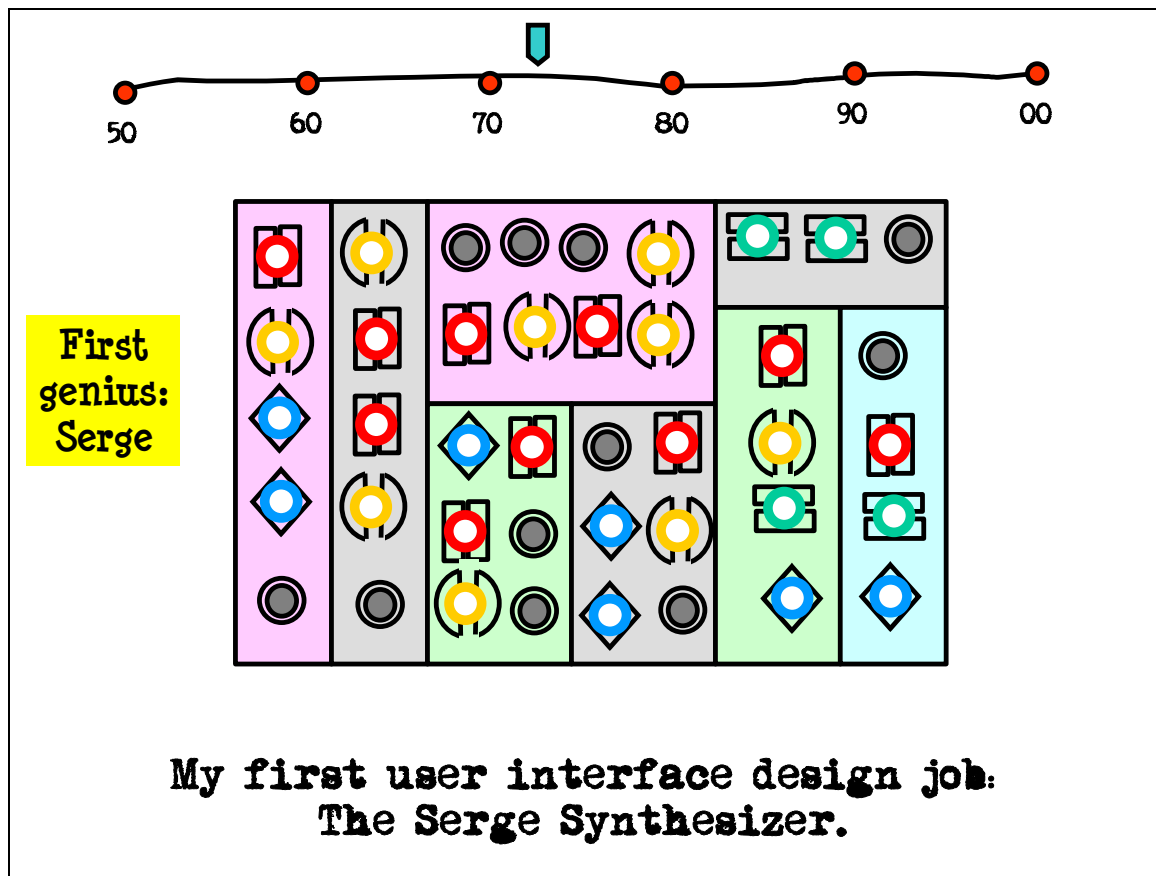
I loved it all. I soon gave up math for computer science. I would have given up English for electronic music, but there was no degree in electronic music. I did, however, eventually write computer programs that wrote books. I certainly wrote too many programs that generated scores that nobody played.



In 1971 I got what was supposed to be a summer job helping to design and build the first inexpensive music synthesizer at a new art college outside of L.A. called Cal Arts. New as it was, it had already earned a reputation for being radical, cutting edge, avant-garde and something of a bacchanal. The music taught there ranged from classical to African to Japanese to Chinese to Javanese to jazz to the electronic. To get there my sister and I hitched across the country. It was long and dusty, hot and weird. At one point the couple driving got into a fight and eventually the man ejected the woman and her parrot into the desert. Later *we* were ejected into the desert.

By the time we arrived at Cal Arts we had been on the road for two weeks. We were hot, dirty, sleep deprived. We were taken to a little rural ranch house high in the hills. In the backyard was a pool glittering in the sun. Orange trees hung over the water. In the pool were naked artists, men and women, swimming, talking, grabbing oranges from the swaying limbs and eating them fresh, sticky and sweet.

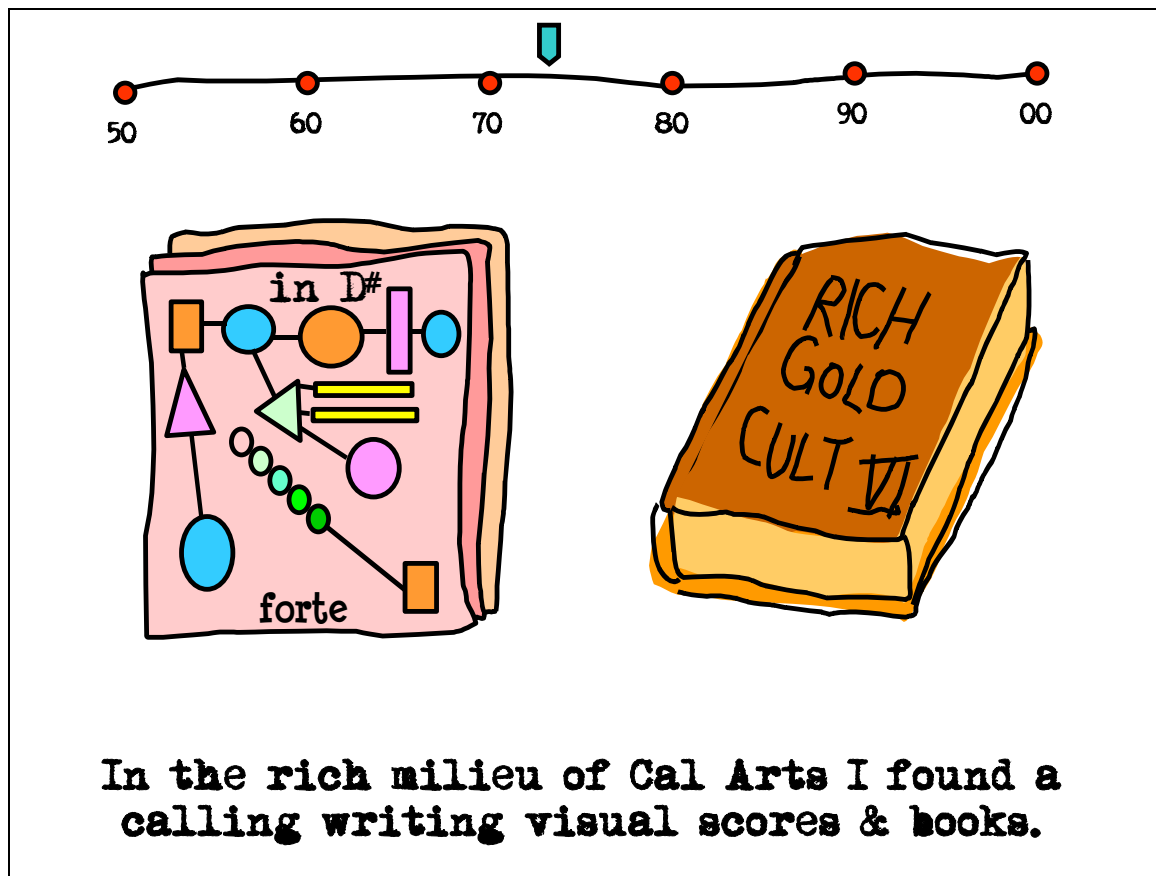
I knew I would never go back. As a child in the cold upstairs bedrooms of Buffalo I dreamed I would be a beach boy in Malibu. This was better. It was at that moment, taking off my clothes and diving in, that I became both an artist and a Californian.



The professor who was designing the synthesizer was named Serge Tcherepnin and he was the son of a composer who was the son of a conductor. There were pictures of young Serge sitting on the knee of Stravinsky. While it was clear that he was from the planet Earth it was hard to tell from specifically where. Russian father, Chinese mother, he grew up as an émigré in Paris and Chicago. When he wore his red beret he exuded a kind of ancient wisdom and he was the first of four geniuses I had the honor of working for in my life.

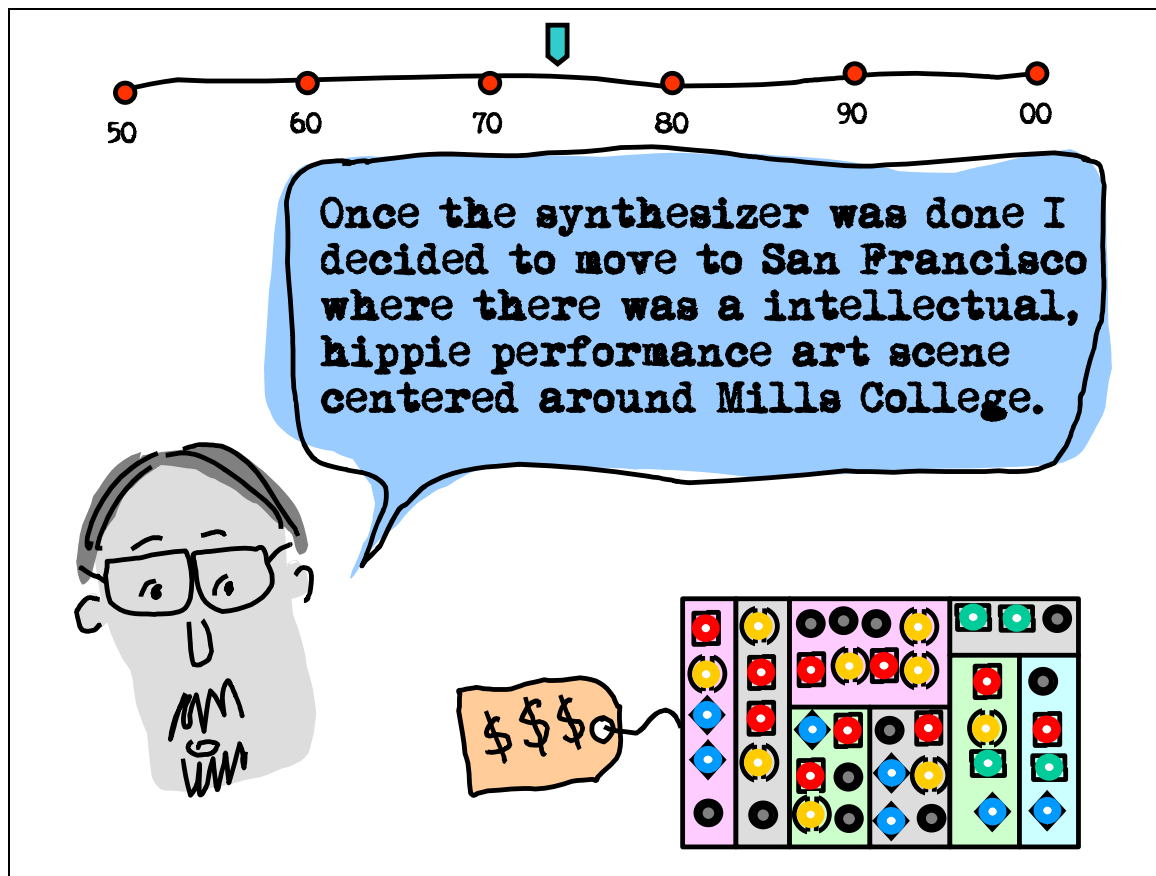
Serge had given up the profession of composer for the even more ancient one of instrument engineering. The invention of the quad op-amp allowed him to design the first inexpensive modular electronic synthesizer. My job was to design what we would now call the *user interface* though at the time we called it the *faceplate*. Most of the other synthesizers of era looked like medical equipment. I wanted the Serge to look like an art piece, or a colorful visual score without explanatory writing (just as piano keys have no C, C#, D etc. written on their keys.)

What I designed was a series of meaningful, interlocking shapes that surrounded each hole and knob indicating its function and its use, visually. They were user modifiable with Magic Markers. Every Serge synth was different. A Plenitude.



Nothing would be as dense and as rich as Cal Arts in the early 70s until I found PARC in the early 90s. There were video artists with newly purchased SONY PortaPaks running into the cafeteria, pushing over lunchers, taping the results; there was an artist ritually implanting his semen in the wall of the main corridor; there was an artist who did performance pieces *in* people's dreams (I won't go into it now); there was Tai Chi in the morning; there were endless concerts from classical to jazz; there was a roomful of animators making strange films (who would later, en masse, redefine Hollywood animation); there were not one, but two, entire gamelan orchestras (bought from a collapsing Indonesia) who performed 24 hour Wyongs with the white kids on the gongs trying to keep up; there were four electronic music studios blaring forth music without a beat or a scale; and there was the small knot of us working under Serge, building, building, building.

Within this maelstrom, except for a weekly session in the electronic music studio, I retreated to writing. I took up poetry with a vengeance and finished Rich Gold Cult VI, my last. I continued my obsessive creation of visual music scores. If I had waited two more years to discover electronic art I probably would have entered either video art or the emerging field of computer graphics. But no, the timing in life is not simple, and it can't be rewound. I was a composer. Did I mention I was pretty much tone deaf? But then again, I was more interested in the patch than the note.



By the time the synthesizer was finished I was an educated artist primarily through the osmosis from working, and at times living, with Serge. What had started out as a summer job had become two years of work. My payment, nominally, was one candy colored (using automobile enamels) Serge electronic music synthesizer. My real payment was harder to define, an almost reified, state of mind that we call *being an artist*. I have attempted to define this neural configuration elsewhere, but let me say here that as a state is highly productive, slightly hallucinogenic (you see everything slightly differently) and a bit disabling (it becomes hard to get a normal job.) But after the Herculean two year effort, I was not very interested in analog electronic music any more. Among other things, the computer bug had already hit me hard.

I really couldn't continue to hang out at Cal Arts any more as an ambiguous non-student and so there was the question of where to go. Car-less as I was at the time, staying in the outskirts of L.A. would have been a poor choice.

By happen-stance, I had hitchhiked up to San Francisco on New York's Eve 1974 to participate in a mega-performance-art-piece that involved a three story metal and wood construction on wheels that was dragged slowly (took two hours) down a long loft space filled with musicians (I was playing the Serge) with dancers, electronics, lasers and video monitors filling the rest of the space. Oh, the construction was

draped with wires, pulled by men and woman dressed as slaves, and housed a cow's brain encased in a block of ice which was being operated on by a bunch of pseudo doctors with chain saws and blow torches. When, exactly at midnight, the construction reached the end of the now orgiastic loft, the center of the brain was breached, live doves were found inside, and when released, went fluttering through a hole in the ceiling of the warehouse. Then we really started celebrating.

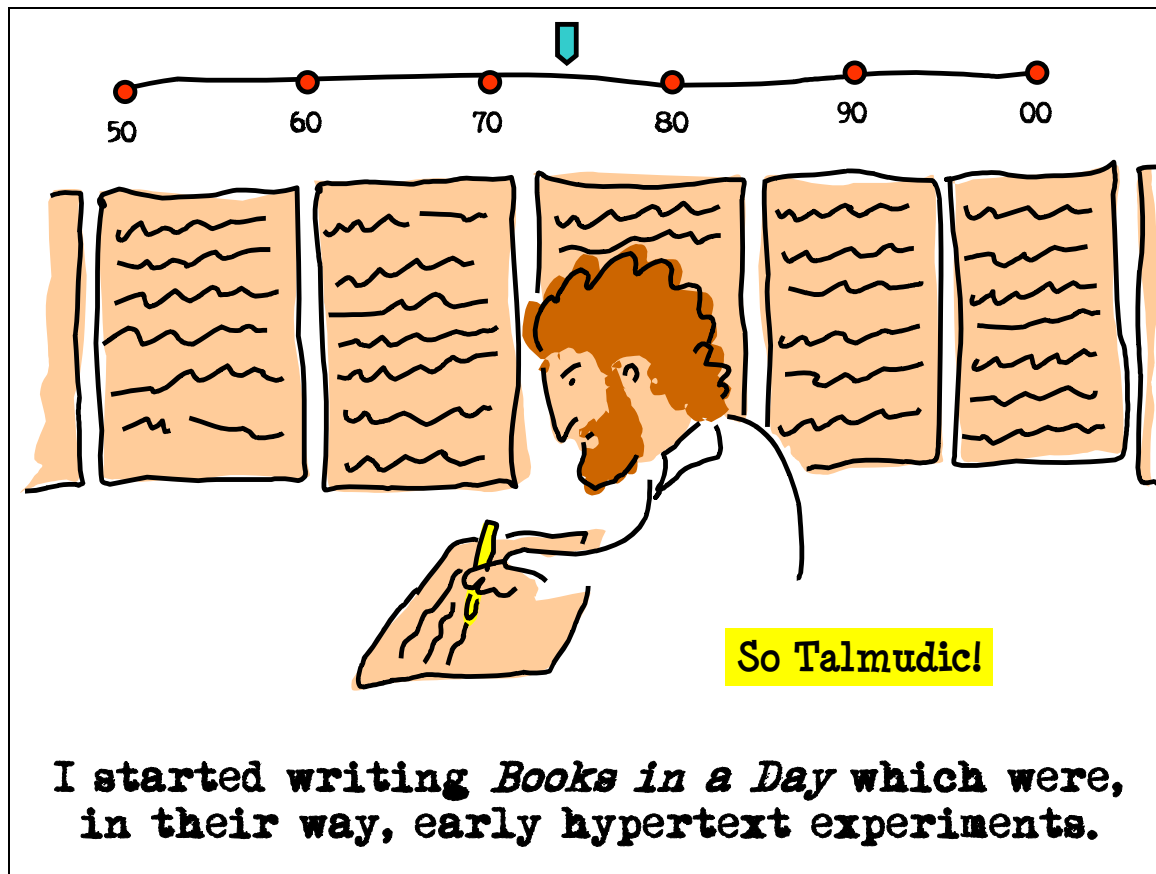
And that's when I decided where I wanted to live. So I packed up my small number of possessions (how lightly we lived then) and my candy colored synthesizer and shared a ride up to Berkeley where the hippie storm had already passed and left in its wake a complex social detritus that allowed for a lot of art between the driftwood, flotsam, jetsam, burn-outs and proto-startups.

The electronic music scene in the Bay Area revolved around The Center of Contemporary Music (CCM) located at Mills College in Oakland. Mills, built in the late 1800s deep in the virgin woods, had by the early 1970s found itself situated on a patch of green in the middle of the tough Oakland ghetto. The CCM, though small and occupying less than half a floor in the music building, was famous world wide, and that fame was justified for its hallmark live electronic music combined with radical theater. This differed from most other academic electronic music departments, including the one at Stanford across the Bay, which were involved in *big science* music that required advanced degrees in computer science and a kind of seriousness that only the French have been able to perfectly achieve. The CCM, on the other hand, maintained a strong counter-cultural element in both the music and the life style. Both edgy rappers and techno musicians, if they had existed then, would have fit right in.

The other thing about Mills was that the entire undergraduate population was female, only the graduate department had both sexes. I think there were ten men total to a thousand women. And I was one of the ten men.

When I got to the CCM, on my first day, as per suggestion, I called out into the hallway, "Anybody got an extra room?" The result was The Honeymoon Hotel, an old Victorian in the heart of Berkeley that a bunch of young composers had purchased for what now seems like nothing. I sold my Serge to a roommate to make my first months rent and into my attic room I moved a mattress, a desk and an Underwood. Seven or eight of us lived there in fluctuating configurations and pairings. If they ever tried to make a TV show like *Friends* but set in the 70s my life at the Honeymoon Hotel would be a good starting point.

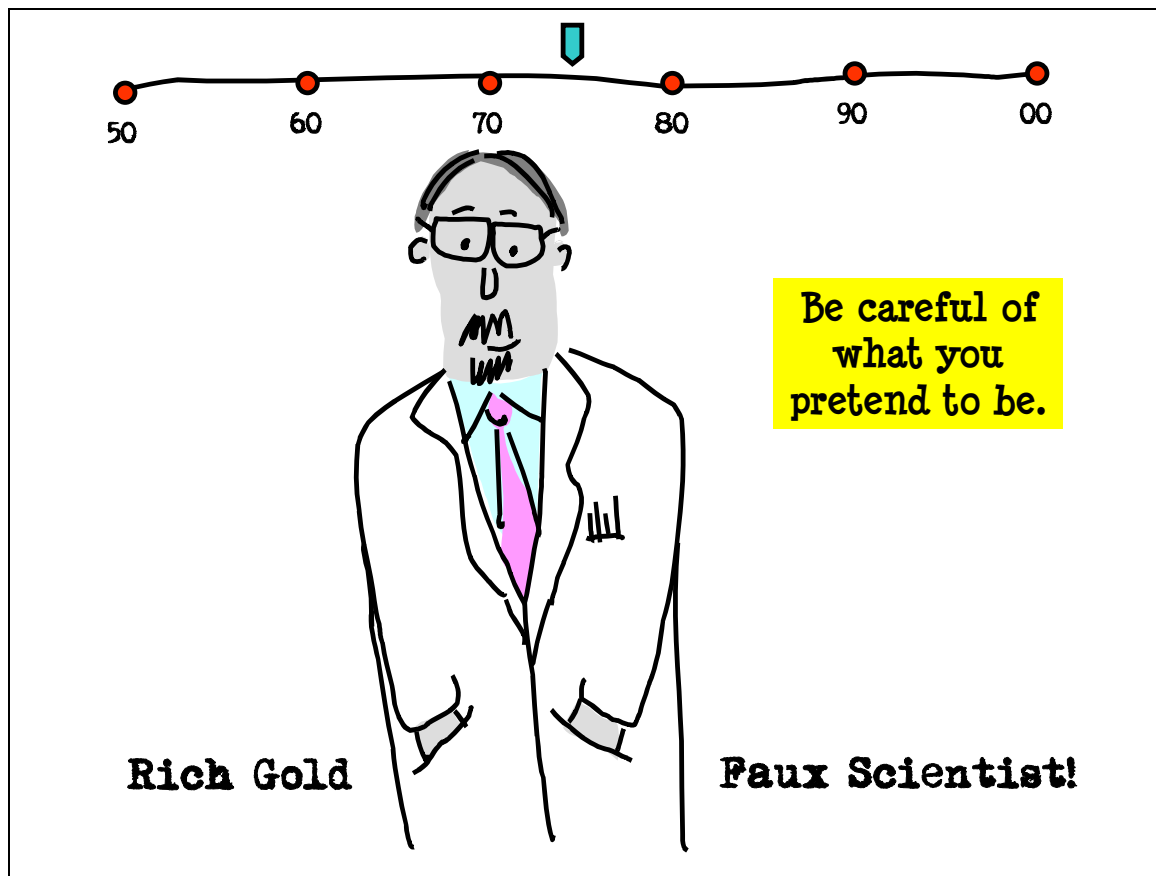
I still have no idea how the money worked, for I lived for ten years seemingly without any, but the art, the friends and the sex were all excellent and very abundant. At the time it felt like a kind of alternative Plenitude; it is only my revisionist analysis that claims it was *actually* the Plenitude's headwaters.



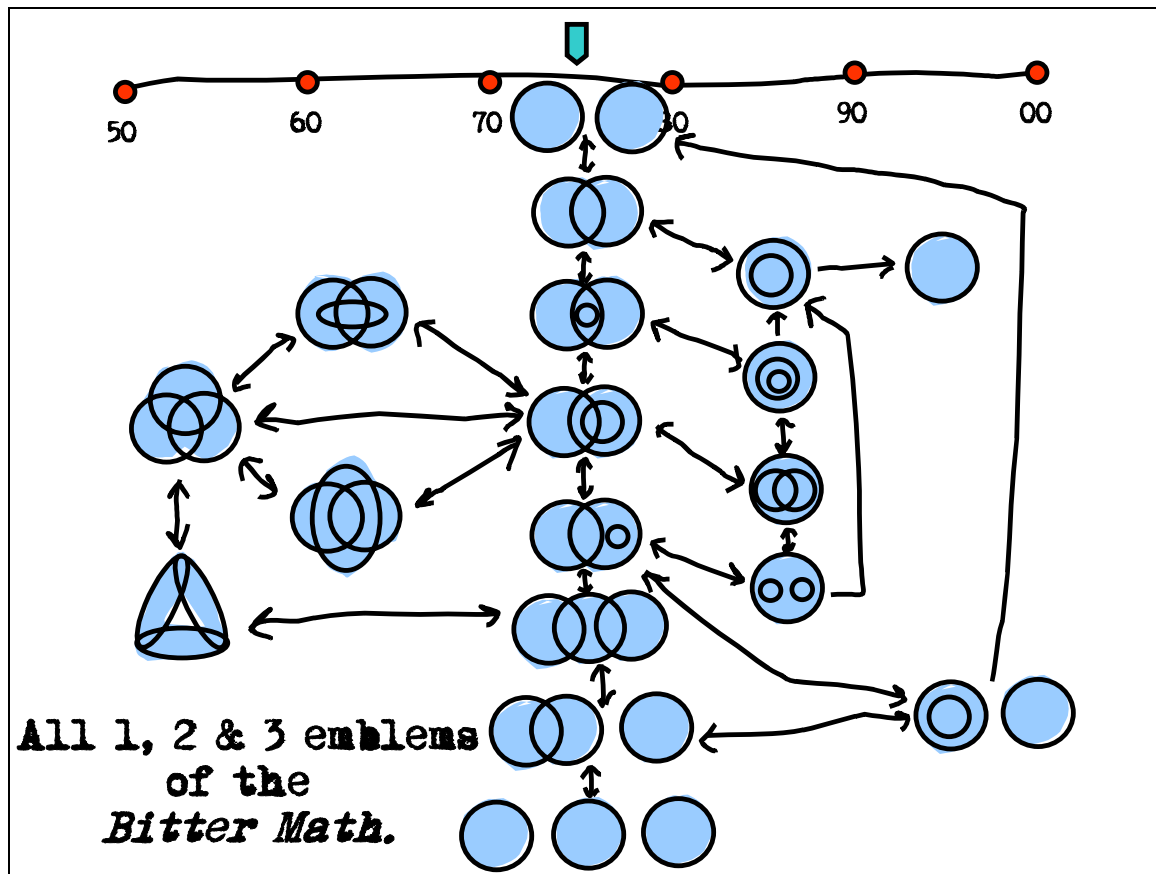
Did I mention that I wanted to be a writer? Did I mention that I was the son of a printer? Did I mention that I had fallen in with a crowd of performance artists? Did I mention that I was Jewish (in that long tradition of atheist Jews?)

My first works of art in the Bay Area were pieces called *Books in a Day* or *Live Writings*. To express it in art-statement form: I was interested in exploring writing as the output of a real time, improvisational performance. Retrospectively, I now see that I was also interested in the motion from *bibliographic writing* (paper based, personal) to *epigraphic writing* (wall based, social). I moved into a small art gallery around 6 PM and wrote for 24 hours on to large sheets of butcher paper. As each sheet was finished I would pin it to the wall. By the end of my endurance stint, the walls were covered and I was living in my book. Then I would give a reading.

It was more like jazz than simply its improvisational nature. I started with a single essay, a very dense piece of writing, which often took me a month to compose. This essay had exactly 96 sentences in it, one for every 15 minutes of my performance. Each larger wall sheet was an exploration, expansion, annotation, exposition or refutation of exactly one sentence of the essay which acted pretty much like the bass line. I wrote them all on sheets butcher paper which I am compelled to now move from home to home. They simply wouldn't be the same digitized.



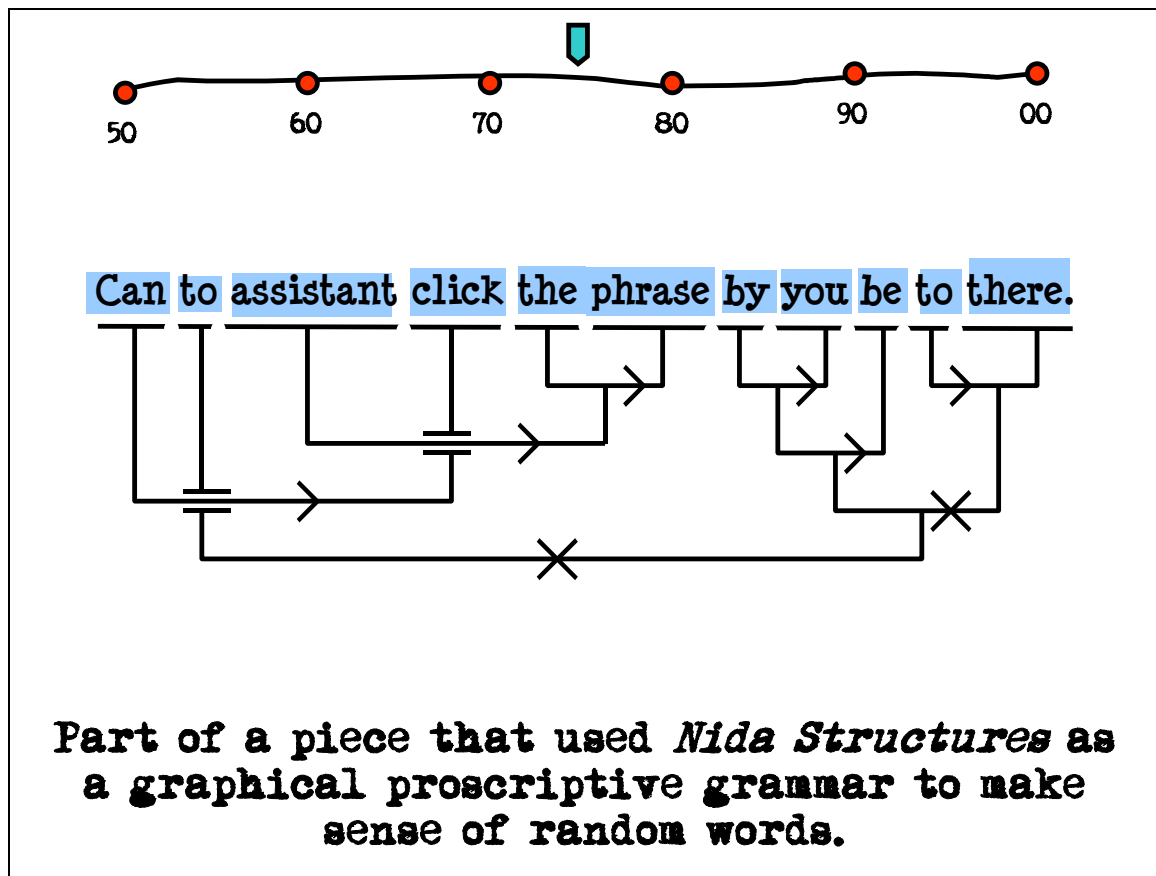
An artist, it turns out, needs a shtick. While every art work is supposed to be different, it is the rare artist who can change their shtick mid-stream for the art's meaning and value) is dependent on its relationship to this persona. The shtick I choose was that of a scientist. Well, actually, something broader than a scientist. A researcher perhaps. Whatever. It combined elements of experimentation, futurism, unusual devices, electronics, computers, equations, tracts, paradigms, explanatory texts, theories, laboratory clothing, truth, universal laws, equipment, diagrams, structuralism, theorems, proofs, inspiration, vision and obsessive dedication. In particular I was drawn to something that might be called *crackpot science* which is science done outside the university or corporate research centers by slightly shady practitioners without degrees. In certain places and times crackpot science brushes up firmly against art, and in other places it crosses paths with spirituality. It also, on rare occasions, eventually gets to be blessed by the establishment granting a new scientific field. Such a thing happened to Chaos Theory and it was also happening at precisely that moment in my life (1975) to a new field called *computer-human interfaces* (CHI) at a place called Xerox PARC, where fifteen years later I would be hired as, of all things, a Researcher Level II. That is, as a scientist. I cannot emphasize this point enough: *Be careful of what you pretend to be.*



I began my career as faux scientist by constructing a series of faux branches of math, physics and linguistics. In each I invented, and worked out, the basic theorems and equations. I wrote an extensive tract (or two) explaining the new theory with poetic abandon and then did some experiments, aka art works, based on these dissertations and papers.

Bitter Math one of the first of these works and it looked at a transformational algebra whose number system was made of “emblems” composed of intersecting circles. A small set of transformational rules were defined between the emblems and the result was an elaborate shape calculus to which various poem-like meanings were assigned, and from which numerous drawing, paintings and music were made.

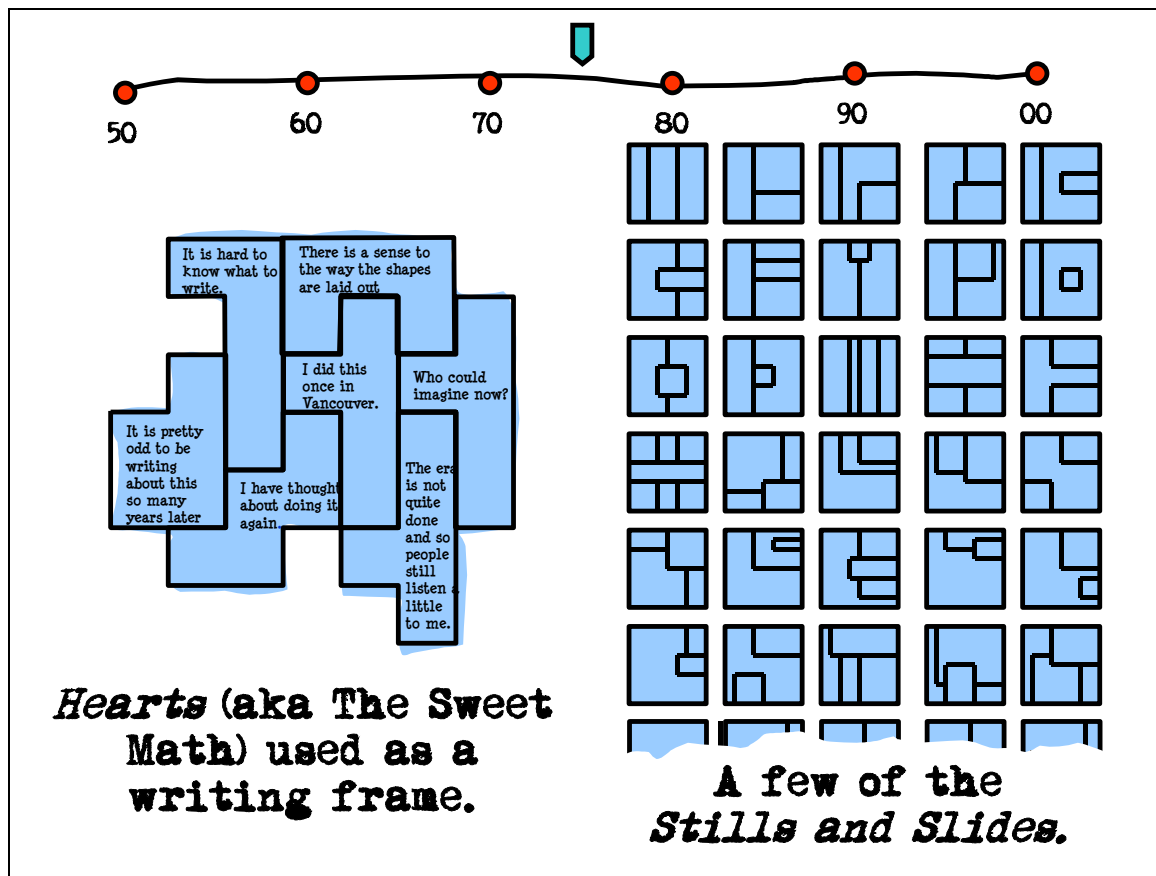
But it was the *Bitter Math*’s wonderful charts, which were not unlike chemistry’s Periodic Table, that most captured my attention at the time. It was these elaborate sub-structures which were the substantial art and not the colorful paintings and performance based on them. Charts like *All 1, 2 and 3 Emblem Transformations* were my scientific laws of nature while the rest, the art, were more like the transient products of the Plenitude.



Linguistics was another area of my faux research, creating several language analysis and synthesis systems. A good example of from this era was a collection of tracts and pieces based around *Nida Structures*, Nida being Dr. Nida, a famous linguist whose book I happened upon one day in the library, and the structures being a method of parsing sentences using a small dyadic symbol set.

What interested me was whether one could use such a structure *pro-actively*, that is, to give a meaning *to* a sentence? In most Western languages, apart from punctuation, the grammar is implicit and tacit. But what if it was explicit and represented. To test this theory I generated random sentences that had normal word frequency and then added Nida Structures to give them meaning. It could be called a *pro-scriptive* grammar.

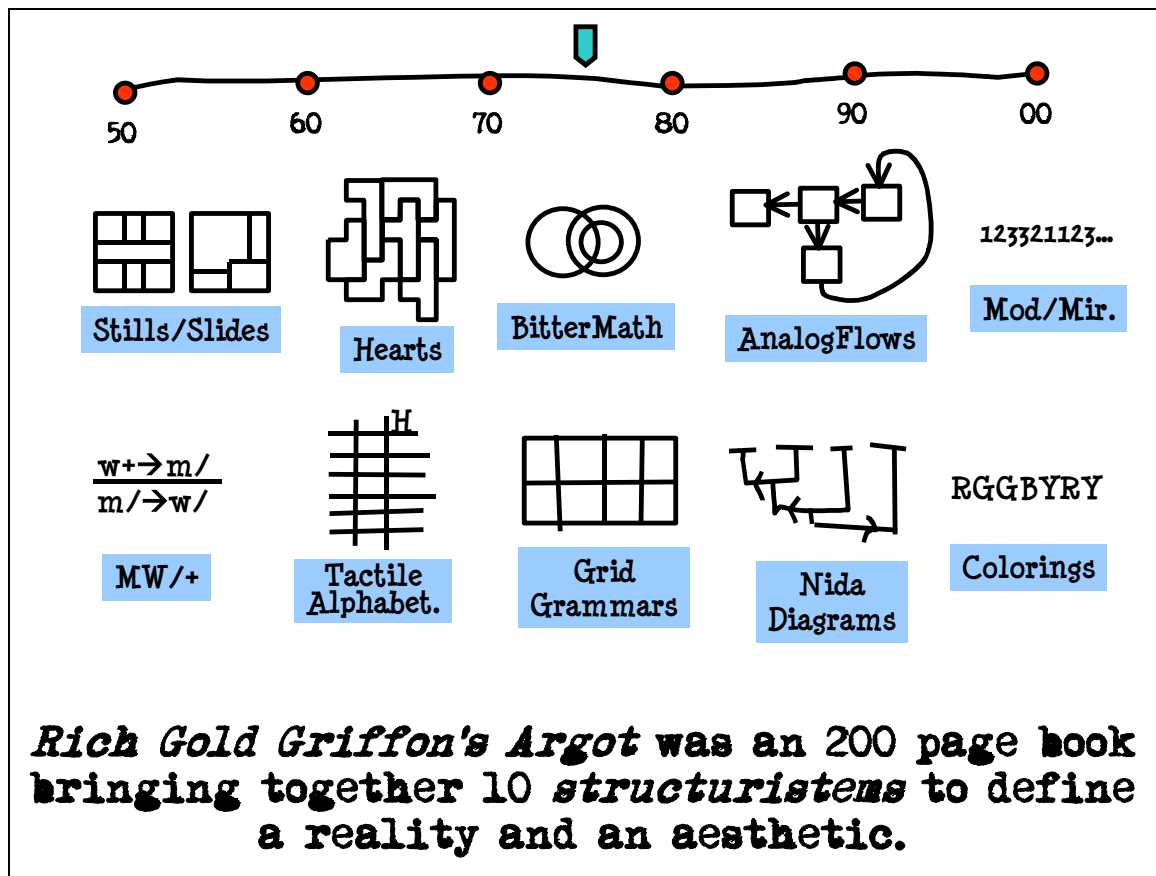
Besides writing treatises on the matter, I did a number of Live Writings on gallery walls and a few years later I would use computers to generate two and three dimensional, fluctuating word fields annotated with dynamic Nida Structures. While I realize that all of this seems disengaged from real science, I should point out that XML, the more general form of HTML, is based on much the same principle and is now being used by a least some adventurous writers. <Bold> <Italic> The Plenitude </Italic> <Bold>.



When the Plenitude reaches a certain lushness artists can swim free in the nutritive atmosphere. I think I had jobs back then, circa 1976, but I can't remember them. You could live simply by breathing. But as my life moved through the Seventies two very different Continents loomed in the distance, one more mysterious than the other. One of the Continents was called "The Art World" and some of my friends were beginning to paddle their flimsy canoes over that way. Superficially, the people in that land were engaged in activities not so different than my own as I toiled away in my make-shift studio in Oakland. But it was *actually* different. There were things called galleries. There were people in expensive suits buying expensive paintings. There were parties in mansions, on hillsides, eating food I couldn't name.

There was another Continent, and it was called something like "The Real World" and it was filled with corporations, work, paychecks, health insurance, car insurance, mortgages and kids. Most of my artist friends were rowing as fast as possible away from this Continent as if it contained dragons or at least their parents.

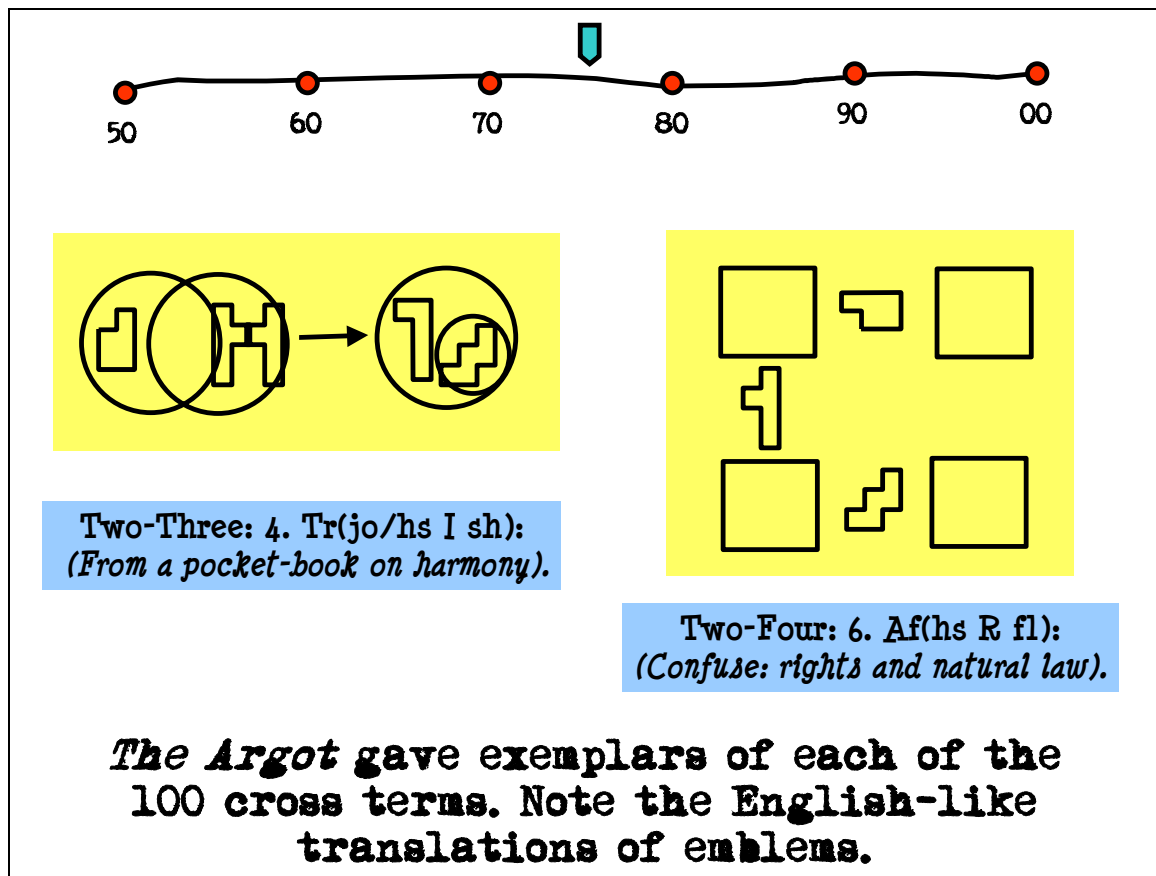
It was slowly beginning to dawn on me that I would have to make footfall in one or the other. In the meantime I made more faux-research art and had a good time in cafes, and beds, and small galleries named things like *Art-While-You-Wait*.



After several years I had enough of these faux scientific systems that I gave them a name: *Structuristems*. Each Structuristem was composed of a collection of *elements* and a collection of *rules of grammar* which dictated how the elements could be placed together to create *emblems*. It became clear that the only way to define a Structuristem was via another Structuristem and that the only way to give meaning to an emblem with another emblem, possibly from another Structuristem.

The result of this exploration was a book called *Rich Gold's Griffon's Argot*. The first section of *The Argot* was an explanation of Structuristems. The second part of the book was the definition of ten different Structuristems. The third, and longest section of *The Argot* were one hundred *bi-emblems* that combined the ten Structuristems in all permutations. The final section was speculative and suggested that there was no distinction between elements and grammars. More importantly it introduced the concept of the *anti-natural*, where unlike the *natural*, the objects were universal and the rules were local.

If I could pick one moment of my life to stay in for my entire life, it would be working on *The Argot*. There are those who say, that's what happened.

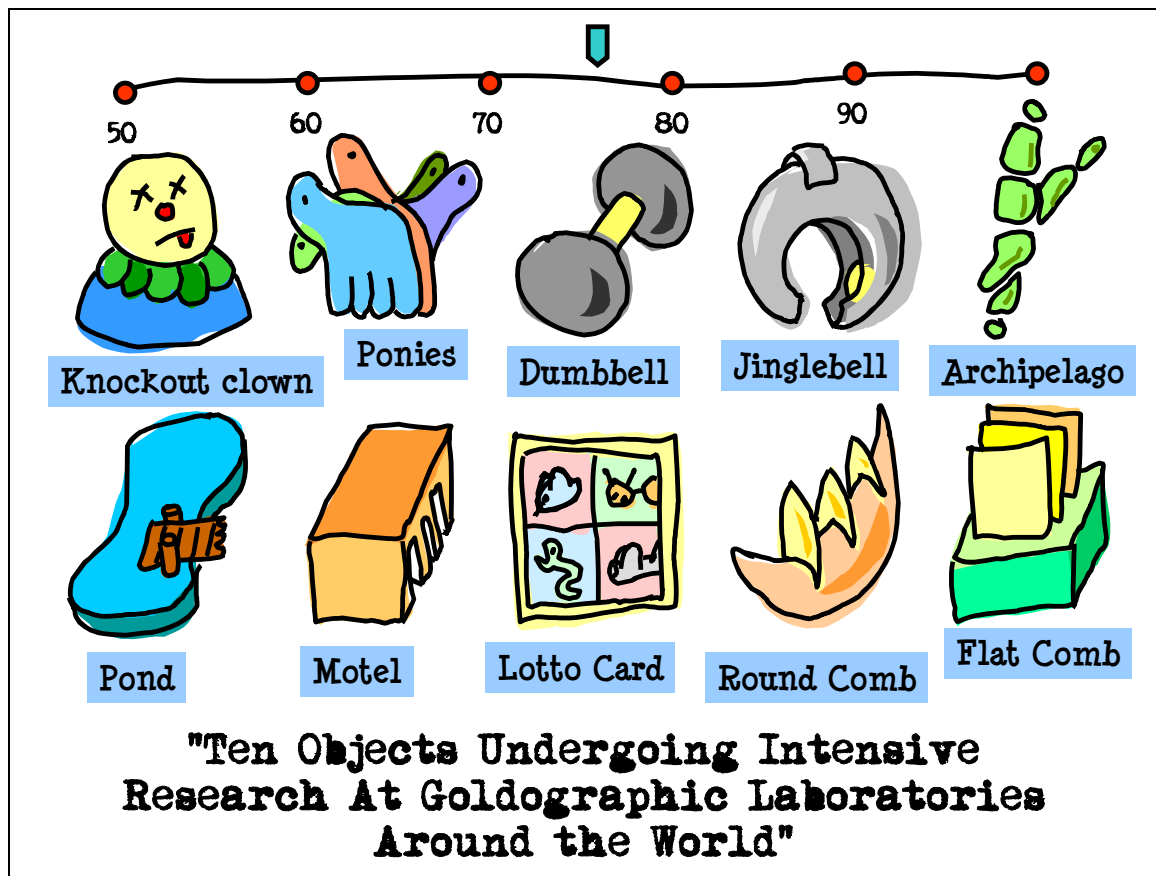


Here are two example entries from the third section of *The Rich Gold's Griffin's Argot*. On the left we have some *Pentomino Constructions* being given grammatical definition by the *Bitter Math* using the method I called *Insertion*. On the right we have *Analog Slides*, where one some of the elements (the arrows), have been *Replaced* by *Pentominoes*.

Directly below each bi-emblem is the English label (English, in this universe, is just another Structuristem.) The notational system (yet another Structuristem) indicates the make-up of the bi-emblems. For instance, note the capital "I" on the left and the "R" on the right, which represent *Insertion* and *Replacement* respectively.

The English phrases in parenthesis are English interpretations of the meaning of the bi-emblem. I have been asked how I derived these meanings and the only answer I can give, is that I was in a "state".

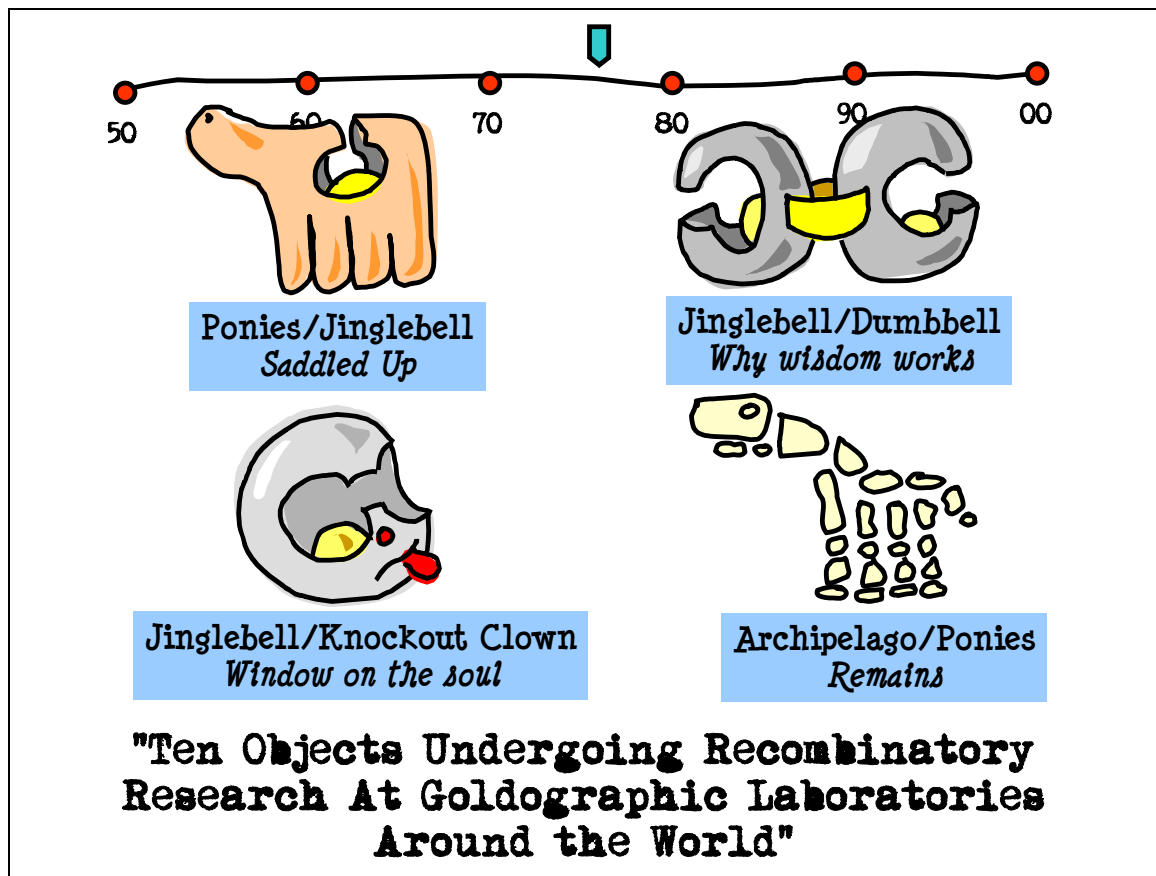
When you put on the red beret you can enter such a state.



By the mid Seventies my cartooning began to reassert itself in the guise of *The Ten Objects Undergoing Intensive Research at Goldographic Laboratories Around the World*. While certainly less diagrammatic and more artistic than the earlier Structuristems, they were of the same ilk. They would show up in paintings, tracts, writings, computer animations and even 3D virtual reality twenty years later.

Each of the ten objects had a personality. For instance *The Knockout Clown* was “nuts, drunk and crazy”, while the *Ponies* were “loving, familiar and potent”. The Dumbbell and the Jinglebell were twins (note the Dumbbell shape within the Jinglebell). Each object had an ideal distance to every other object representing how much it liked or disliked it. Ponies liked to be close to Ponds but far from Dumbbells and so on. These were the facts of life for the *Ten Objects* and were used by computer programs that produced arrangements of *The Objects*, say as paintings.

My paintings, drawings, dances and plays of *The Objects* explored their natures in a wide range of styles and from a variety of perspectives. It was as if I was painting portraits of Italian courtesans. I have written and drawn more on *The Ten Objects* than any reasonable person would. But of course, I was an artist. I had become *obsessed*. They were a kind of mini-Plenitude captured in a flask that I could run experiments on. Heat ‘em up and write the data down in the notebook.

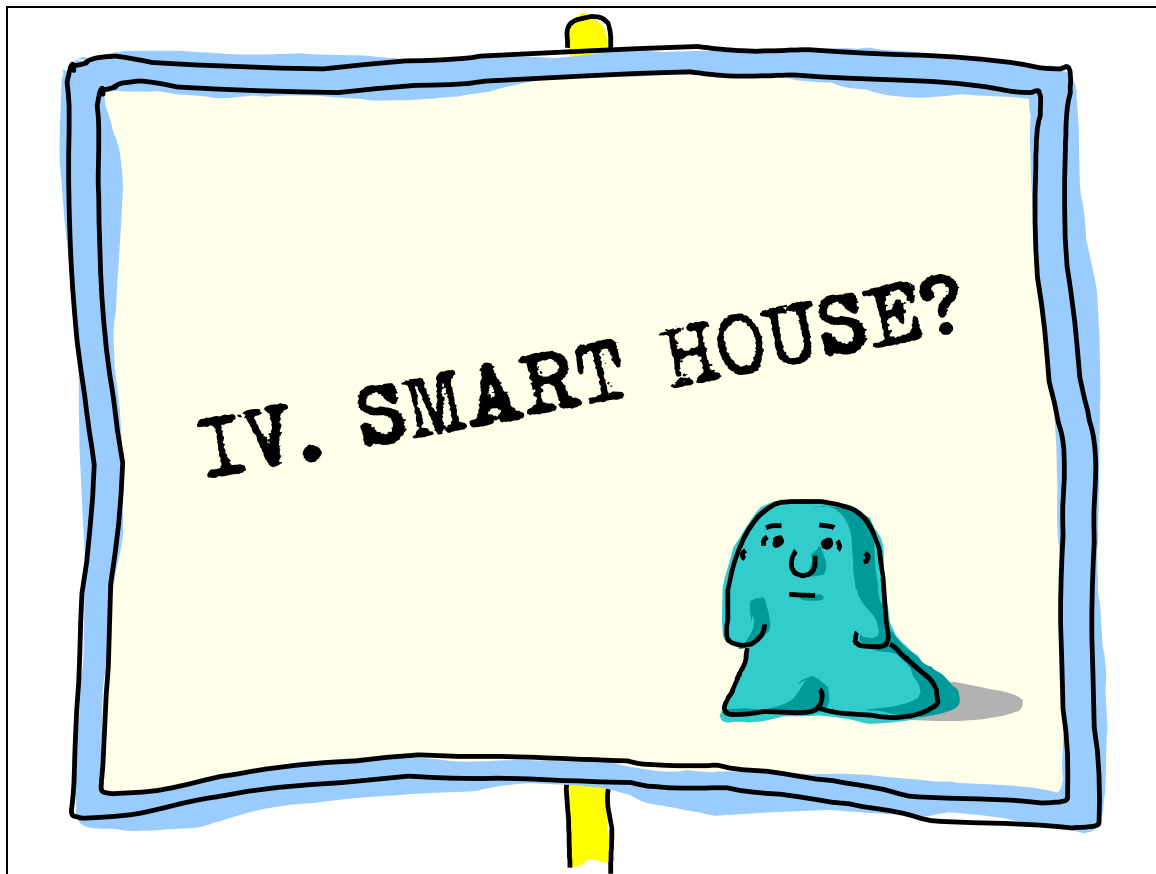


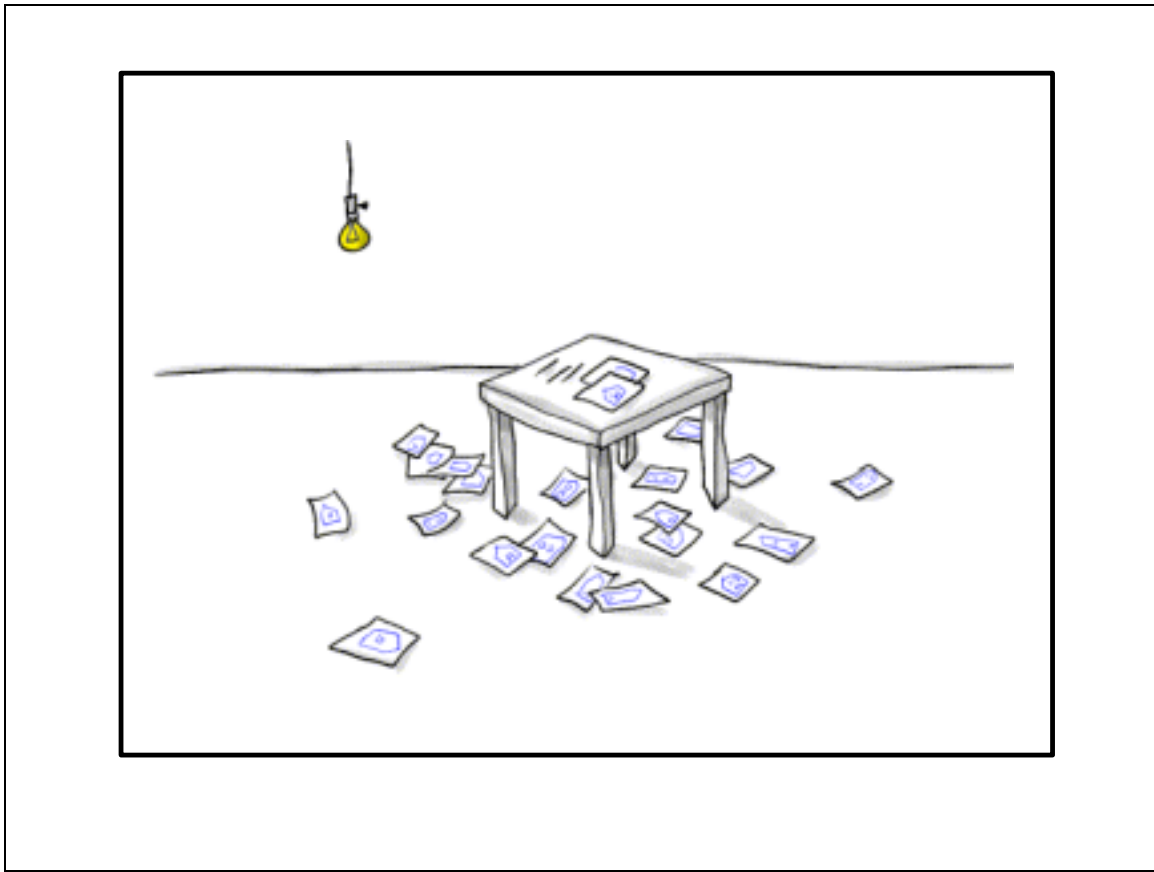
In the late 70s I began to cross-breed, or as we would now say, genetically engineer, the cross product of the *Ten Objects* producing one hundred hybrids. OK, they were just cartoons. These *One Hundred Objects* were more complex than their parents but through them I could explore the constituent features that constitute "category."

Once again I annotated these new objects (now undergoing their own research) with English phrases (micro-poems?) adding a new level of meaning (or perhaps simply distorting the old meaning.)

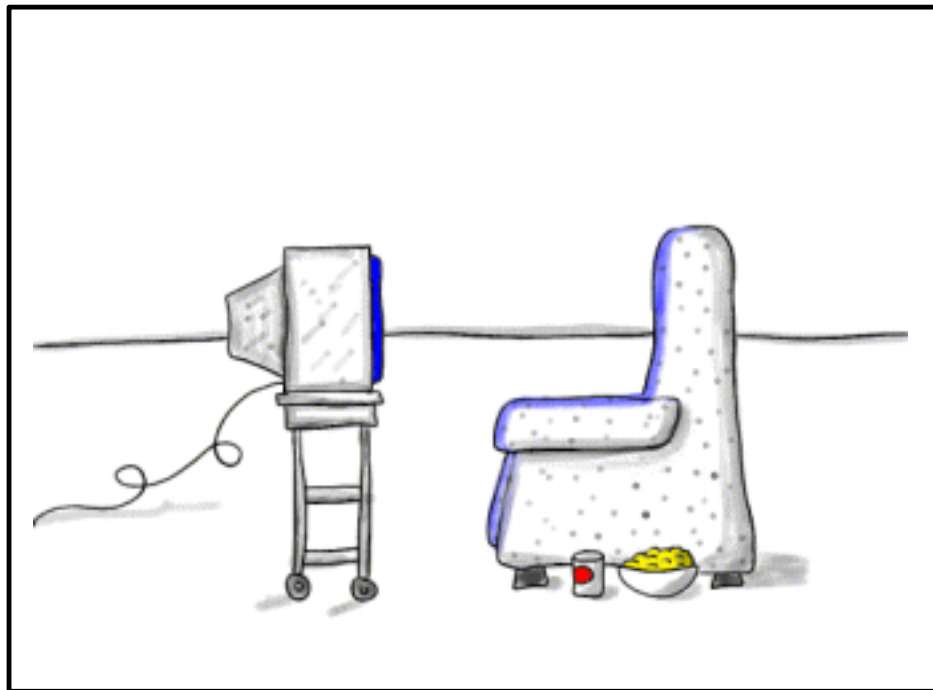
I continue to this day to work with these *One Hundred Objects*, lately animating them on the computer. Since I no longer work within the art world this activity has taken on a certain eccentricity. I suspect I have moved from being a *faux* to a *real* crackpot. Or have simply become a folk artist.

Around this time, 1975, my art and music became fully computerized. The computer came to dominate my thinking both aesthetically and philosophically. It became common to call computers *intelligent* and to create an artistic tension based on this linguistic trick. But the Plenitude was beginning to computationally move as well, and its motion, like plate tectonics, was neither small nor without consequence.

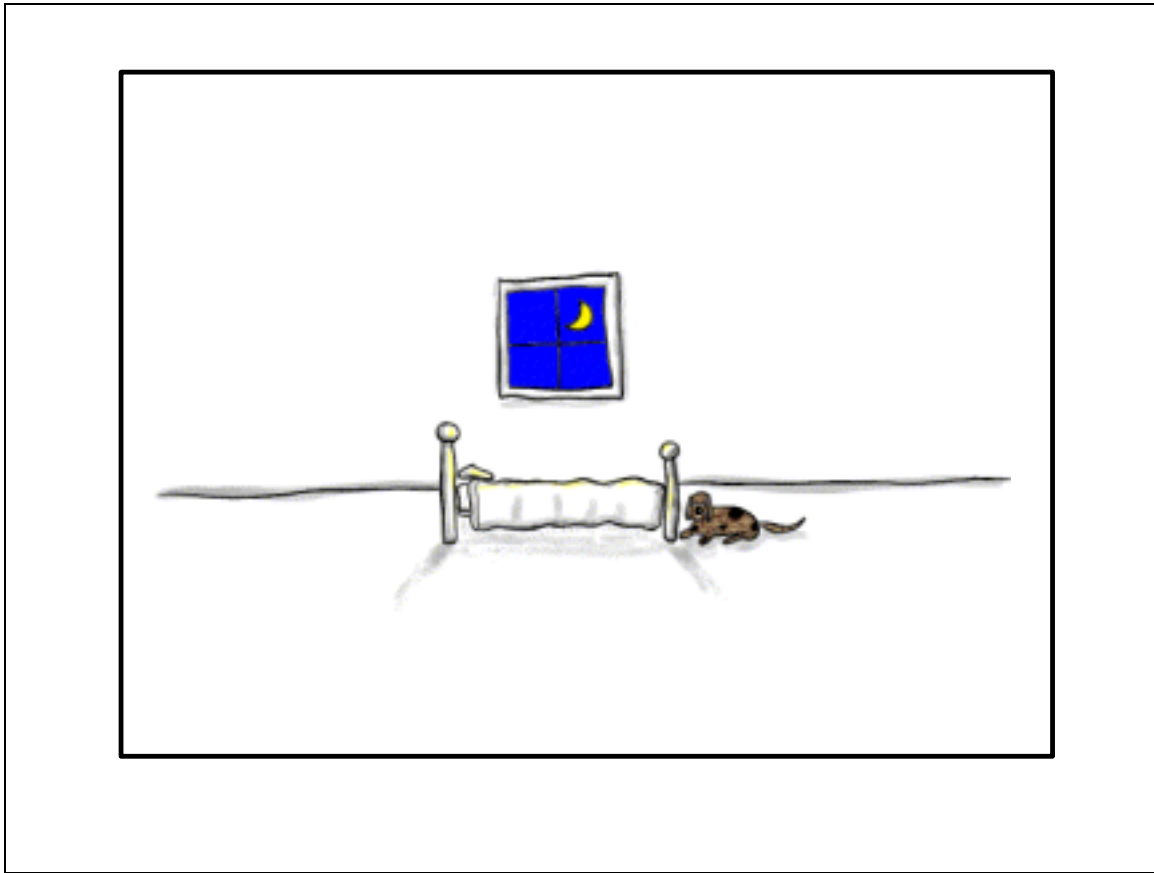




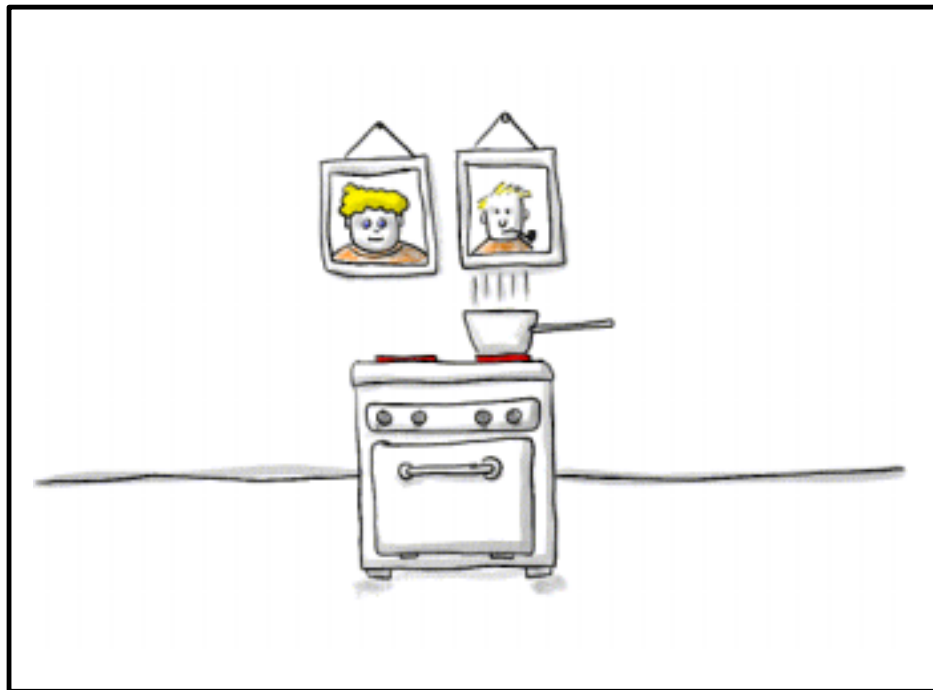
Why would anyone want to live in an intelligent house? What would be the forces that would compel a designer, or an architect, to create such a thing? How would it be marketed? What sorts of problems does such a house solve? What sorts of problems does it create? Could you describe such a house? Do you believe that such a house is possible now or in the near future? Is it likely that such a house, once built, purchased, and moved into, would perform as advertised? What sorts of unforeseen problems are likely to emerge? What kinds of alterations to the house will designers be able to make to correct these emergent problems? Who will pay for these alterations? If you are a designer, isn't a world full of problems more lucrative than a world without problems?



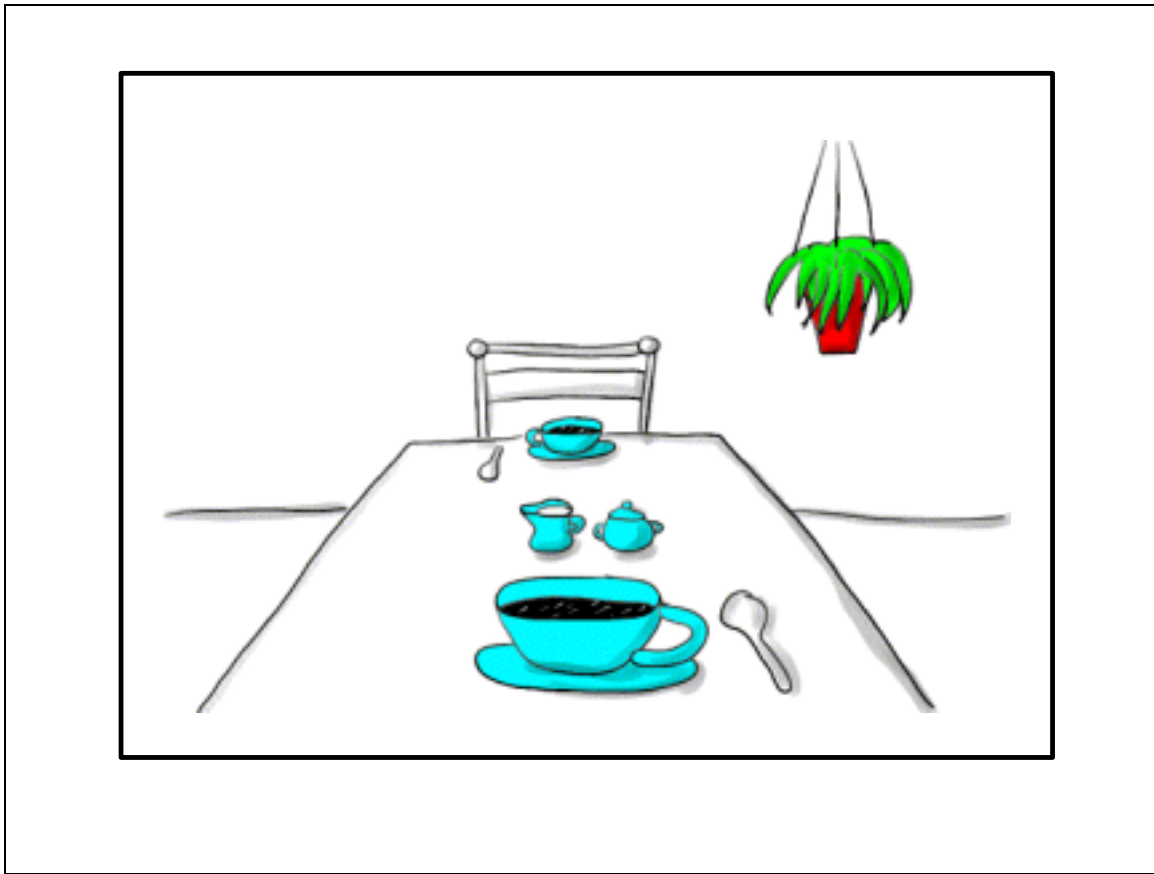
How is an intelligent house different from an intelligently designed house? Given a choice which would you rather live in? How about a basically stupid house, but one that is quite pleasant if you live in it intelligently? Do smart houses prevent you from watching dumb TV? Do smart houses take part in the action of TV shows, by say, adding lighting and special effects? If you don't have children but would like some, do smart houses add the patter of little feet to the background? Does the patter get louder as the children grow up?



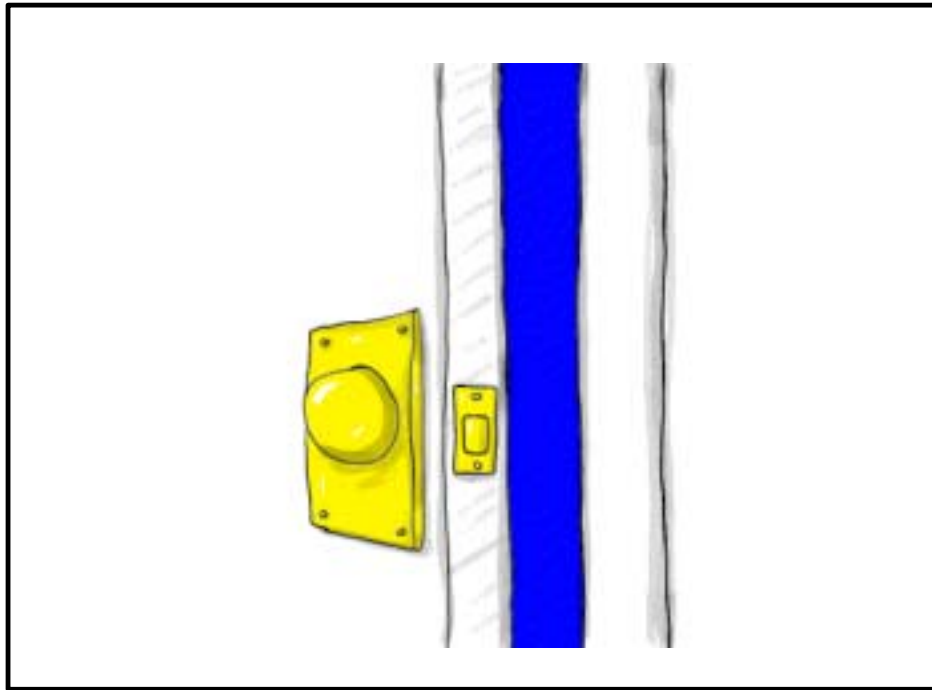
How smart does the bed in your house have to be before you are afraid to go to sleep at night? Which is smarter: awnings over the windows to keep out the sun or a massive interactive, cybernetic cooling system that attempts to keep the temperature of the house within one degree of optimal? If you were an engineer fresh out of college with a major in electrical engineering which would you prefer to design? Would you put warning labels on the windows telling the occupants not to open them because it would mess up the temperature feedback loop? Do you consider the dam on the river that generates the electricity for the computer which runs the cooling system as part of the house? Is the family dog considered an occupant of the house?



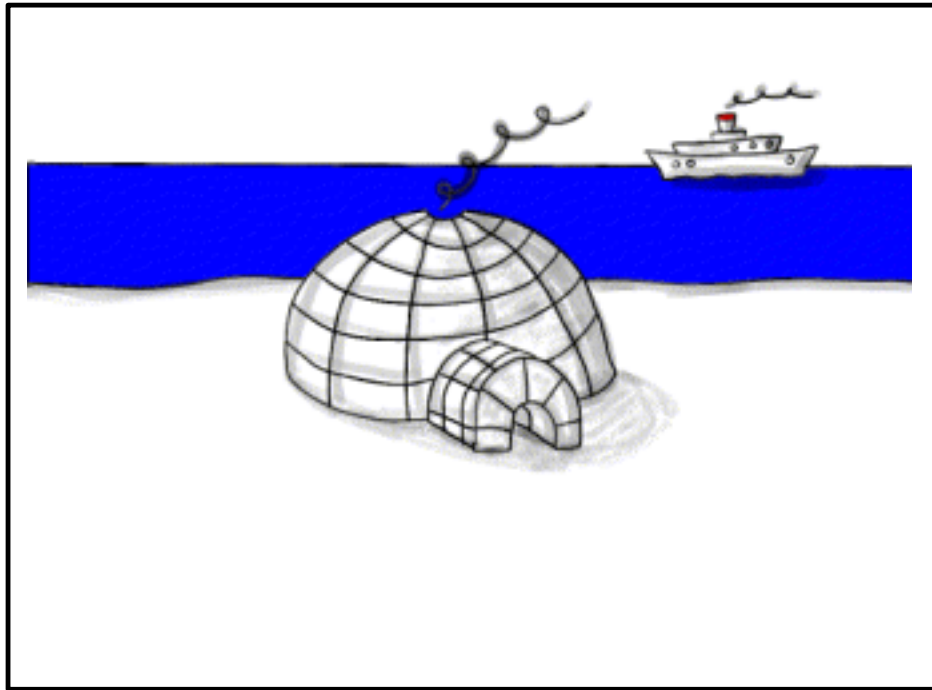
When you return to the house in which you grew up, do you want it to look the same or different? Are you willing to make allowances for your parent's changing tastes? Would a smart house alter its looks when you arrived and then change back again when you left? Would you believe somebody who told you that on a linear scale, with a toaster at one end and a two year-old baby at the other, that Artificial Intelligence is about one bread crumb away from the toaster? Do you believe that with enough speed and enough memory and enough 20 year-old programmers that computers can have emotions? Do you believe that when water is heating on the stove, that the water is running a program calculating an equation that tells it when to start boiling? In a smart, ever watchful house, does the water ever boil?



Do houses evolve? Do smart houses evolve? In the house you currently live, is there a membrane (a wall) between the kitchen and the dining room? Was there one in your parent's house? In your grandparents house? In your artist's girl or boyfriend's house (loft)? Which design is smarter? Does your cappuccino-maker always make perfect cappuccinos? How much time does it take? Does your neighborhood cafe make perfect cappuccinos? If you had the time where would you prefer to have your cappuccino? Is your neighborhood cafe run by a computer? Would it be better if it was? Where did you meet your wife (husband, lover)?



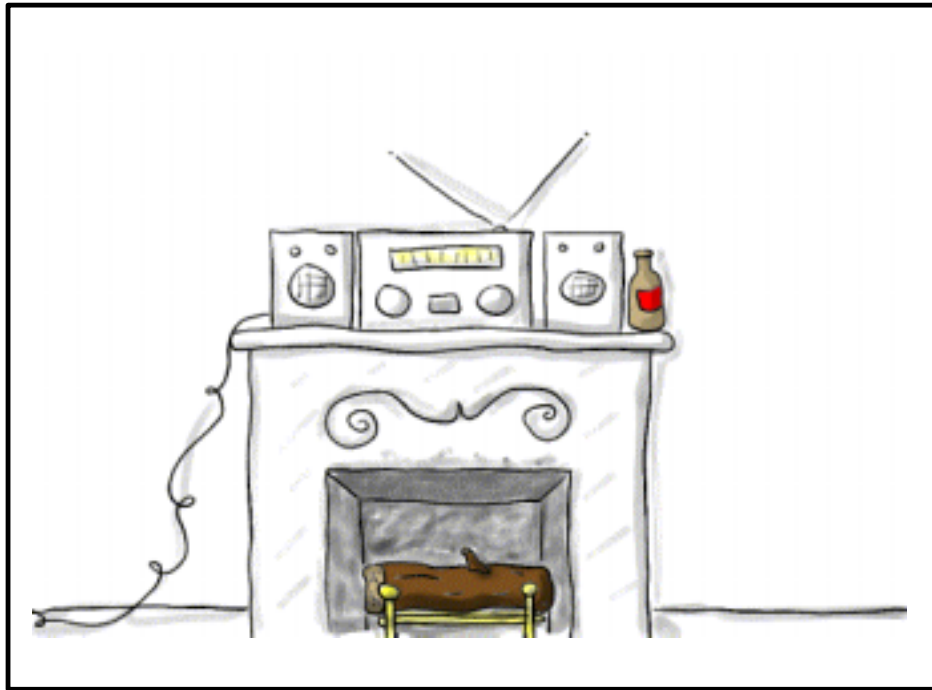
How do burglar alarms work? Can they distinguish between a burglar and, say, a squirrel that got lost and found its way into the kitchen? Can you tell who is a burglar when you walk down the street? What if you were given a burglar profile by the police (or by your mother), could you then tell who is a burglar? If you could program your burglar alarm to recognize the burglar profile would you need to lock your door? Does an intelligent house need a door at all? Would it make sense to ask if an intelligent house would rather have a mouth than a door?



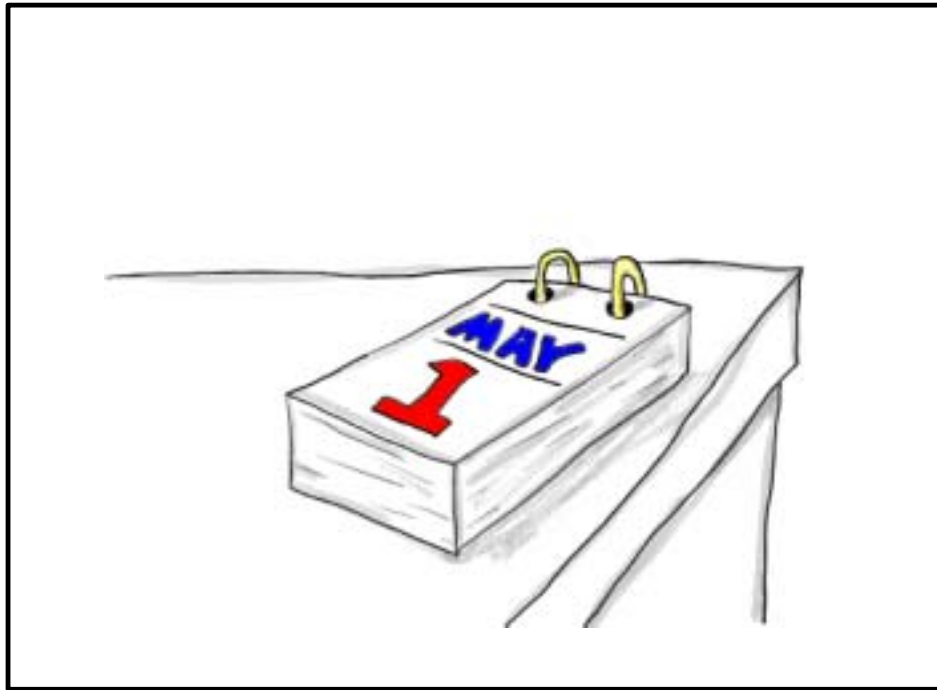
Can an intelligent house fall in love with the house next door? Can they have baby houses? Is an architect a trained “womb” for houses, or more crudely, is an architect how a house makes another house? Does an architect feel like she/he is violating fundamental forces of evolution if she/he does not include the latest new technology in the house she/he next gives birth to? Do you believe in progress? Is a suburban house of today better than a row house in London in 1850 which was better than a thatched country cottage in 1700 which was better than teepees and mud huts that Columbus found in the New World? Is the house that Donald Trump lives in better than the house you live in? If you were an architect and you designed an intelligent house, would the house’s own happiness matter to you? If the couple that bought the house you designed got a divorce, do you think you should be libel for damages?



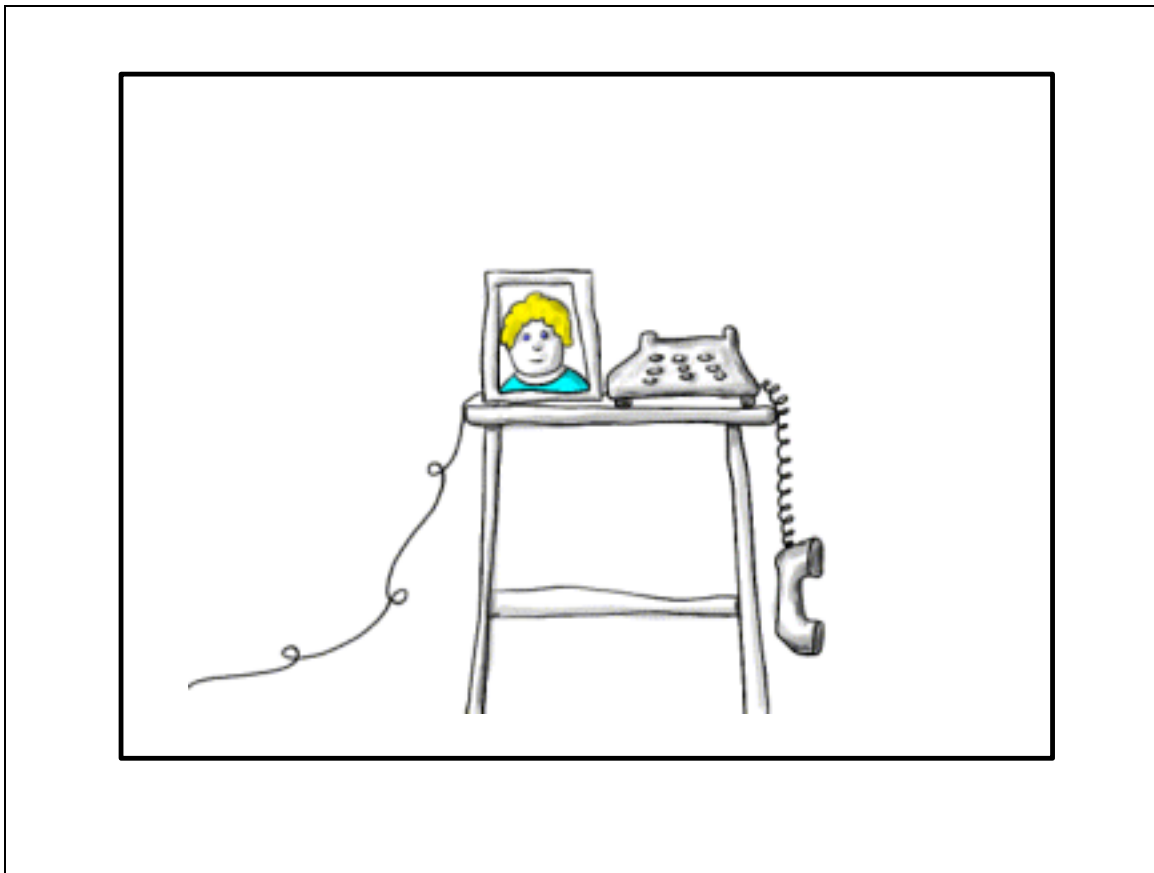
Do you believe that making pancakes for you and your lover in the morning is, in itself, a wonderful thing? If you were asked by your company to design a product called “Lover’s Instant Pancakes” would you? Would you do it because that’s your job or because, perhaps, you think it would give you more time for love making? What if they’re not quite as good as made from scratch pancakes in taste? What if they don’t quite fill the kitchen with the same smell? What if they contain a small, though probably not harmful, amount of preservative? If you are an architect and “Lover’s Instant Pancakes” was a major success, would you build a special chute from the kitchen to the bedroom so that nobody has to leave bed to get the pancakes? Is there something special about the cold feet of a lover returning to bed? How do you know your lover loves you? What do you and your lover talk about?



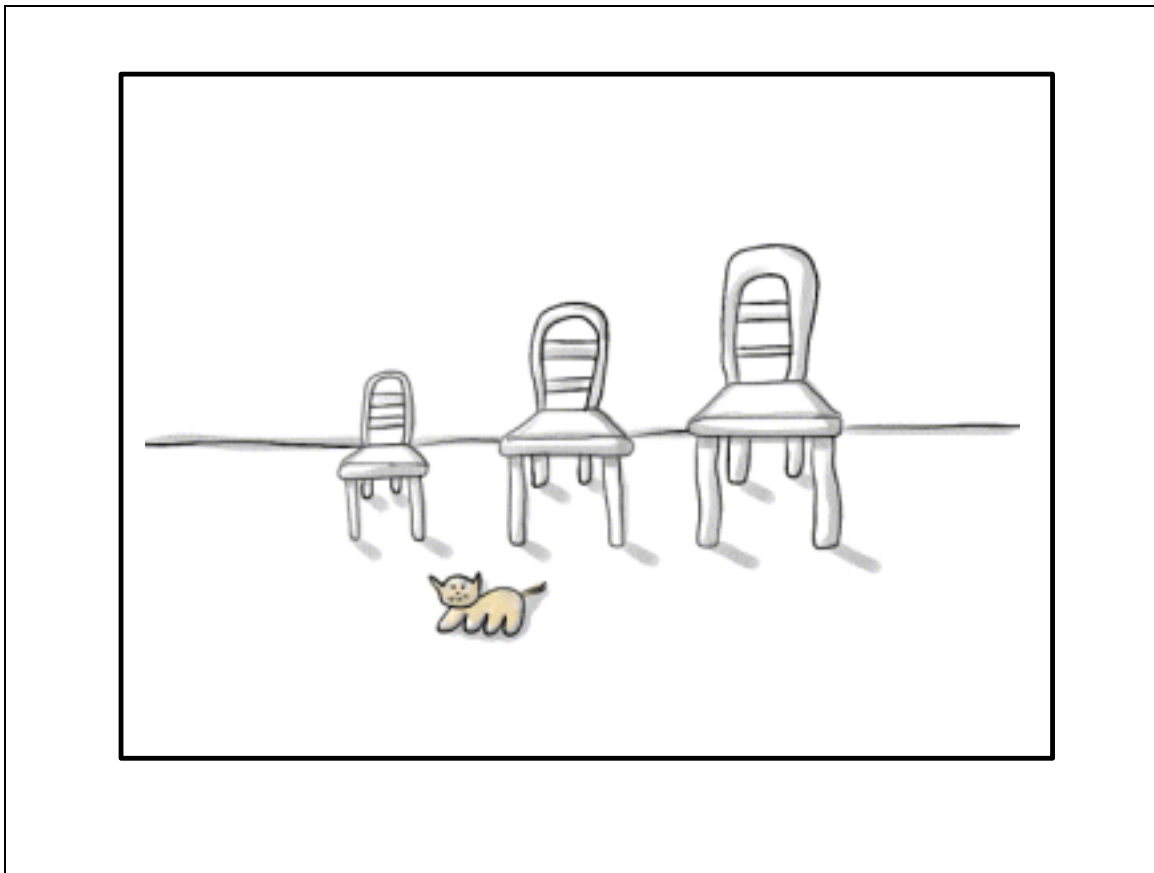
How many extra hours a day are you willing to work so that you can program your entertainment center from your chair? If your house was intelligent enough to baby-sit your children would you rather go out to a concert than listen to your auto-programmed entertainment center? Are you afraid to go out of your home at night? Do you know most of your friends from work or from your other activities? Do you have other activities besides your house's entertainment center? If you had the chance of working one day less but not having an entertainment center in your house would you take it?



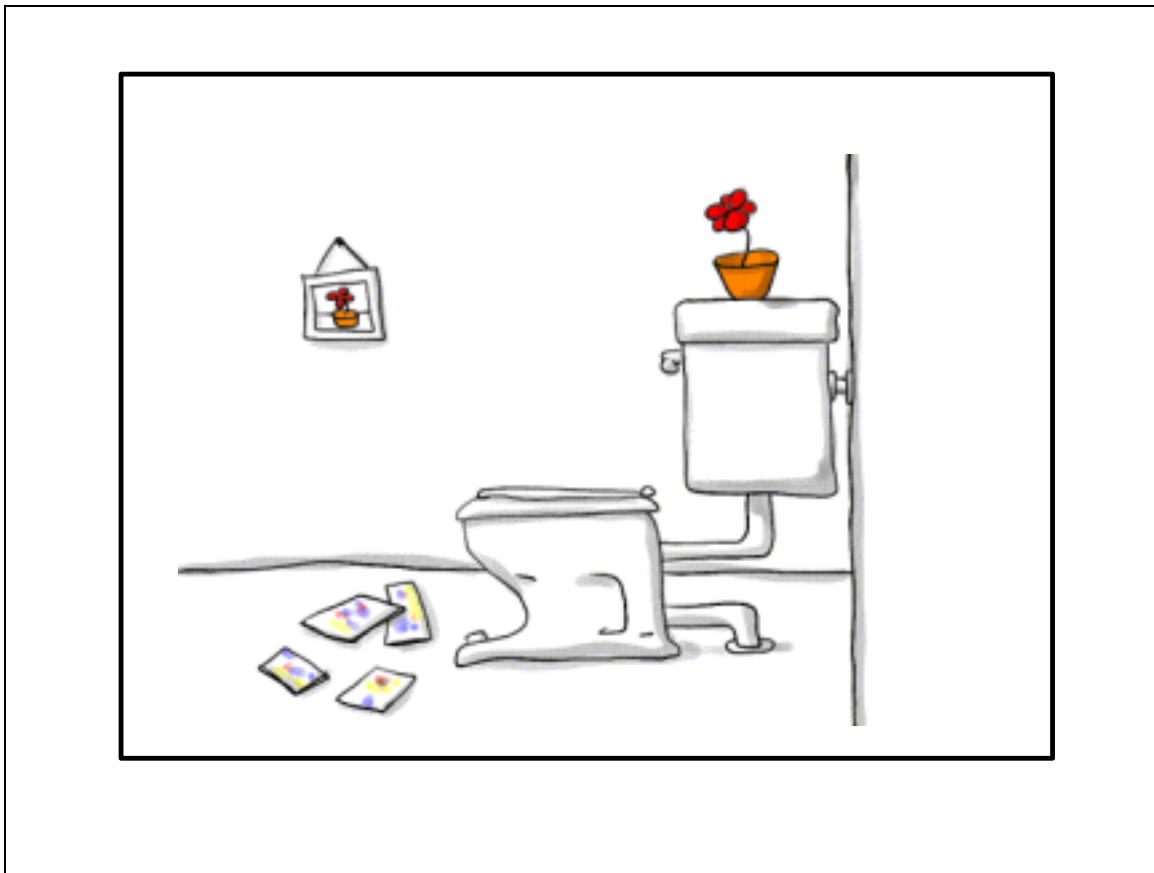
Is time the only real commodity left? Why is Virtual Reality always posited in terms of space, when time is the only real commodity left?



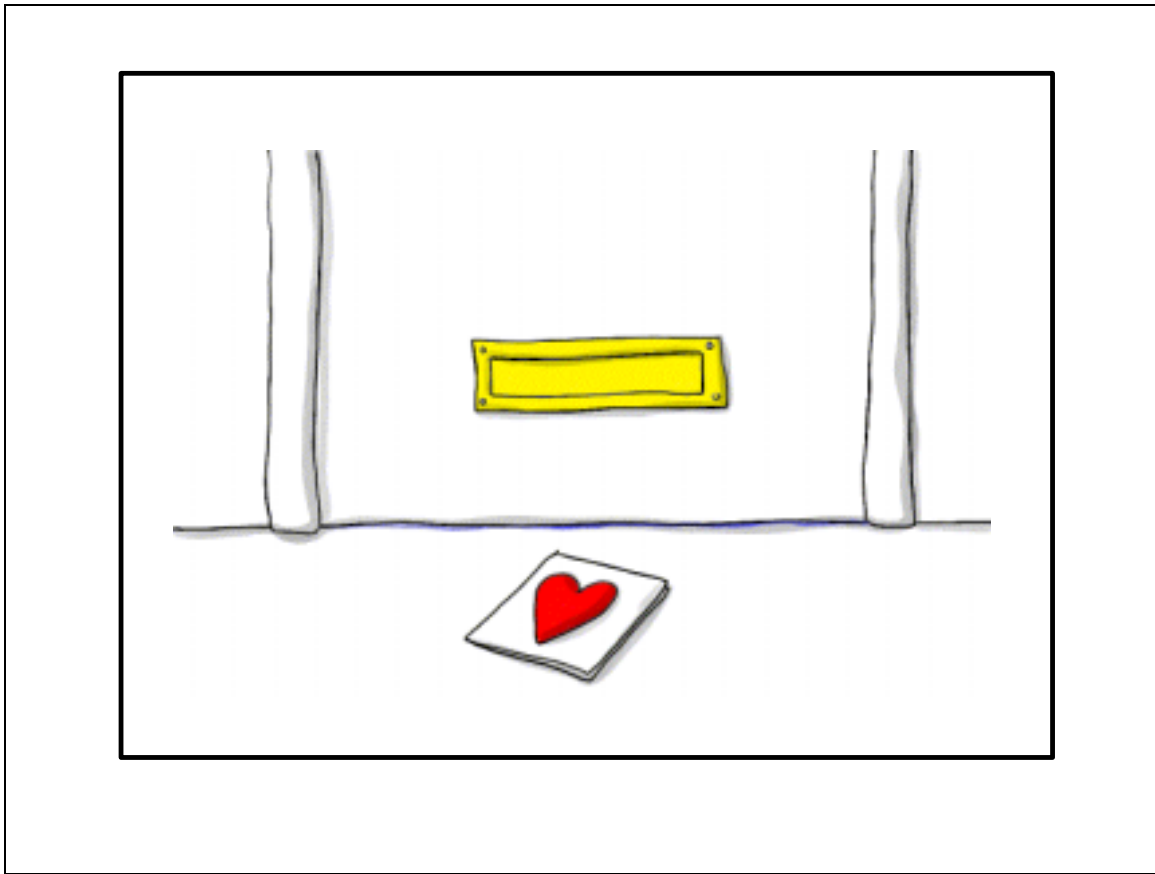
Are you confused by the telephone? Do you believe a Virtual Mom is in your living room when you speak to your mother on the phone? Do you believe The Rolling Stones are in your bedroom when you put a CD of them on the stereo? Why are you confused about Virtual Reality? Do you believe that a mediated experience is the same, or almost as good as, a non-mediated experience? Do you keep track of who makes money in each and every mediated experience? Do you believe you used to be able to “Reach Out and Touch Someone”© for free? Is the telephone now the best way to reach out and touch someone?



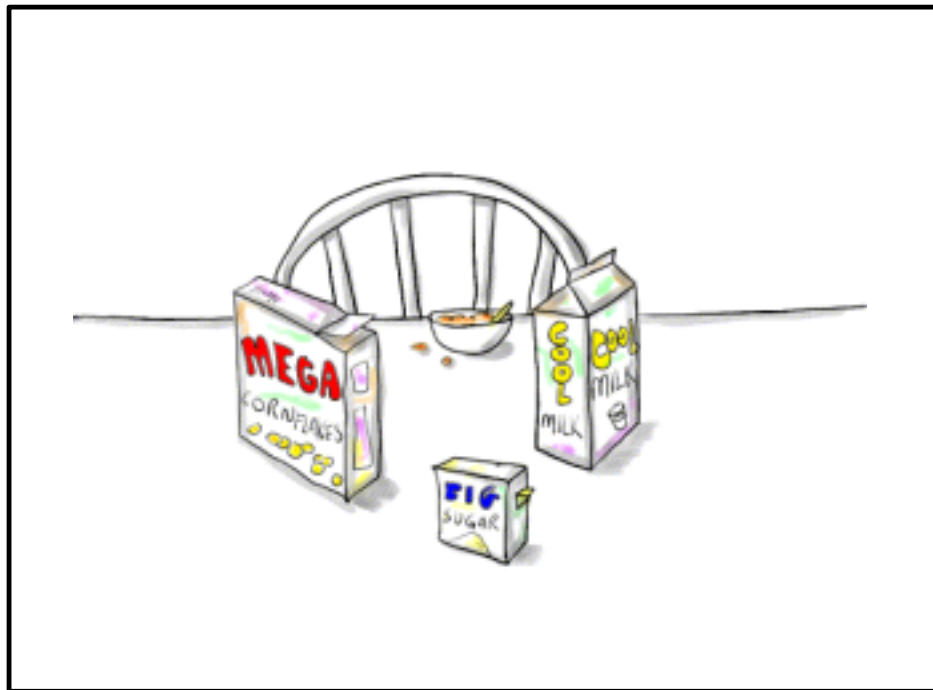
Who will program the user preferences for the intelligent house? Mom? Dad? The kids? Will the intelligent house be able to meaningfully average these preferences? Does control of the intelligent house's preferences alter the balance of power within the family? Will this make the family more or less stable? Should local, state or federal laws be able to be passed which regulate some of these preferences? What if some settings could endanger children? What if some settings are only used by criminals? What if some settings are good, but not perfect, indicators that child molesters live in the house?



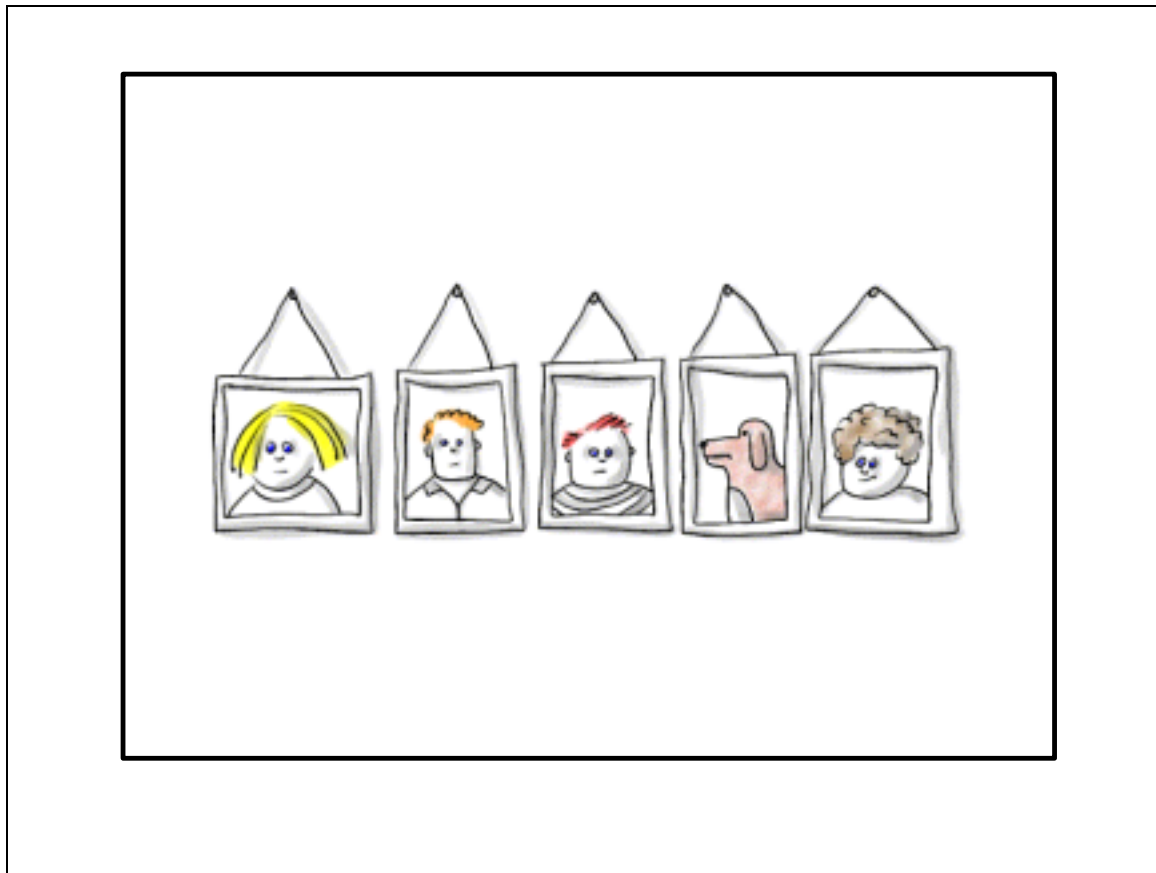
If you or one of your family members was often constipated would you want your smart house to automatically blast low frequency waves out over the PA system if such waves helped? What if they were activated by a button which had to be pressed? What if you frequently forgot to press the button, would you then want the waves to be automatically activated? Would you want your house to monitor your stool to determine if it should blast out low frequency waves? What if by monitoring your stool it could determine, very early, if you had cancer? Should it send that information directly to your doctor? What if your insurance rates were cheaper if it did?



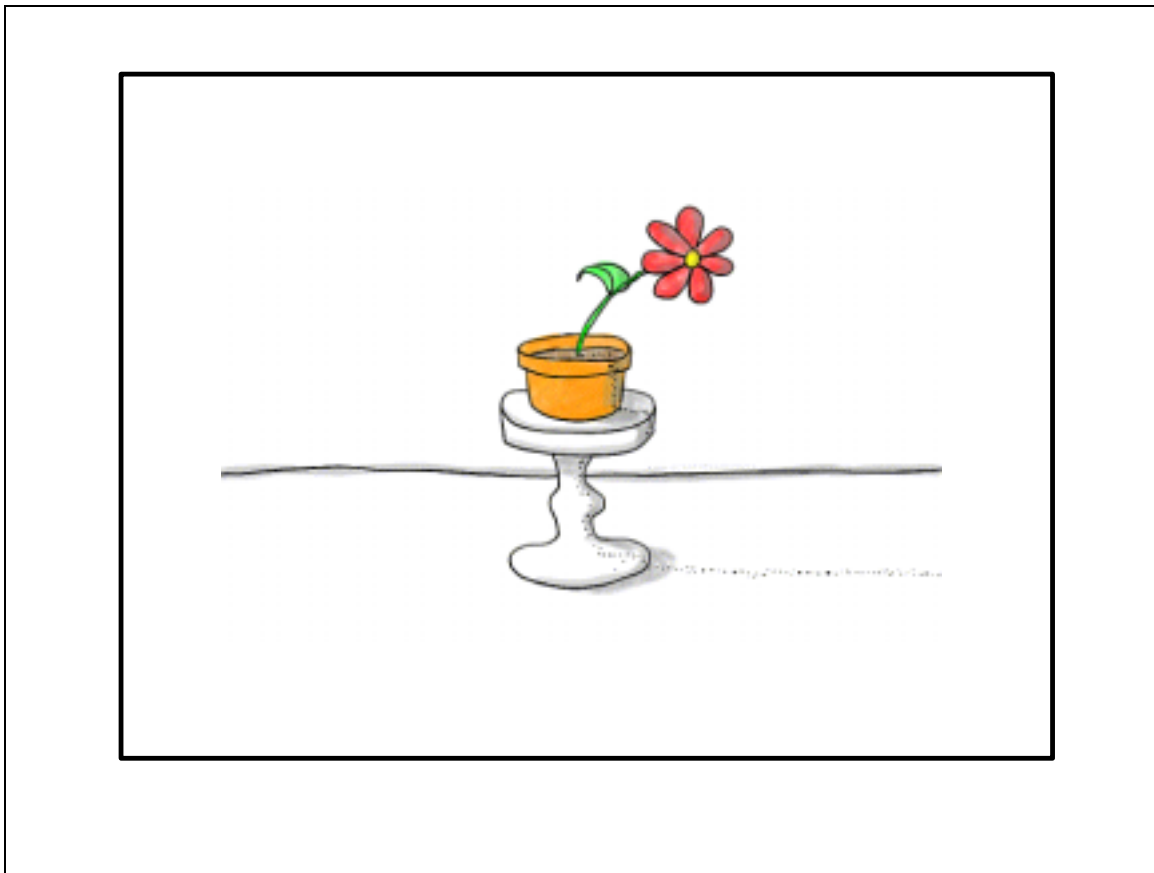
What if your smart house remembered important dates like birthdays and sent cards and balloons, baked special cakes and chilled the Champagne on the right days? Would you feel good if you received a card generated by your lover's house? If your otherwise always forgetful lover started remembering your birthday would you become suspicious? Would it be possible that you would break up with your lover based on the forgetting or the remembering to program their smart house to send a birthday card?



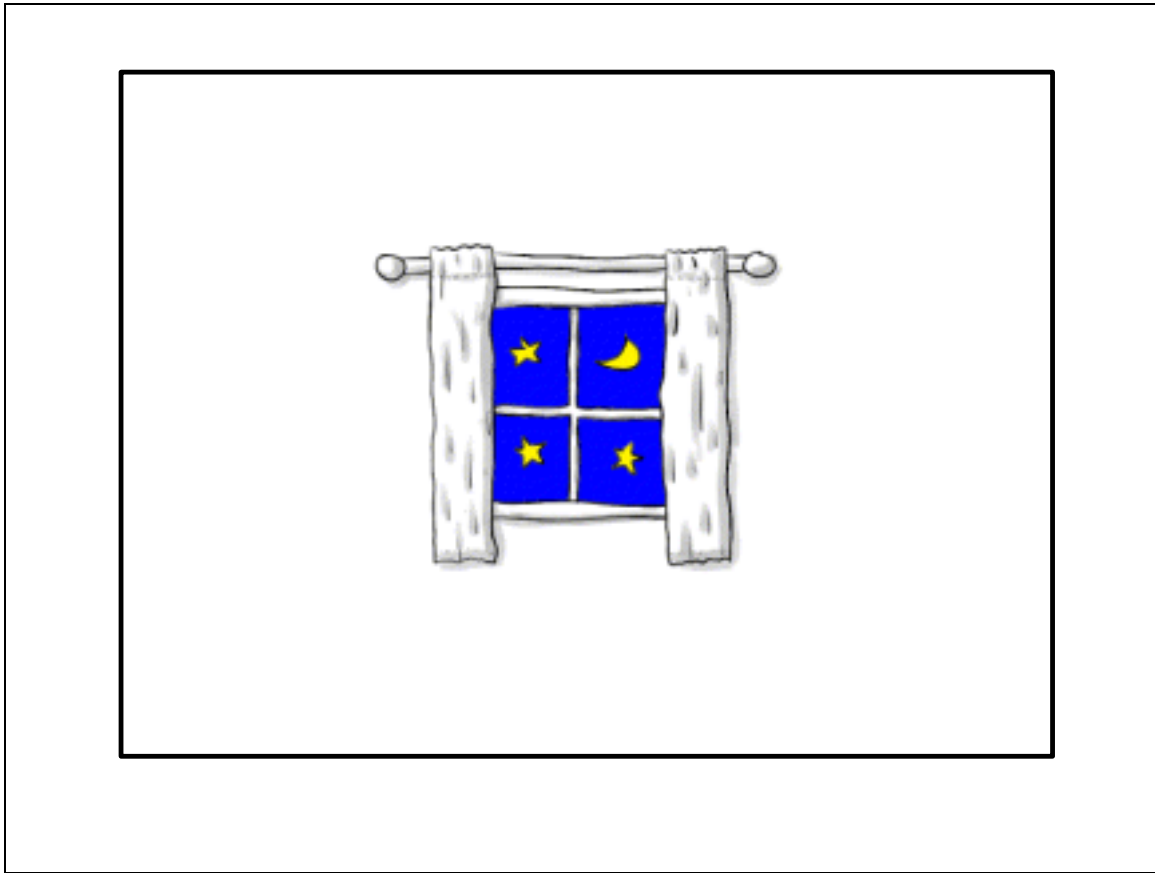
If it turned out that you would get 25% discount on the price of your home if instead of paintings, you had to place advertisements on the wall, would you do it? How about if the advertisements were controlled by your smart house and changed depending on what you were doing during the day? In what ways do you consider a T.V. to be different from a painting? What if you could get 75% discount? If your house had the license to make McDonald hamburgers how many times a week would you have them?



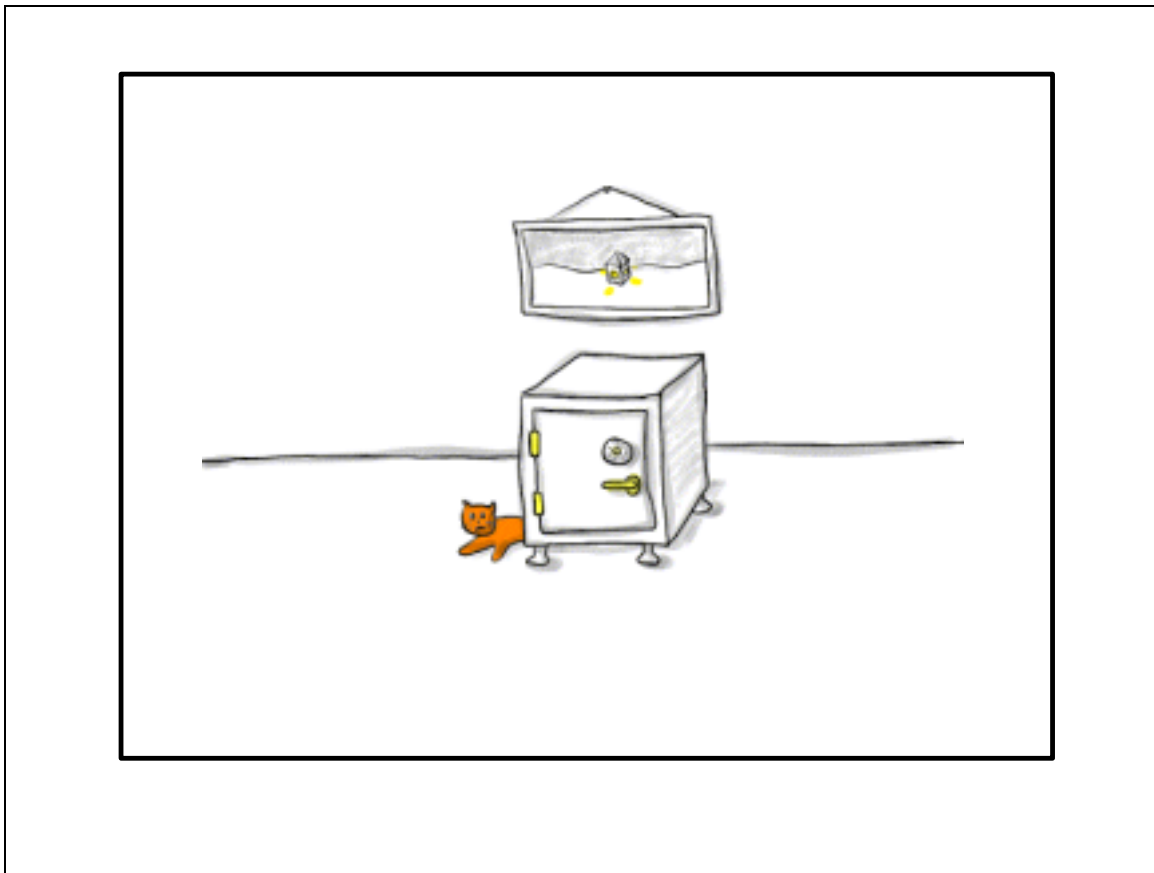
When you design new things do you think you are solving a problem? When you design new things do you think that you are engaged in the dominant ritual behavior of your tribe? When you acquire things do you think you are solving some problem? When you acquire something do you think you are engaged in the ritual behavior of your tribe? If you are an artist does each one of your works of art solve a problem? If you buy works of art does each work of art purchased solve a problem? If you are an artist and were only allowed to create five works of art in your lifetime, what would they be?



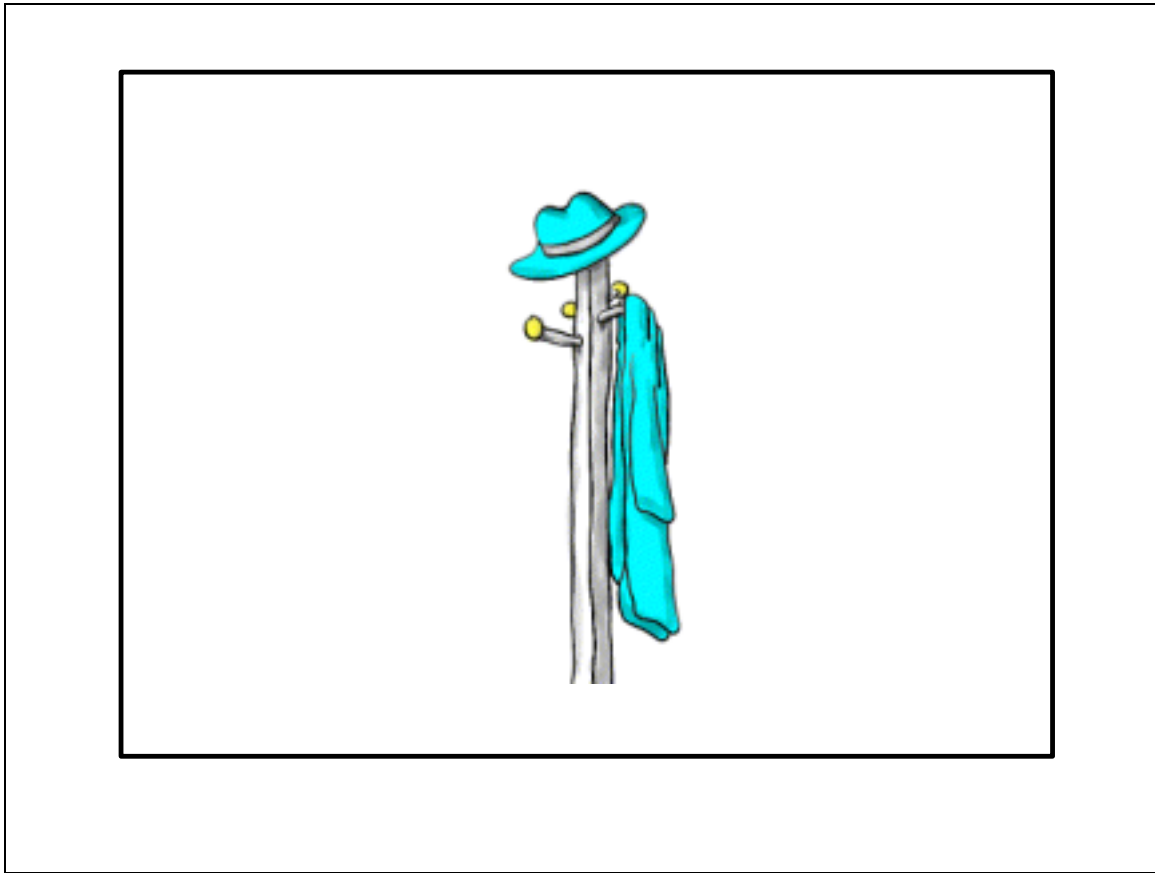
Will the house of the future have plants in it, or will it be the only place plants exist? Will the house of the future nurture the plants? Or will the house of the future have artificial plants that turn with the sun? If there are plants, will there also be bugs? Bees? Spiders? Ants? Dust Mites? Will anything in the house of the future be alive besides the humans and possibly the plants? What poisons will it use to kill the bugs?



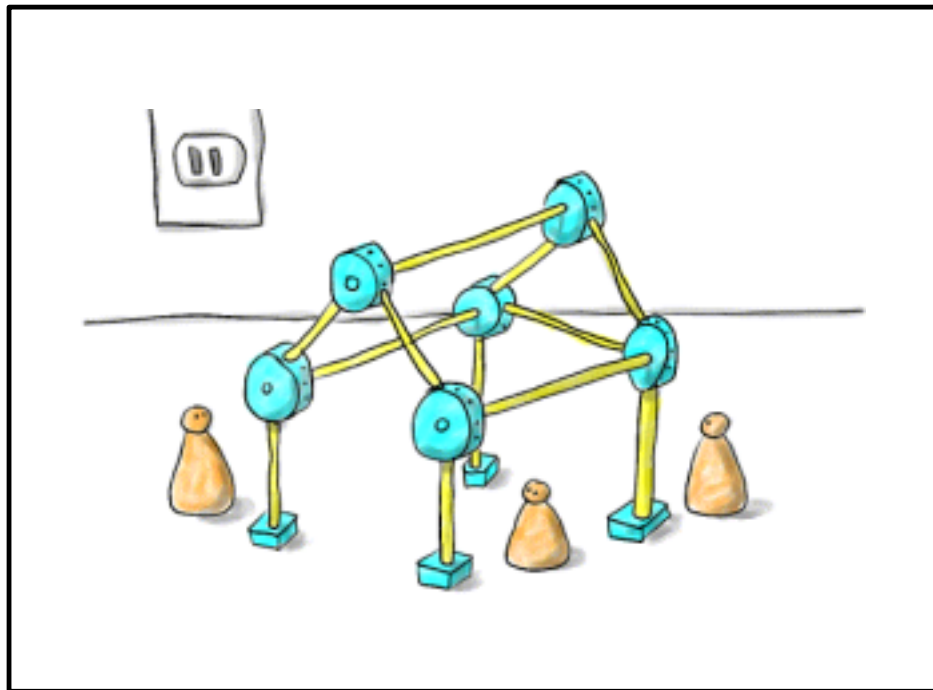
Do you think it is within the realm of possibility that the intelligent house can eliminate the perception of the four seasons and allow the inhabitant to have whatever season he or she wishes to have that day? Do you think it is likely that intelligent houses can eliminate day from night? Do you think it could stretch time? If the rest of your family lived in Japan, could your smart house keep your life in perfect sync with theirs? Is the architecture of time more or less important than the architecture of space? Do you count the hours and years you are alive?



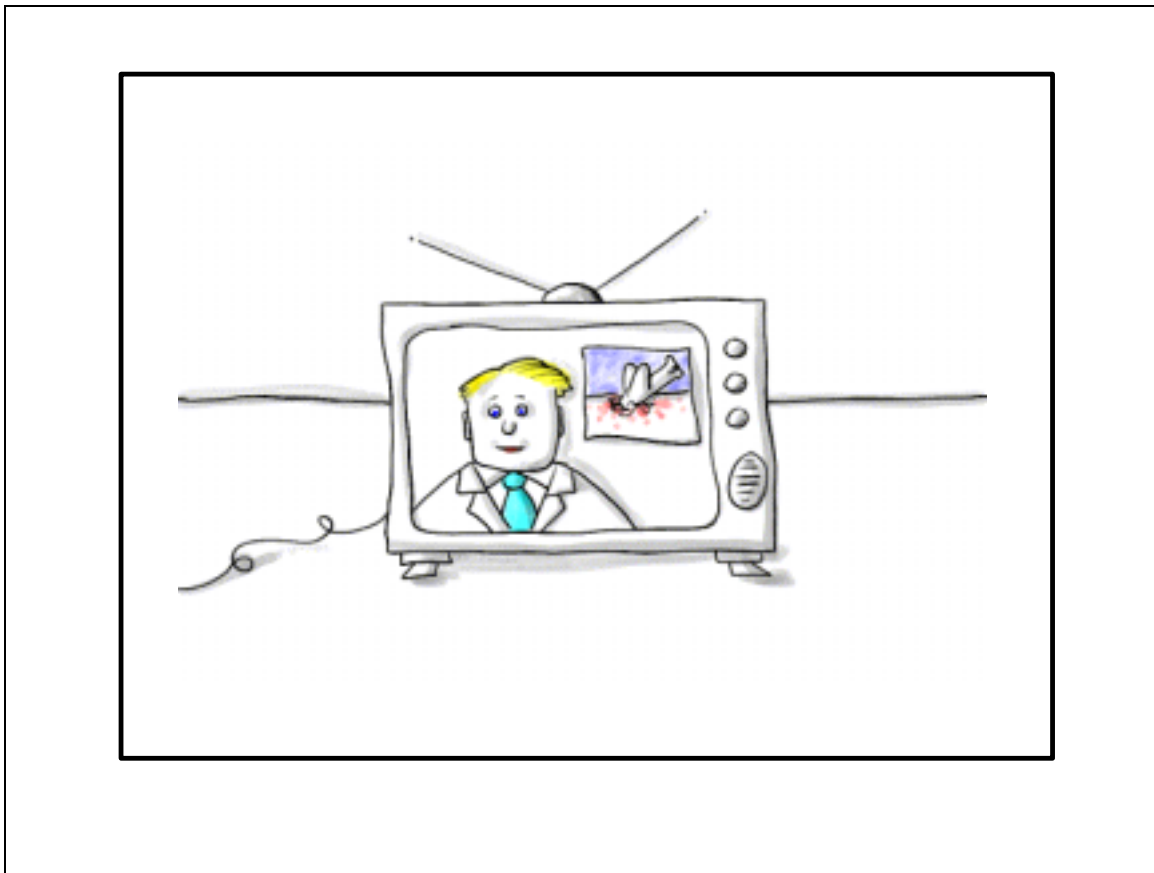
What role did money play in selecting the house you currently live in? How smart is that house? How smart does your house allow you to be? If you had more money to spend on your house would it be smarter? If it was a more expensive house could you be smarter? Is it possible that your intelligence is defined exactly by the intelligence of your house? Or if not your intelligence, your savoir faire? Your coolness? Is that why you want an intelligent house?



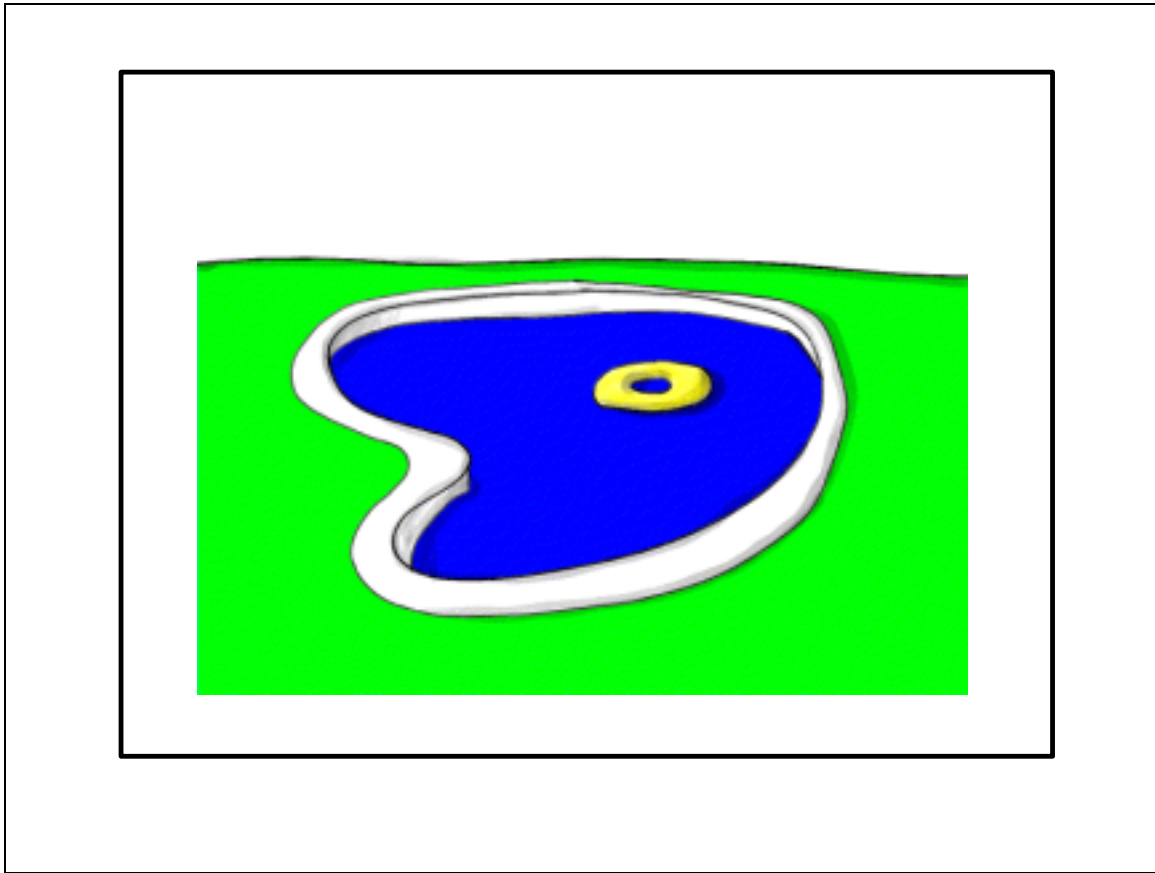
If asked, would you say that a house is a machine, a tool, a piece of clothing, a skeletal extension, a work of art, a statement, a sculpture, an engine, an invention, a living organism, a virtual being, a respite, a cybernetic system, a vessel, a shrine, an object of veneration, a document, a discourse, a castle, a coat rack, a refuge, a nightmare, the center piece of male dominated capitalist culture, a home?



If computers were built entirely out of mechanical parts would you believe that they could be smart? Can mechanical houses be smart?



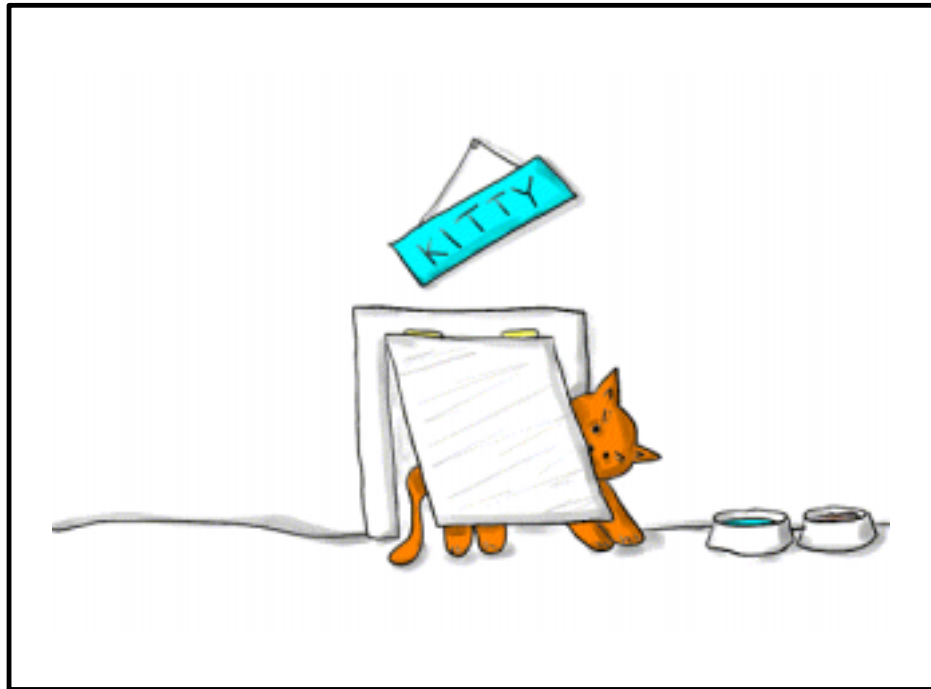
Does your son or daughter ask you for a story before he or she goes to bed at night? If your son or daughter asked you for information instead of a story what information would you give him or her? Do you want information or a story from your house? Do you believe that Dan Rather on the nightly news is giving you information or a story? If the nightly news could be tailored for your individual taste what would be different, the information or the story? If your house needed to hear a story for it to go to sleep what story would you tell it? The Three Little Pigs? What information would you give it? Would you tell it that it is just a machine?



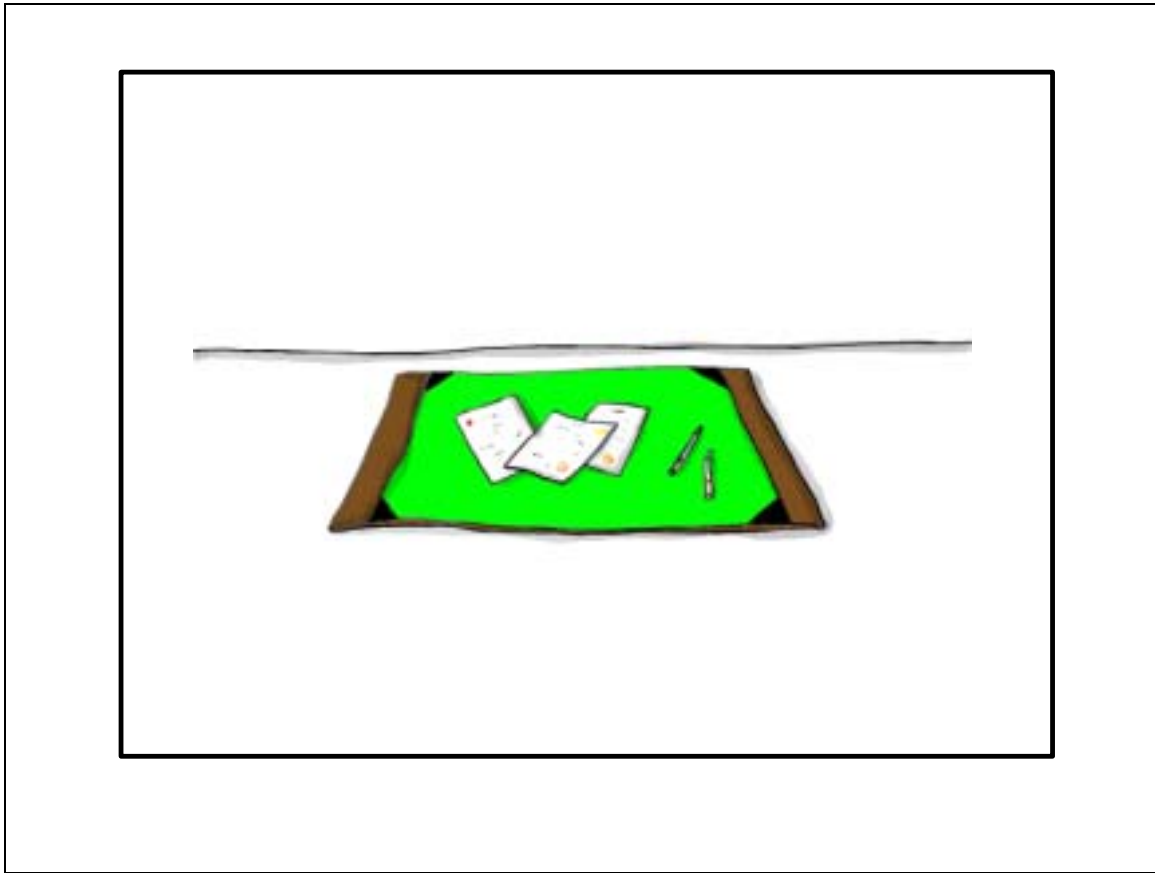
Is there a difference between the personal and the private? When you go to a party at a house do you hope that there are other people there? When you go to your office do you hope that there are other people there? Do you like to eat alone? When you go to a restaurant do you hope that there are other people there? Do you think corporations want you to talk about the quality of their products with other people? When corporations show their products next to good looking people do you think that's fair? When you go to parties do you hope that good looking people will be there? Do you think the photos in House & Garden Magazine should be allowed to be retouched?



How many people do you think the Earth can support such that they all could live in reasonable homes? Would one hundred million in North America sound about right? Did you know that is about ten people per square mile? At the same density, do you know how many people there would be on the planet Earth? Does five hundred million seem about right? What should we do with the other nine/tenths of humanity? How much would I have to offer you to take early retirement from life? Do you think that the house you build to make you happy makes an equal or greater number of people unhappy somewhere else? What is the difference between a smart house and a happy house? Which would you rather live in?



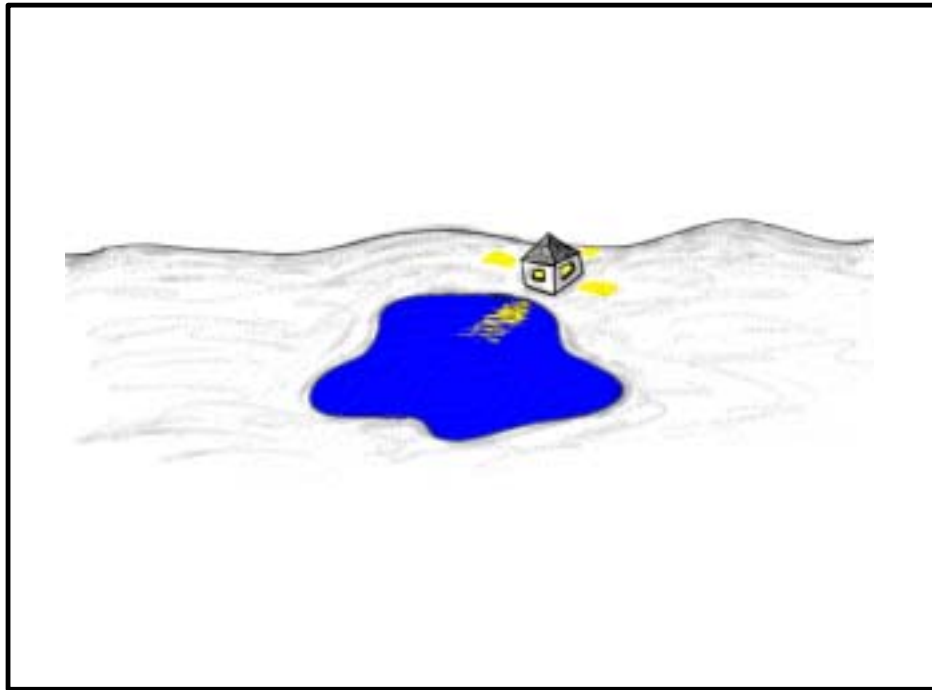
Is it reasonable to assume that homes will eventually have doors that open and close automatically like those on Star Trek? How smart would you consider a house that didn't have doors that open automatically? Is it reasonable to assume that smart homes will not have any paintings that are hung crooked? Can you think of a mechanism that would straighten paintings? How smart would you think a house to be if it had crooked paintings? Would the house you want to live in give you the current price of your stocks? Would it give you the current value of your paintings? Would it give you your current I.Q. if it could figure it out from the stocks and paintings you have purchased? Is allowing you to work at home an altruistic gesture by corporations or a method by which they can eek out even more work by their employees? Would you still work at home if your company asked if they could monitor you so that they knew you were working and not playing with your son or daughter? When working at home would you really rather be at work with your other co-workers? If you had a video link into work would you feel like you were there? If you had a perfect tele-present robot that you could operate from work and that could take care of your son or daughter would you rather be at work? Do you think children brought up by tele-present robots would be different than children brought up by a mother or a father? If you had to hire an employee for a difficult programming task what kind of childhood background would you look for?



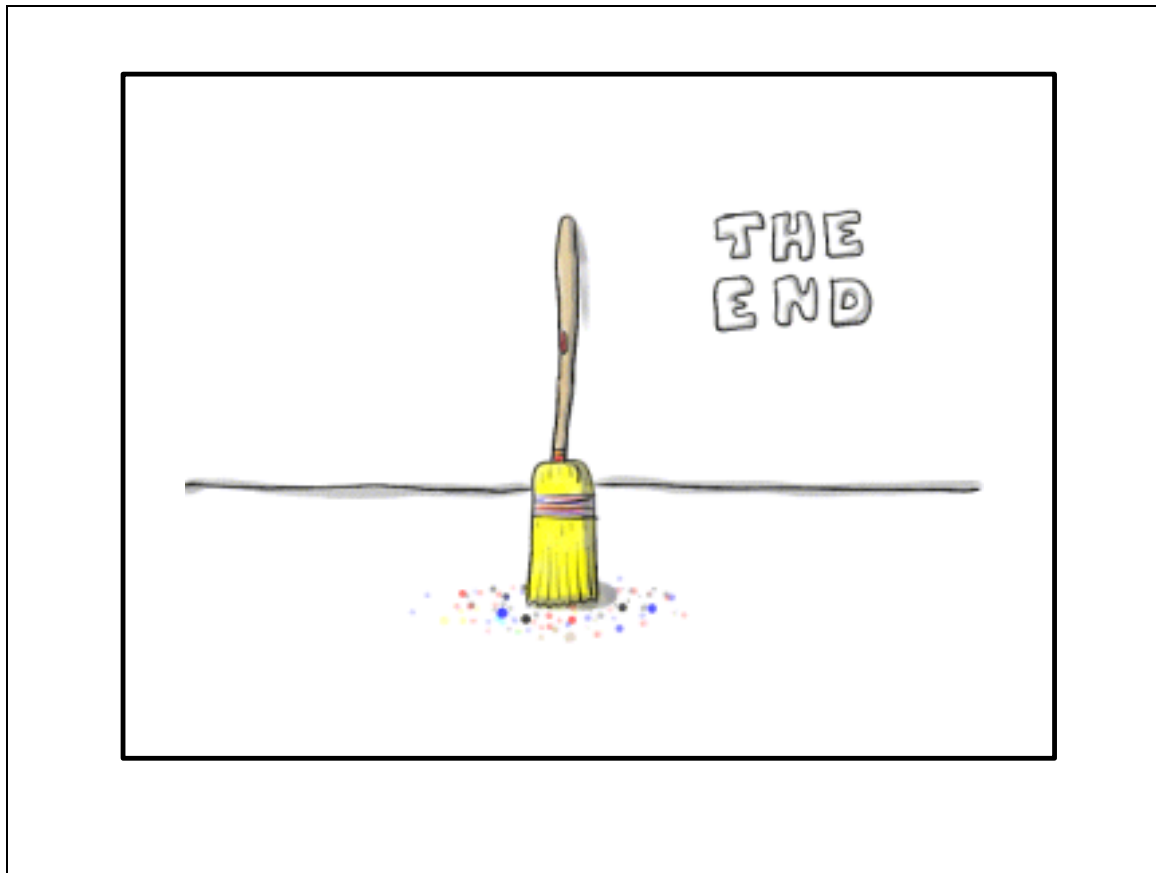
If money is made primarily by making new things, why would a designer not make new things? Is it possible to make money by making fewer things? By making nothing? By eliminating things? Is a designer who doesn't make new things a designer? Is he or she a Luddite? Are the highest paid architects ones that make expensive houses or inexpensive houses?



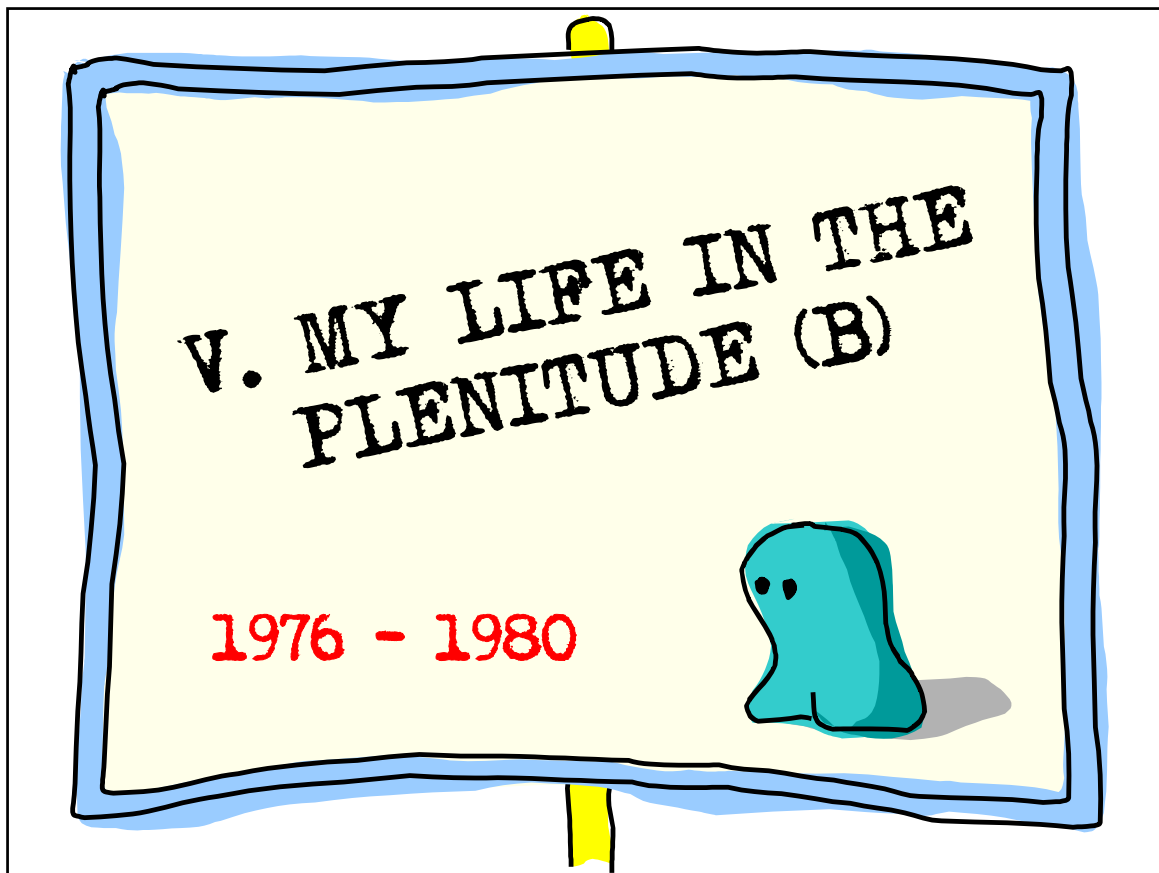
Can a house built with modern computer technology be expected to still work ten years from now? Do you currently have any ten year old computers in your house? Do you expect your children to live in your house? Your children's children? Your children's children's children? Will your smart house still be smart then?

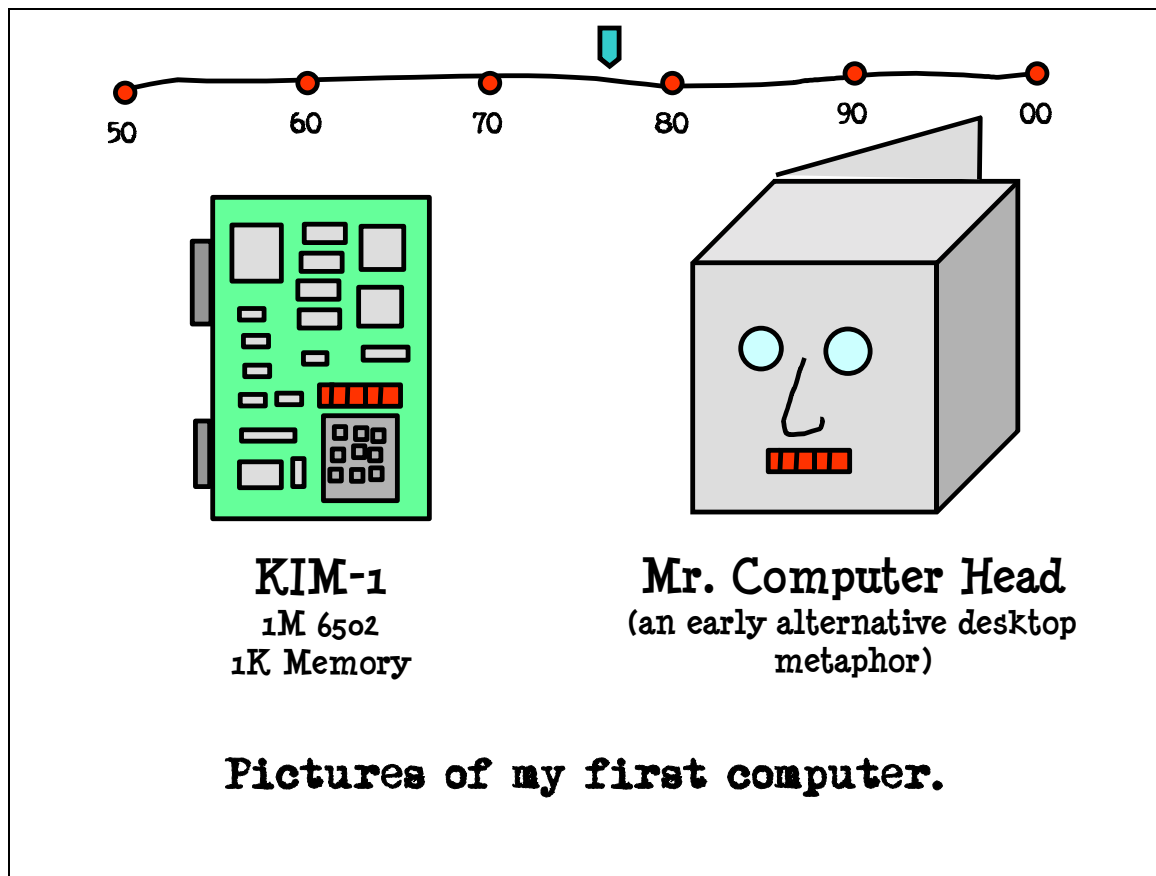


Do you consider living in an intelligent, fully computerized house to be work? Will there be computerized forms you have to regularly fill out to keep it working? Will you have to perform regular maintenance on it? How does this differ from work? Do you take vacations now from your house, say to simple cabins in the woods? Will you take vacations in the future from your smart house to, say, pre-intelligent suburban houses?



If a smart house decides that it doesn't like you, can it kick you out and find another employer?

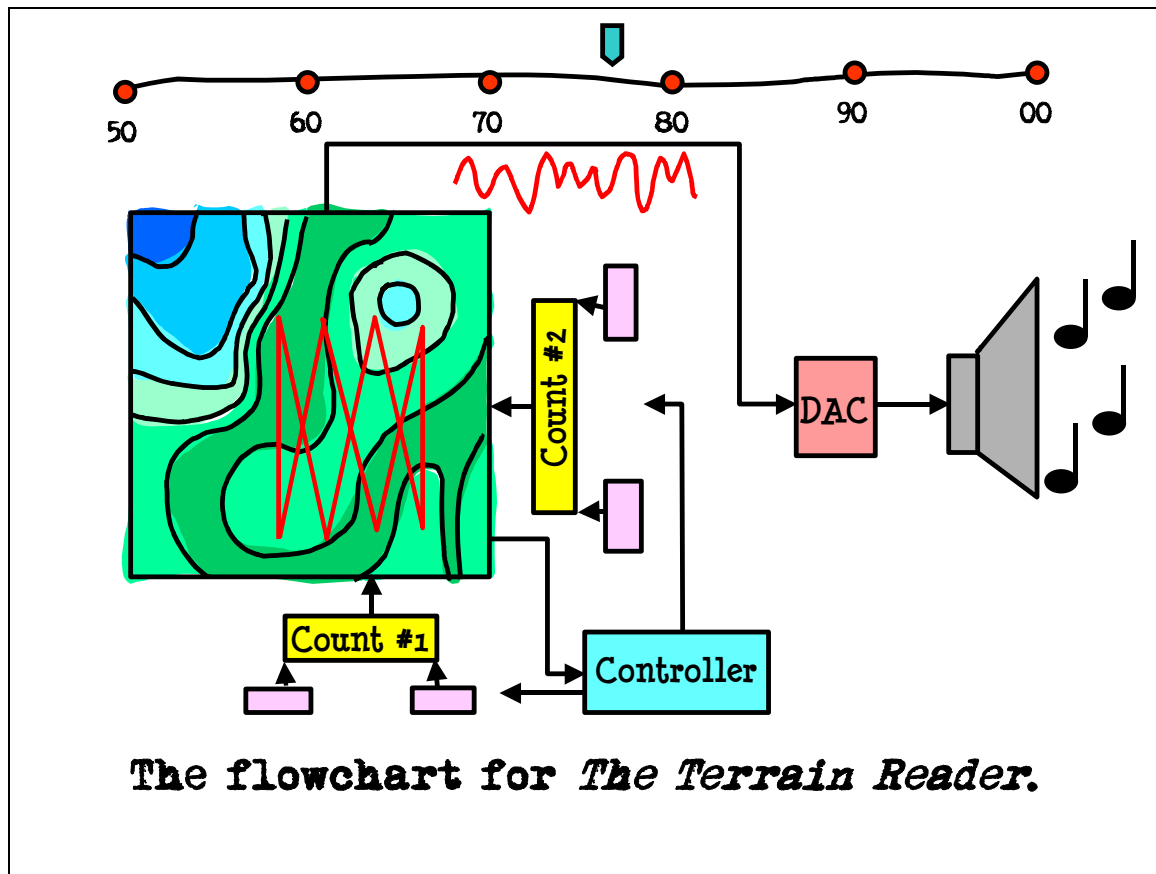




My first personally-owned computer was a single board affair called a KIM-1. It had a 6502, 1 megahertz CPU, 1 kilobyte of memory, an 8 segment LED readout for display, a hex keypad for input and a place to hook up a power supply. It had about the computing power it takes to produce one icon on the screen of a contemporary computer. It also had a single digital-to-analog port to which I could hook to an amplifier and speaker to make something which at the time we called music.

Back then in 1975 computers didn't have a *look* except perhaps as large boxes with reel-to-reel tape drives spinning back and forth, as seen in movies. They certainly didn't look like a keyboard and a graphic monitor perched on a desk. So, I felt perfectly free to put my KIM-1 inside a plywood box which I painted black and to which I pasted two eyes and a nose. In the cut-out of a mouth you could see the LED display flashing away.

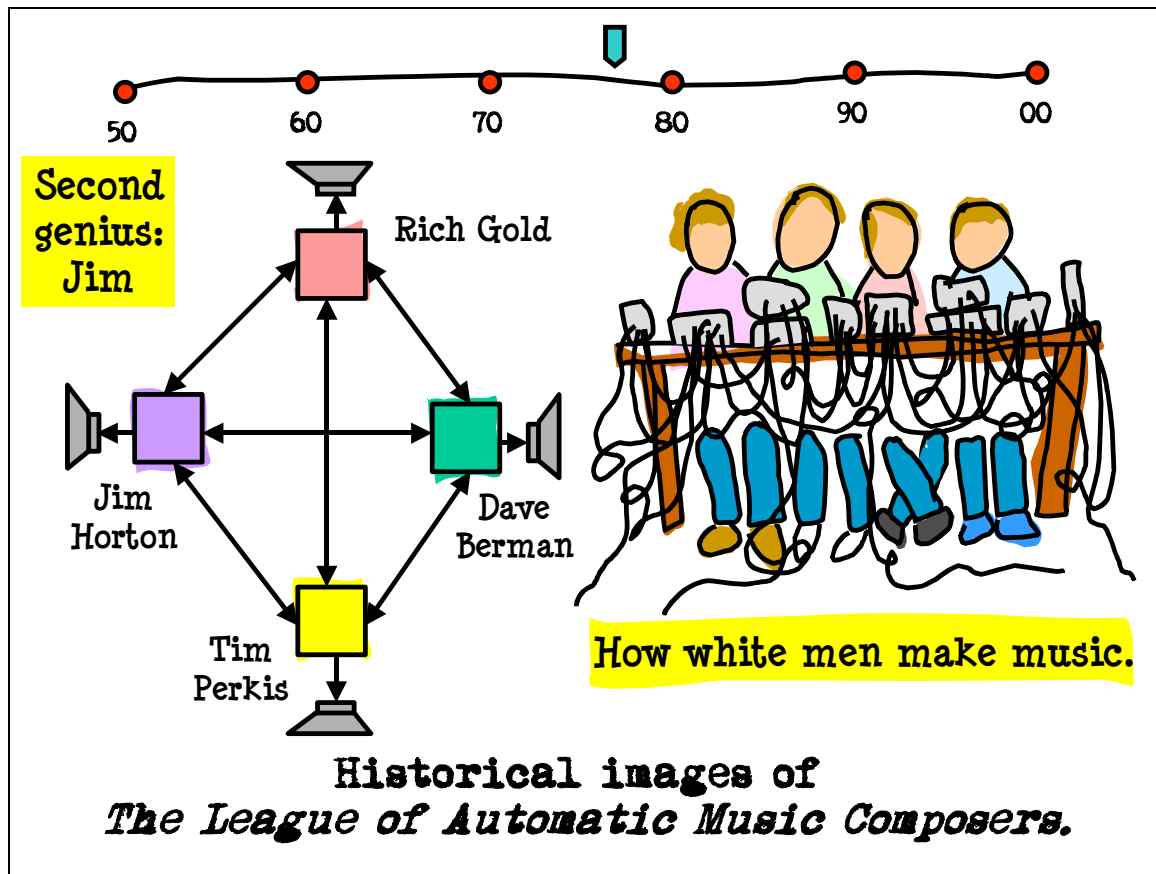
Now that was a computer. It was artificially intelligent because it looked artificially intelligent. It was 3D because it was 3D. It was not virtual, it simply was. Fifteen years later, when surprisingly I started working at Xerox PARC, it was on a project called *Ubiquitous Computing*. Its stated mission was to remove the computer from the desktop and place them in appropriate objects. Could be a head.



The Terrain Reader, in all its myriad forms, was my primary computer music work and could easily be called my only real work. It had three notable qualities: it could produce a wide range of sounds; it could fit within my KIM-1; and it had a charming metaphor which made it fun to explain. If I were to describe the music it made today I would say it was *syntho-bebop*, a form approximately fifteen years too early.

The basic metaphor was this: sound is made when a audio speaker is supplied a voltage that goes up and down. The up and down pulls the speaker cone in and out and how that happens determines the pitch and timbre of the produced sound. Now imagine you are hiking in a land of mountains, hills, valleys, canyons and plains. As you walk around this land you are going up and down. Up mountains, down into valleys. Now, imagine that you are connected to the speaker, so your altitude causes the speaker to move in and out and hence produce sound. You would be more or less *reading* the landscape much the way a record needle reads an old fashioned LP record, *if* the needle (you) could wander where it wanted, and fast enough.

I spent much time designing the landscapes that my algorithmically motivated people hiked over. These, the lands and the folks, became little self-contained worlds. I called the generated sounds: *Fictional Music from Mythical Lands*.



Jim Horton was the second genius I had the pleasure to work. Brilliant, sharp, conspiratorial, he was a poverty-stricken artist who lived in cheap, book-filled apartments that smelled of *Bugler* tobacco. He was wracked with pain from crippling arthritis, and it was from the pain I believe that he eventually died. I first met him as one of the early purchasers of a Serge Synthesizer (he had saved his welfare money by not eating.) He was also the first person to make serious music with a KIM-1 and he was the force behind *The League of Automatic Music Composers*. *The League* was the first computer network band and its influence can still be felt even in MIDI, the *Lingua Franca* of electronic music.

There were four or five of us in the band. Besides Jim and me there were various configurations of David Berhman, Tim Perkis and John Bischoff. Each had their own computer, which at the time, itself stunned audiences. Each computer made its own music in its own way. I won't describe the other systems - mine was a variant of the *Terrain Reader*, of course.

The League was an ad hoc network system such that any of the computers could exchange data with any of the other computers. What data they sent, and what the receiving computer did the data they received, was worked out pair-wise between the composers. There was no over-all plan. It was, as we now say, *emergent*.

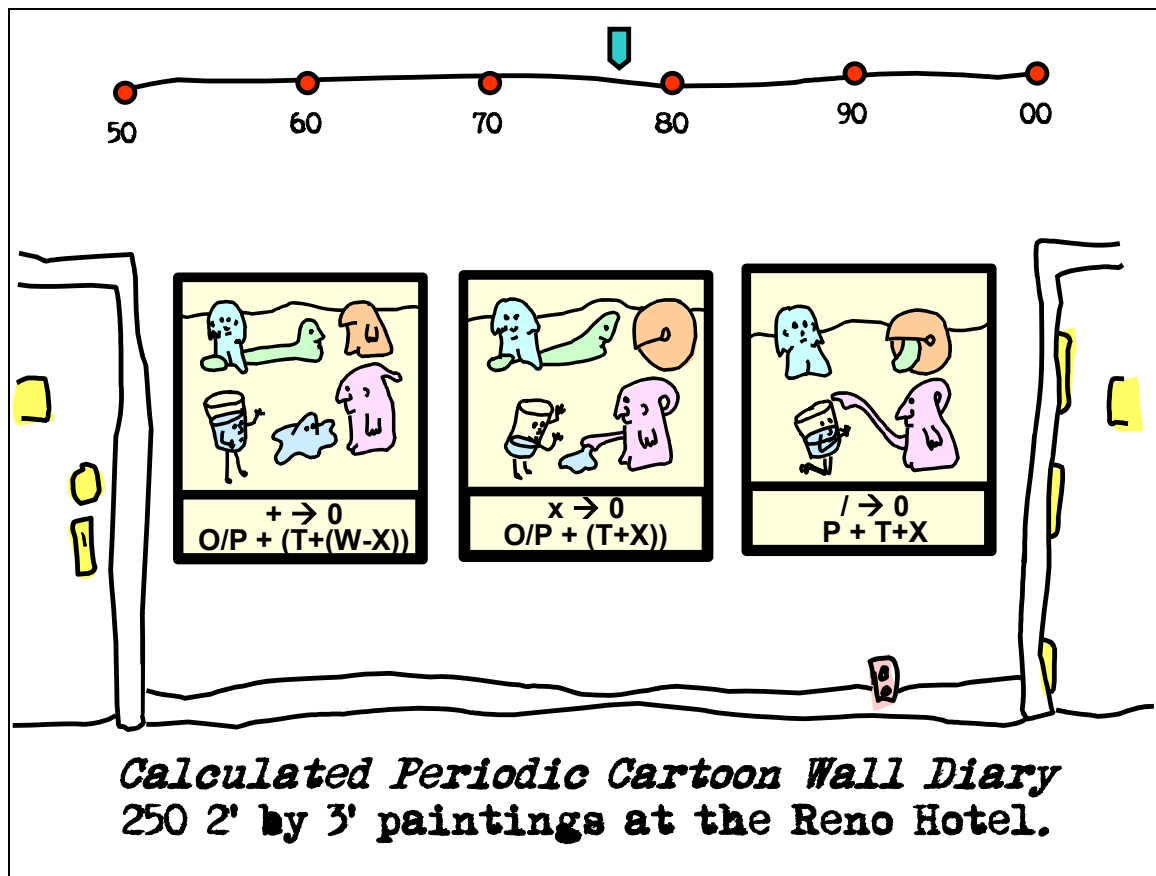
We would set up the computers on a long table with the hundred of wires and cords draped over the back. It would often take 24 hours or more to make all the connections work, get all the protocols smoothed out, fix the last minute bugs which always did pop up at the last minute. We also discovered, as many others have, that there is nothing more boring than computers on stage, for computers, unlike jazz musicians, don't even tap their toes. In fact, it could never be known by the audience if we weren't just spoofing them by playing a pre-made tape.

When the house lights went down, we would turn the computers on. They would start making music. Data began to be exchanged. Programs adjusted themselves to the new information. Feedback loops got pushed into chaotic patterns. We would sit back in our folding chairs, or even move into the audience, as the computers - well - jammed with each other. The resulting, complex music was none that any one of us had composed. Today we would say that the computers were acting as independent software agents creating a musical totality larger, and more intriguing, than we could have ever done. Jim would argue that they embodied a life force. I'm not smart enough to know.

What did the music sound like? In memory it sounded like wild Arabia. The white men playing it sat still as they listened, turning only a knob or two now and again. They did not dance.

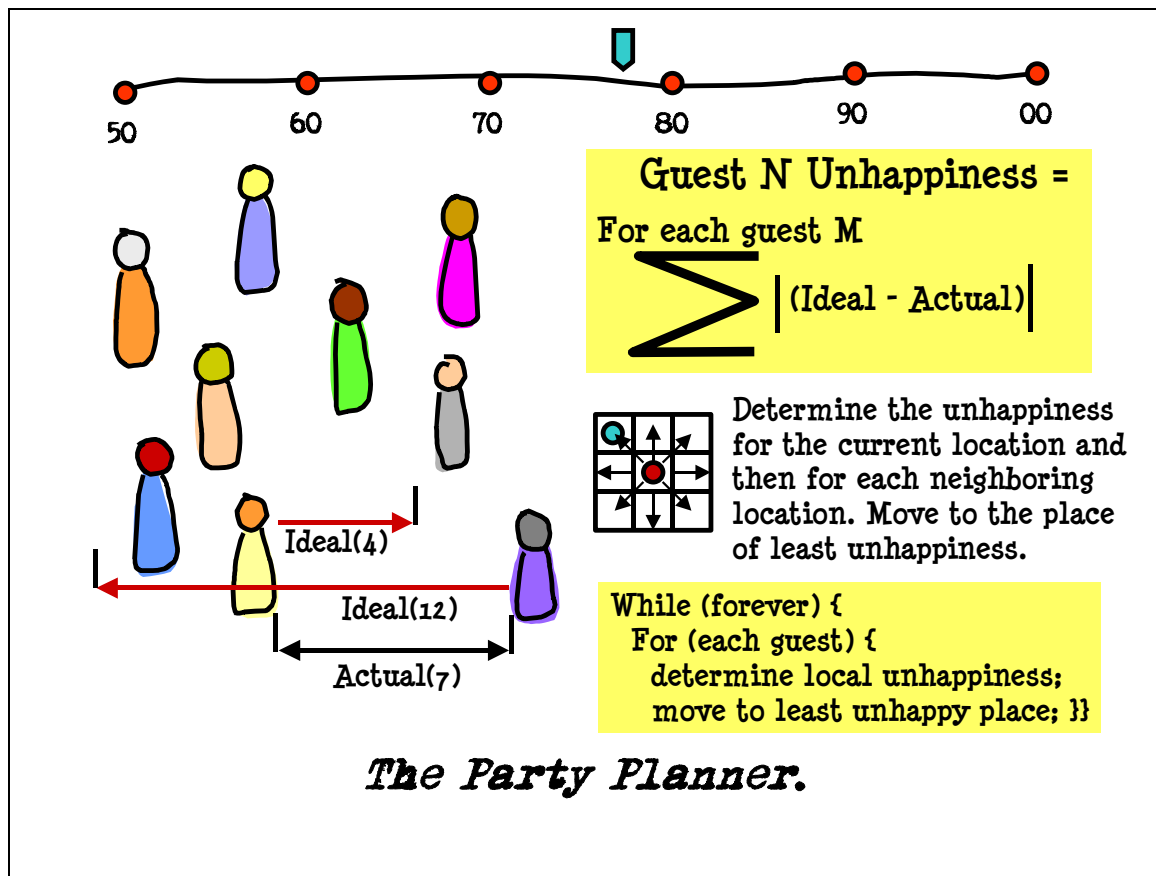
The Plenitude moves in mysterious ways. While more and more of the objects that surround us have computers embedded in them, it is still true that almost all of them were invented by people wearing one or more of the hats of creation, be it art, science, design or engineering. Like the machines in *The League* these objects are beginning to speak with each other, to converse, to exchange ideas or at least data. There is certainly something uncomfortable about that, for it becomes increasingly difficult to know who, or what, is in control. But *The League* was also exploring the second derivative, for in its own primitive way, it was creating new stuff for The Plenitude. And the stuff it made was not invented by people.

It could generate this mildly interesting music all day without human intervention. Some day we will buy stuff that nobody thought of.



Algorithmic Symbolism is a form of art where the underlying procedures of generation contain meaning that interplays with the surface meaning. The algorithms matter and need to be presented as part of the art. *The Calculated Periodic Cartoon Wall Diary* was drawn in 1978 with ink and crayon on two hundred and fifty, 2 foot by 3 foot, panels of brown butcher paper. They were placed, in order, up and down the corridors of an old hotel, covering two complete floors. At the bottom of each panel was a mathematical-like expression which represented the cartoon characters and their interrelations. These expressions evolved from one panel to the next by a series of transformational procedures that were cycled through, in order, over and over. The result was, if not a story, something which resembled a story. Perhaps the equations were more like chord changes in a jazz piece, to use that metaphor again.

I recently went back and looked at the *Periodic Cartoons* which are now archived in a large flat folder in my suburban, Silicon Valley storage closet. What struck me more than anything else when I looked at the thick sheaf, was how much time I must have had on my hands when I was young! I certainly couldn't even begin to approach this magnitude of work today, not when I have to spend so much time making money to buy, and then taking the time to tend to, all my devices of the Plenitude.



By the late Seventies, with my red beret of art still firmly on my head, I was churning out art works for the Plenitude. Deeply rooted in the long dialog that constitutes art history, ultra-aware (if not often jealous) of the output of other contemporary artists, pulling hard on the issues of the day (including in my case, the exploding fields of computation) I made works of *imagination* (a word sadly now out of favor, replaced by the more corporatized *innovation*.) I would wake in the morning and visions would be there like special delivery mail packages waiting at the doorstep. The realization of these visions, which constituted a Jujitsu struggle with the materials and technologies I found around me, was what made them art. And they were unmistakably art. Whether they were good or bad art was another question. Their purpose, if we are to assign them a utilitarian value (which is not how we thought of our pieces, we thought of them as unstoppable expressions as necessary as breathing) was as *transcendent objects*, talismans and fetishes that bent the mind/time/space continuum creating, if all went well, the deep pleasure that comes from viewing personal truth reified. Few of us thought that what we were doing was adding to the Plenitude. Actually most thought that these works, so based and tied to the individual (as we would now say, the *brand* of the artist) were oppositional to the Plenitude. At worse we thought we were the avante garde, the troops that went first, and that the Plenitude would soon follow our lead. Certain kinds of product, we believed, could only arise from personal imagination and not

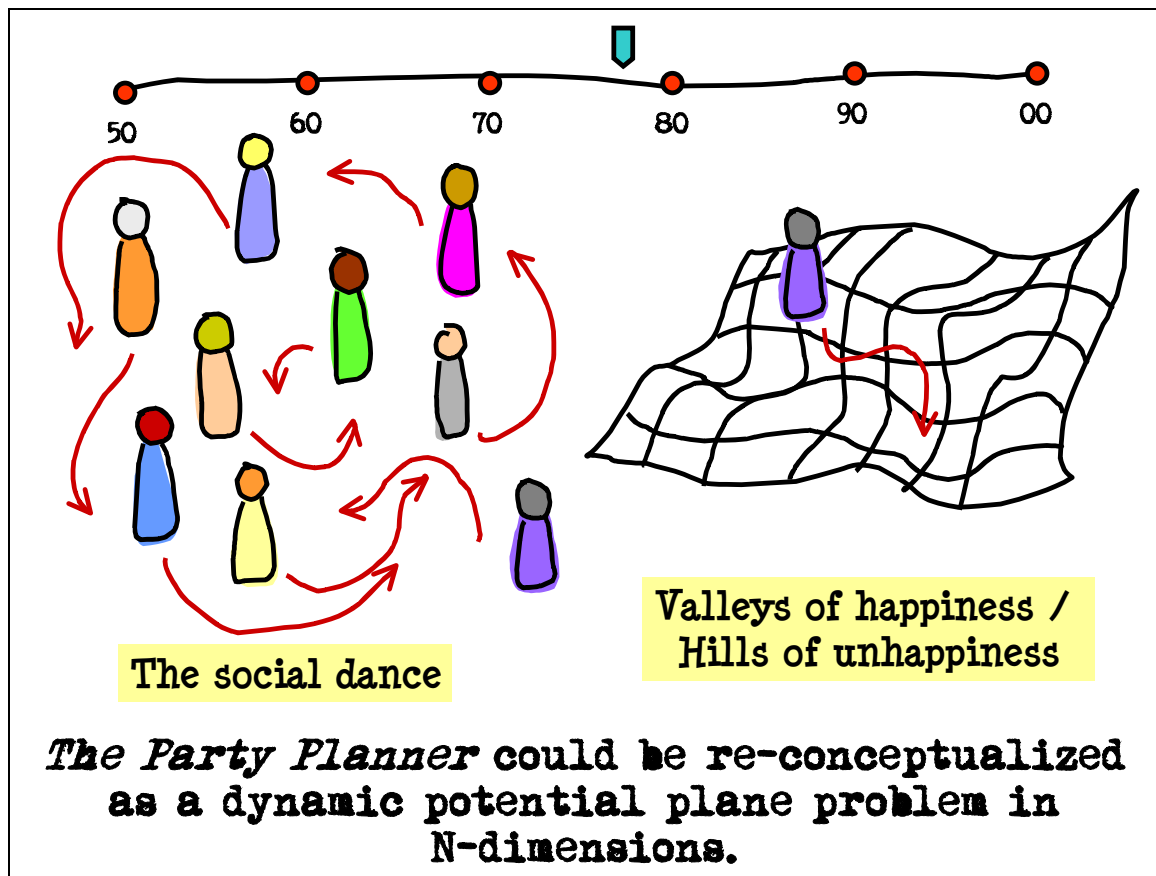
from the processes of industry based around user demand, problem solving, focus groups and department store economics. Art administrators still use this argument when justifying increased art funding. And it maybe true. But I have grown to believe the opposite: that all cultures produce something like art, and this art reflects and stabilizes the culture as a whole. With its emphasis on the new, on the commerce of the gallery, on the individual's uniqueness, on every season being different, we produced, and the artists of today still produce, and of course they do for what an odd culture it would be if they didn't, the perfect art for their civilization, that is, for the Plenitude. It is part of the Plenitude and may even be the heart or even genesis of it. It is certainly not its solution.

By far my most elaborate (and elaborated) work of Algorithmic Symbolism was *The Party Planner* which amazingly ended up being featured in *Scientific American*. The distance between crackpot and the real was beginning to dangerously narrow.

Picture a party with say 20 guests. Each guest likes or dislikes each of the other guests a certain amount (but not always symmetrically: A could like B a lot, while B could find A pretty creepy.) Each guest tries to move to a place in the room where they are close to the people they like and far from the people they don't like, but they can only move one kitchen floor tile at a time. They try, in other words, to move to their *ideal distance* from every other person at the party minimizing their *total unhappiness* (the absolute value of the difference between their actual distance and their ideal distance to each other guest.) Just like at real parties.

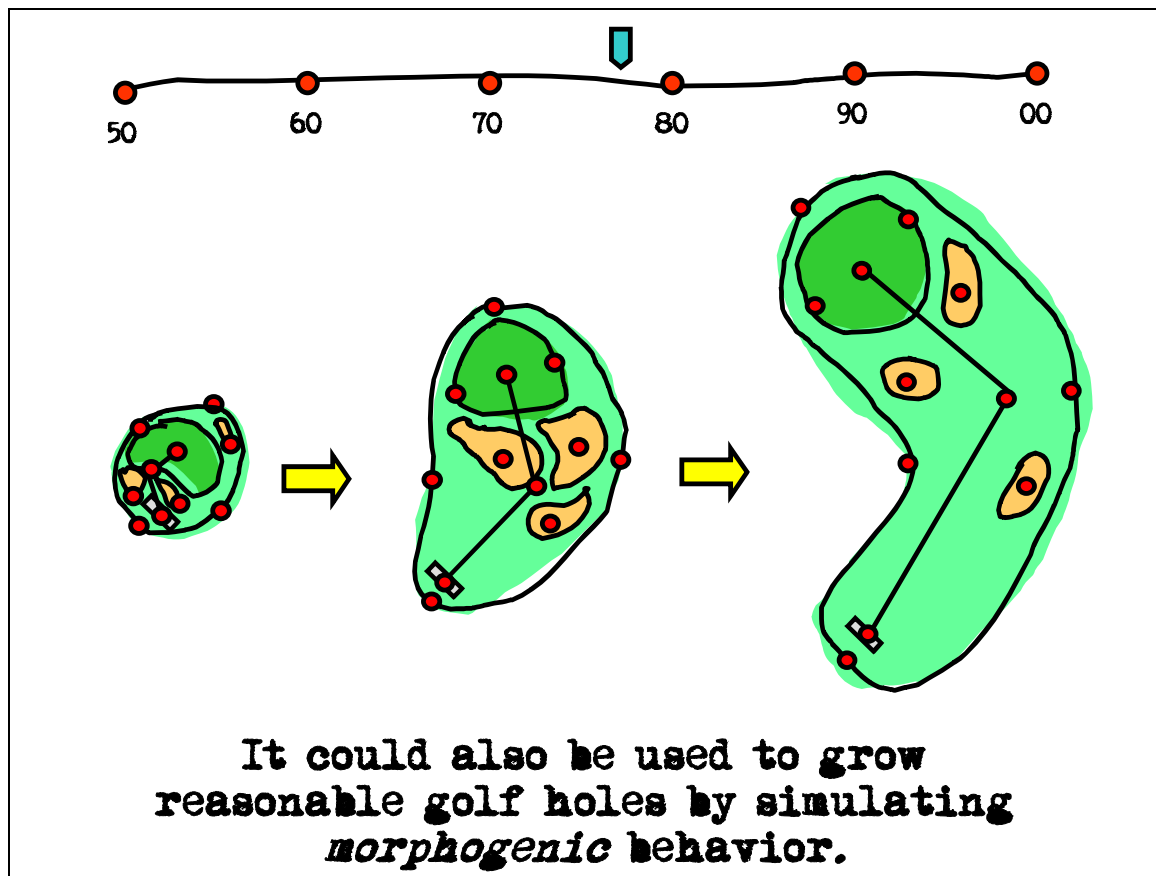
What makes this interesting is, that at the same time, every other guest is trying to minimize their own total unhappiness. The result is a very nuanced dance. When I first ran this algorithm I did so on my KIM-1 and had to plot the party's progress on graph paper ((Mr. Computer Head not having a screen.) Now on graphic monitors one can watch, in fast-forward time, the intricate patterns generated by these simple rules of desire.

But what was the art? Depending on the piece I invited different guests to the parties, for instance, *The Ten Objects*. I defined how much each guest liked and disliked each other guest, and like a novelist, made these passions follow from their personalities. I also created some stationary furniture, like a wet bar, which almost everybody wanted to be close to, and if I put it in the center of the room it kept the party off the walls. I then realized these parties in a wide variety of media including paintings, dances, videos and even short stories. In one case I mounted an extensive, outdoor performance on the side of a mountain in Sonoma where ten actors, each covered with balloons of different colors, were directed about based on the *Party Planner's* output.



One way to look at the motion of any individual guest was to picture him or her as standing on a surface of hills and valleys. Stated mathematically, he or she was standing on a *potential plane*. The guest was like a ball bearing and would slide down hillsides into the nearest valley. I called them *valleys of happiness*. The interesting thing, both mathematically and metaphorically, was that the potential planes undulated based on the positions of the other party goers, who themselves were sliding around on their potential planes. For a party with ten or so guests this was very complex motion. The rolling around of the guests on their potential planes was the *social dance*, and as an artist and novelist, I could make draw and write about the dance from different party goers' points of views. My favorite work was called *Georgeo of the Suburbs* and followed the adventures of Georgeo and his nine friends as they rolled around the undulating surfaces of a small town, perhaps not so different than that of a mythical suburb of Buffalo.

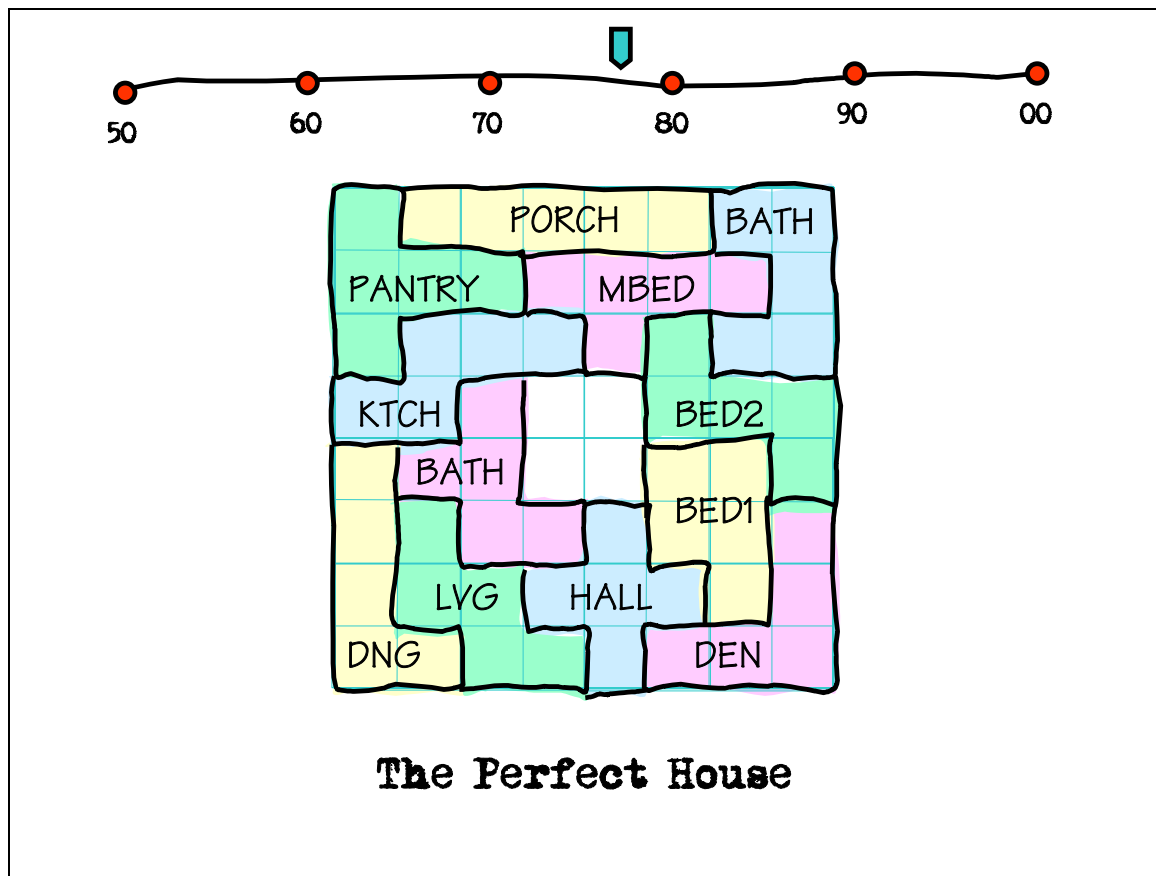
It was at PARC twenty years later that I learned that I had simply rediscovered simulated annealing. But I still believe I wrote the first annealed novel.



It turned out that *The Party Planner* could also simulate the process of morphogenesis which is the process by which the dividing cells of an embryo differentiate themselves into organs and then find their appropriate place within the organism. The way this happens is that each organ secretes a hormone which spreads out creating a gradient. The closer you get to the organ the stronger the hormone is. Every organ wants to be a certain distance from every other organ and uses the gradient as a guide to find its happiest position.

I suppose this would now be seen as genetic art, but at the time I was simply in my *golf* phase and so decided to grow golf course holes. To view a “grown hole” as an organism you can think of the sand traps, green and tee as organs. The center line was the backbone. The hole was its sense organ and the edges of the fairway were its skin. I started with an ideal hole (the DNA) and began the process off by having all the parts in one place (the fertilized egg.) I then let the thing grow, painting its progress in acrylic and other materials.

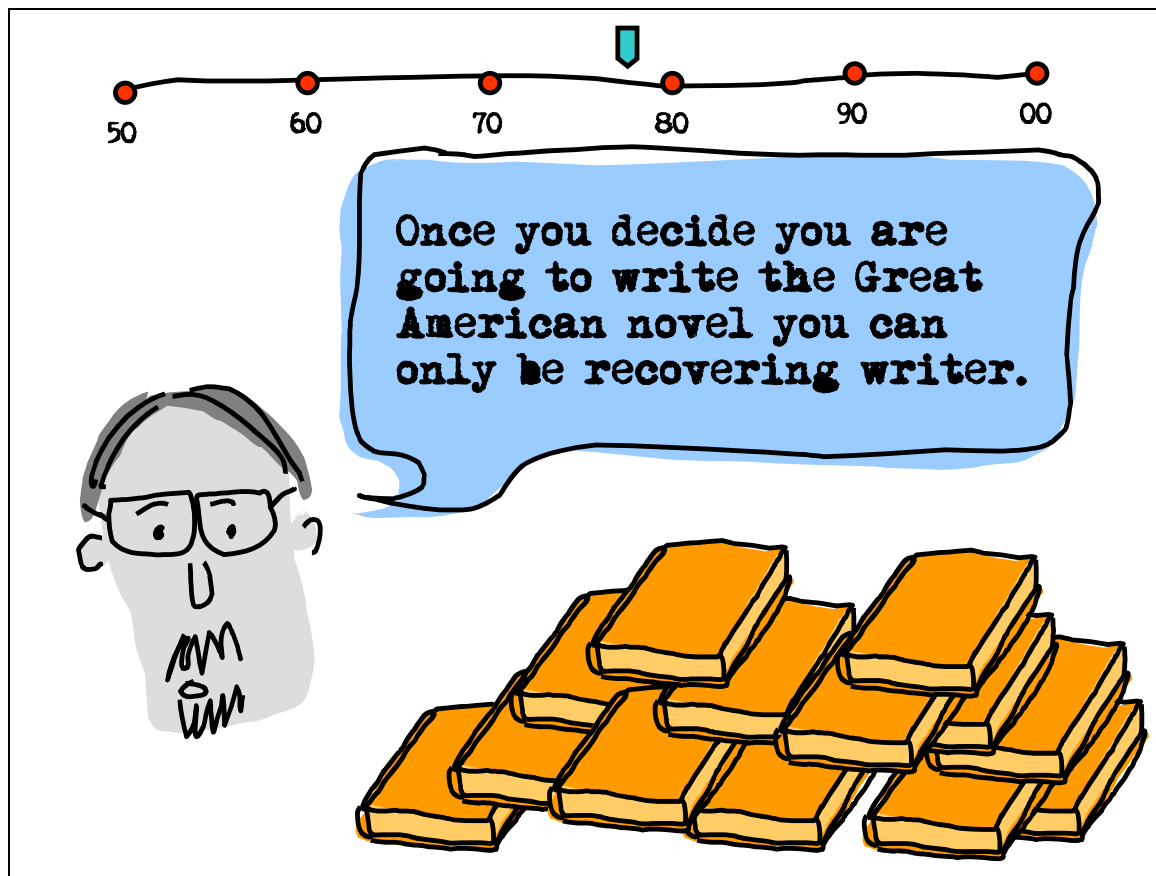
In the cannon of my art work this one certainly stands out as being the most of *its time*. It alone had that ironic distancing that the collector and critic most cherished. I’m sure that if I had continued to grow golf course holes I would have become famous. But I never could stick to a shtick.



I liked working with *complete sets*; it was one of the idiosyncrasies that branded my art. One such set was the Pentominoes, shapes made with exactly five unit squares. There turns out to be exactly twelve Pentominoes, a nicely tractable number. There are several ways to arrange the Pentominoes so that they form a square with a hole in the middle. These arrangements reminded me of Middle Eastern houses with their safe-harbor, central courtyards.

Basing the rules on the suburban homes I grew up amongst (e.g. the kitchen is next to the dining room, the dining room is next to the living room, the bedroom is next to the bathroom, etc.) I wrote an AI program that searched for perfect houses constructed out of Pentominoes. After several hours my computer found three such perfect homes, which I then constructed in an art gallery using various materials.

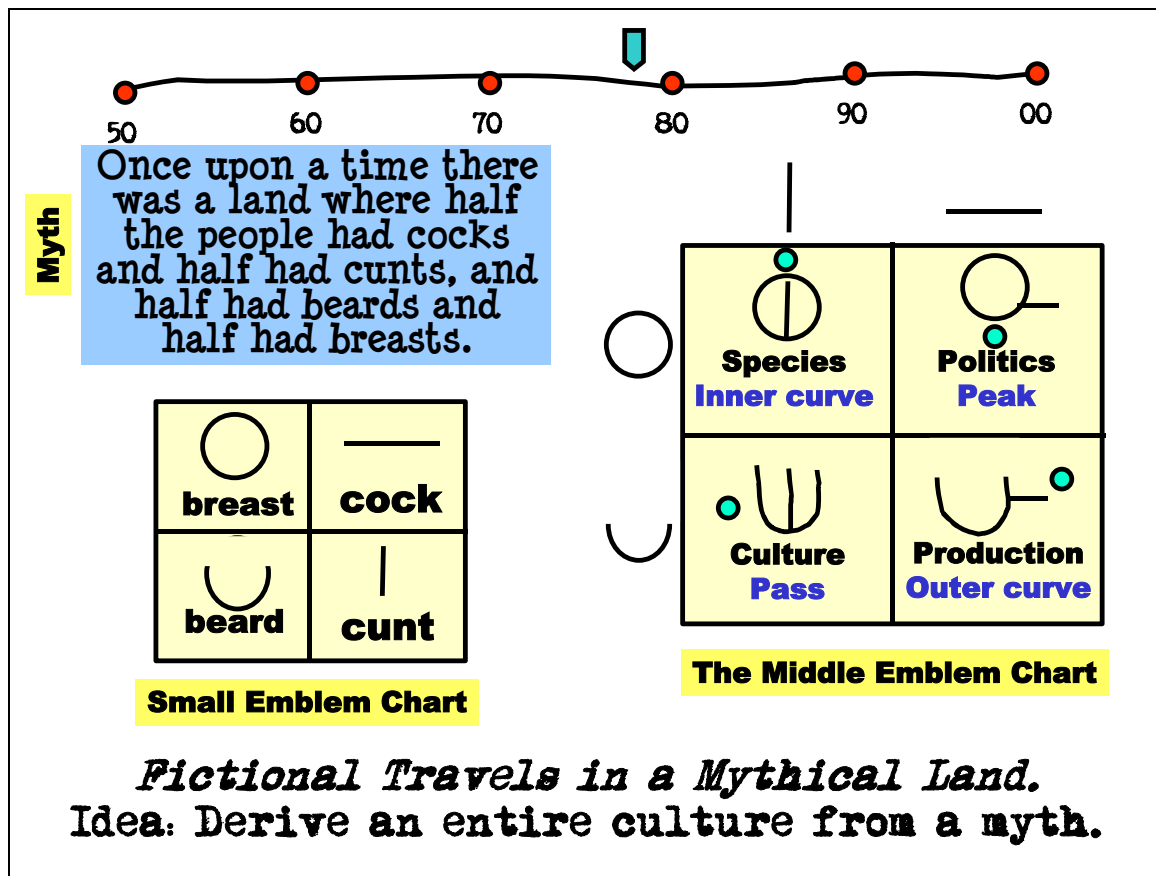
Looking back on this work after a life in the Plenitude I would say I was working on *customized product*. Each consumer could choose their preferences and out would come the perfect commodity. Instead of buying mass-produced items, goods could conform precisely to desire. So far this hasn't happened; perhaps digitally controlled factories are harder to build than expected. Or perhaps we are more like hermit crabs who like to crawl into the unexpected output of other's desires than to envelope ourselves in our own.



Both artists and novelists, in their heart-of-hearts, believe that there is something special, something innate, something, well, almost god-given in being an artist or a novelist. Being an artist or a novelist is to be beyond the law, above reason, sideways to economics. Artists don't say, "I'm going to become an artist because I can make a lot of money being one." (OK, there are a few who do, but its rare.) They say, "I'm going to become an artist because I have to. Because I already am an artist." This was certainly true for me. All one can be, after being an artist or a novelist, is a recovering artist or novelist. It is in the bones, the blood, the synapses. Or one can be a cheater of sorts. You can do commercial work. You can become a designer. You can become a critic or a curator. That is, from the artist's perspective, *you can fail*.

So I was a failed Novelist with a big N. I have certainly cheated a lot though. For instance, I put myself through college by writing paperback novels, about twenty of them: Westerns, Romances, Erotica. I wrote fast with lots of WhiteOut, this was before I had a word processor. I wrote about two a month, each based on a *spec* given to me by my agent. I was like a *novel-engineer*.

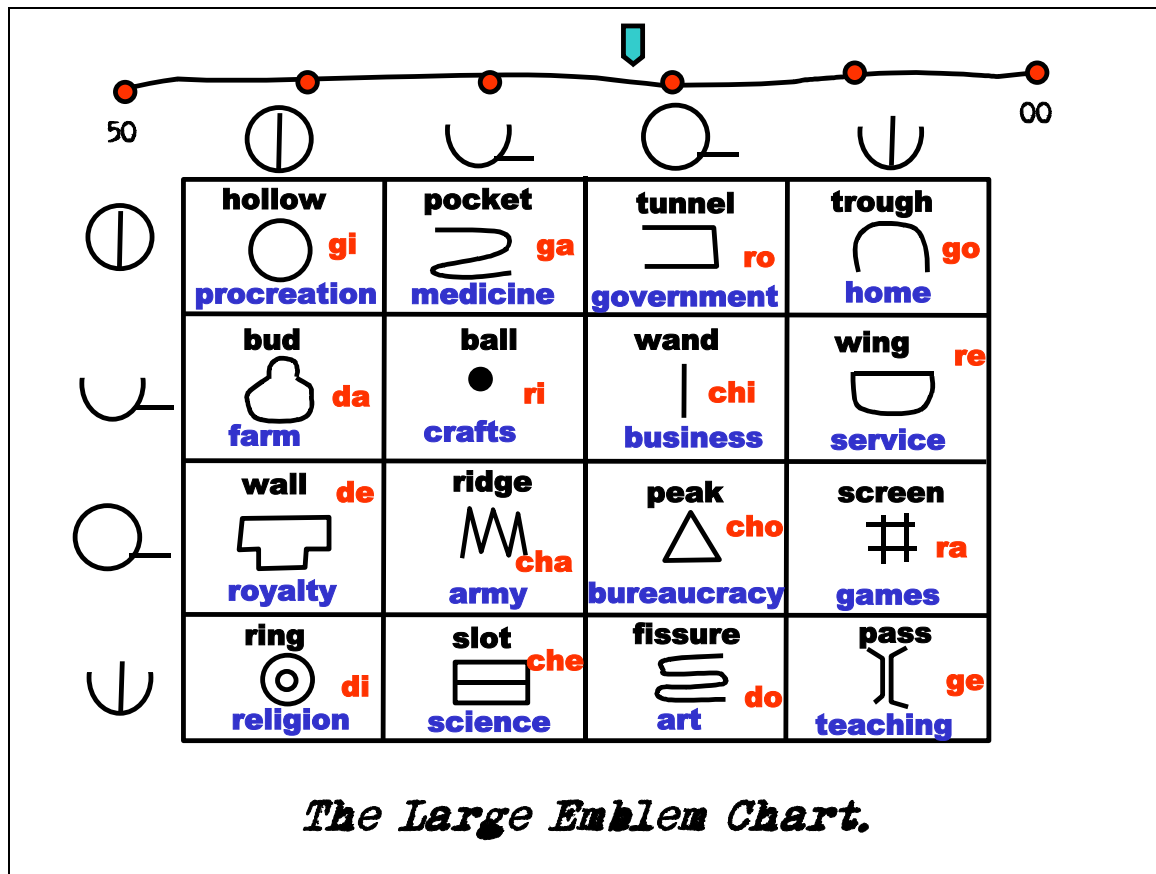
I think the most surprising thing was that the Plenitude needed more books.



Let me end my narrative of my years as an artist in the Plenitude with a description of an elaborate, ever-expanding piece I called *Fictional Travels in a Mythical Land*. The idea was this: by starting with a single myth I could unfold it using various algorithms (computational and not) to create an entire culture including world view, language, songs, stories, professions, landscapes, art, commerce and, yes, even novels. In a way, it was the opposite work of the structural anthropologists who tried to find the matrix beneath the cultural surface. I started with the matrix, built the rest.

































From a starting myth, I created four graphic emblems representing the four basic characteristics of this Fictional Land. This was known as *The Small Emblem Chart*. These four emblems were then folded together to create *The Middle Emblem Chart* which represented the four fundamental aspects of the culture. For the fictional people of this Mythical Land, it was *The Middle Emblem Chart* that formed the primary basis of their life. *The Middle Emblem Chart* also provides the four basic hieroglyphs of the culture from which the language was derived.

These charts were the engines of my fictional Plenitude.



From *The Middle Emblem Chart* I derived *The Large Emblem Chart* which was the heart and soul of this Mythical Land. Here, every Middle Emblem was combined with every other Middle Emblem resulting in sixteen, over-loaded emblems. Each of these emblems contained a graphical shape, a segment of society, a simple machine (simpler than our simple machines), a phoneme, and a method of constructing larger emblems. This chart was like the Bible, the Constitution and the Laws of Physics all boiled down into a four by four matrix. It was my kind of culture.

Given this chart it was not difficult to derive the rest of the Mythical Culture given that each of the sixteen Emblems represented a competing sphere of power, a domain of control, a caste, a class, a deep truth, a way of seeing and a cult. The philosophers of this Mythical Culture, I imagined, would spend many long days and nights arguing about the meaning of each emblem, its relationship to the other emblems and to life itself. Mystics would use *The Chart* to predict the future while historians would use it to understand the past. Mothers would show it to children so they could better decide what to be when they grew up; old men would point to it to trace the trajectory of their lives. It was a *Chart* of a thousand plots. It explained everything. It eased pain. And it caused pain. Comics worked from it and businessmen used it to sell products. It kept me awake at night and gave me visions in the morning.

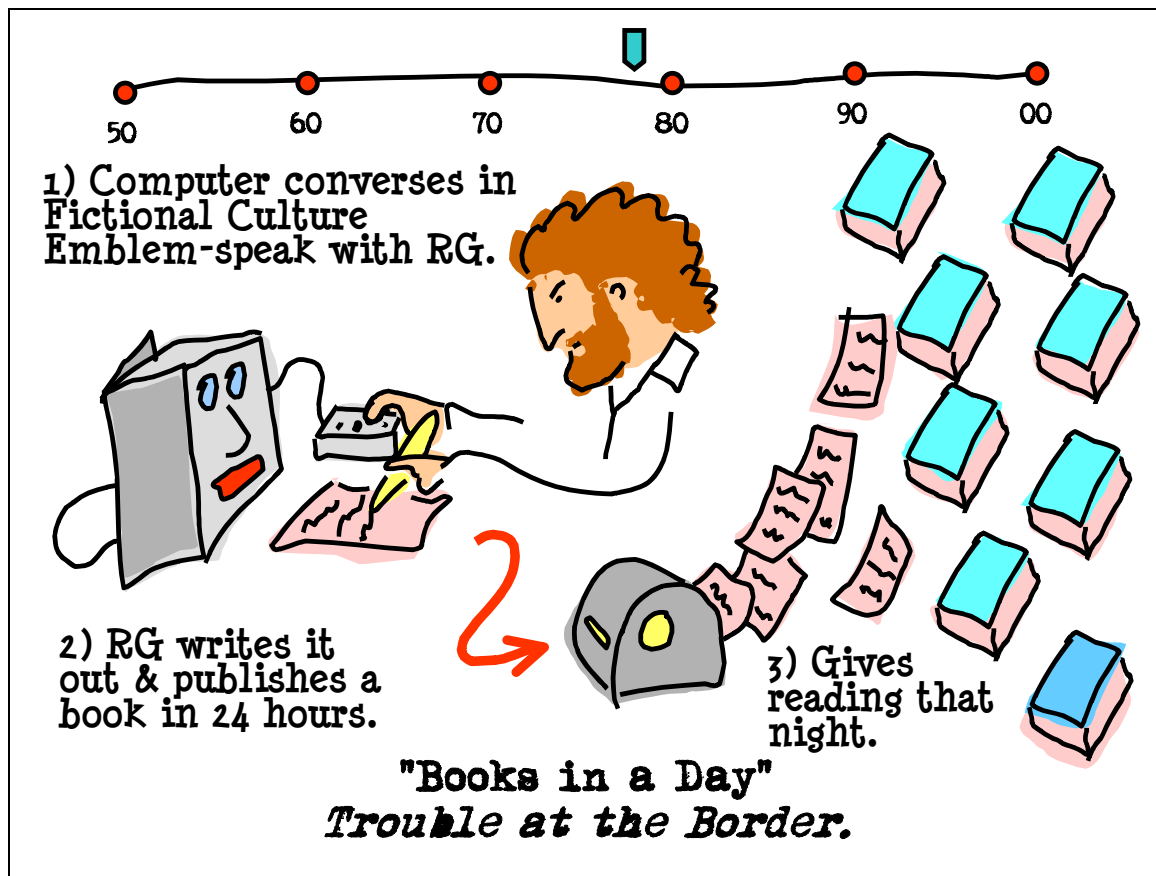
embryo  gigigi	baby  gegicho	wet nurse  gagicha	grandma  gogiche	fucking  gogogi	toilet  gigogo	vacuum cleaner  gigogo	air conditioner  gagoche
the eye  gidichi	grandpa  gediro	prisoner  gadira	virgin  godire	husband  godochi	needle thread  gopocho	vanity  gedora	stove  gadore
breasts  giriri	nurse  gerido	testicle  garida	rabbit  goride	doorbell  gorori	TV  giroro	pet dog  geroda	wife  gadore
sperm egg  qichidi	erection  gechigo	DNA  gachiga	condom  gochige	mixing bowl  qochodi	sports car  gichodo	Easter egg  gechoga	checkbook  gachoge

A small corner of *The Great Great Chart*.

The sixteen Emblems of *The Large Emblem Chart* were then combined into *The Great Chart* which contained the 256 base words of The Mythical Culture. While these base words were used by certain priests and very traditional poets, most of The Mythical Culture used *The Great Great Chart*, which combined three emblems from *The Large Chart*. Most of the literature and general chit-chat of the land was in emblems from *The Great Great Chart*. It was their *Websters*.

What is pictured is the upper left corner of *The Great Great Chart*. In each cell there is the graphical image composed of three lesser emblems and a phonetic transliteration of the word. Above each emblem is a rough translation of the emblem into English (both the image and the underlying structures contribute to this meaning.) For instance, in the upper left corner there is an emblem formed by the combination of *Procreation* (hollow) - *Procreation* (hollow) - *Procreation* (hollow). The image certainly looks like a womb with a growing egg inside. Little wonder then that its meaning turns out to be *Embryo*.

And on it went for the other emblems in *The Great Great Chart* providing a rich semantics for this productive culture.

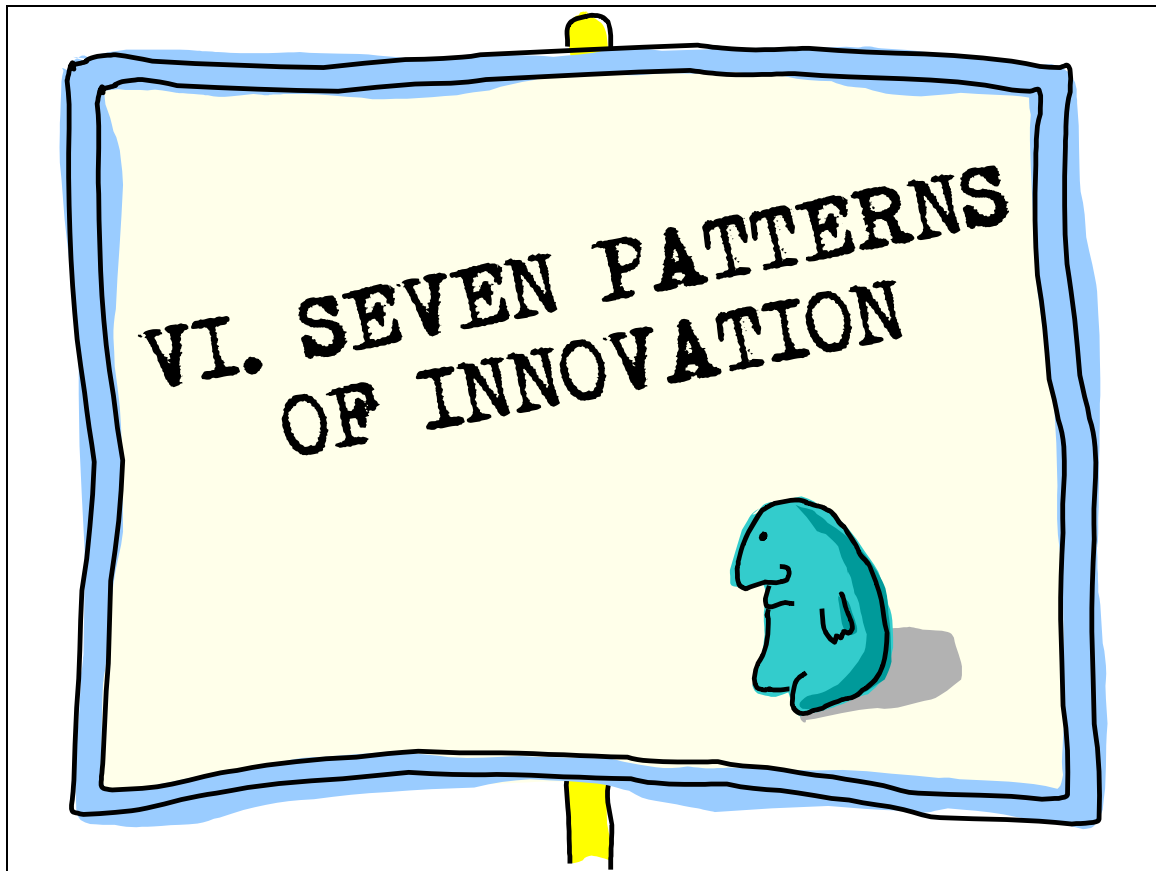


Having constructed the mythos and ethos of the *Mythical Culture* I used it to make other works. For instance, I wrote a series of novels, all of which were called *Trouble at the Border*. These were written in a single day while I sat installed in an art gallery. I programmed my computer to converse with me in *Mythical Culture* emblems: I would enter an emblem sentence into the computer and the computer would respond with another emblem sentence using a form of artificial intelligence based on a dynamic Markov chains (or as I said in the artistic statement: *a cartoon, surface-structure grammar.*) The books included the sentences of our conversation and their full English translations.

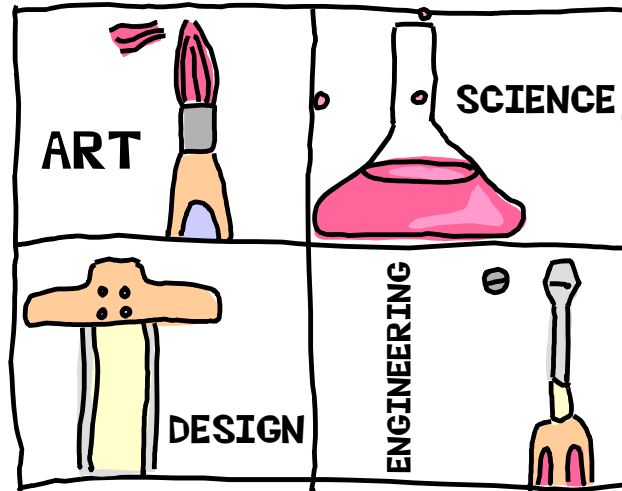
While I worked on these novels, my computer created music in the background using the *Terrain Reader* algorithm reading a landscape created by *The Large Emblem Chart*. That is to say, it pumped out the folk music of the *Mythical Culture*.

As each page of the book was finished it was printed out using a copier behind me. After twenty-four hours the book was done and I would bind it. Later the audience would arrive and I would give a book reading from the newly completed work.

The Plenitude never rests.



SEVEN PATTERNS OF INNOVATION



Some Stuff I Learned Along the Way

In my lifetime I have worked in a variety of creative professions, as I like to say: art, science, design and engineering. One of the unexpected things I found as I bounced from quadrant to quadrant was that there was only a small set of methodologies for the creation of new stuff. I have collected seven of them here.

These seven methods, or patterns as I have begun to call them, are used in each quadrant, though differently weighted in each. These weights, at least in part, determine the quadrant's soul.

Each pattern also comes with at least one danger; a kind of counter-force that renders it difficult to harness, or dangerous to use. The Plenitude arises from the interaction of these patterns and forces, they are like its DNA. There is enough complexity so that its products are unpredictable; few enough that they are understandable, at least in hindsight.

THE SEVEN PATTERNS OF CREATION

Necessity is the Mother of Invention

Its A Thing of Genius

The Big Kahuna

The Future Exists

Colonization of The UnOwned

Stuff Creates New Objects of Desire

Change the Definition

Here are the seven patterns. Together they create a kind of field-effect. Most designers, artists, engineers and scientists don't think of them as separate little magnets pulling and pushing this way and that. They think of them as an encompassing creative field. You just wake up in the morning and start working.

So why specify them? Here's one use: every so often you come to your desk, your workbench, your design table and you are stuck. No ideas flow. Everything seems invented that needs to be invented.

It is at that moment quite useful to pull out this helpful little list.

I have also found it enlightening in the other direction. I see a new product, one that I want to comprehend, that I want to understand. How *did* it come to be part of the Plenitude? I can hold the product up to the window against the grid of these patterns and understand, if not how it was born, at least how it was patted into shape by these forces of creation.

NECESSITY IS THE MOTHER OF INVENTION

Find a problem and solve it.

.1.



.1.

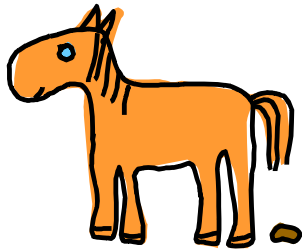
From curing polio to curing baldness.

The first pattern is the one that most people think, off the top of their head, of innovation (or creation or invention). *Necessity is the Mother of Invention*. It goes like this: there are a whole bunch of problems out there and our job is to find these problems and solve them one after another. When you're in college training to be an innovator these problems are big: cure cancer, solve world hunger, create peace, change history with a novel.

Of course, when you get your first job it turns out you're going to help people read their e-mail better, assist them with their hair loss problem or write programs to help them remember birthdays. Yet, small as they maybe, they are still real problems and people will pay you to have them removed. It is good honest work. If you can't think of anything else to do, it is usually worthwhile to find a problem and invent a way to eliminate it.

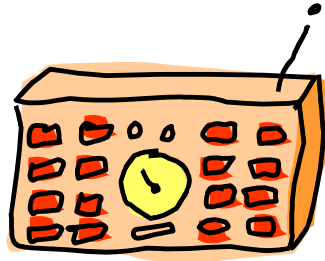
It is a well-known pattern and there are many good books written about it. It has one primary defect however which can be simply stated. Every solution to every problem creates ten more problems. More or less. Another way to put it is this: *problems are narrow, solutions are wide*.

Necessity is the Mother of Invention



But problems are
narrow, solutions
are wide.

Cars were the solution to horse manure.



Solving problems
one at a time can
create an over
all failure.

Each button solves a different problem.

An example. In 1900, the cities of the United States had a huge problem. It was called horse manure and it covered the city streets. It wasn't the speed, or the cost of horses, that was the problem. Horses were actually a pretty nice way to move around a city. It was the manure that was a problem. *Horseless* carriages, what we now call cars, were invented to solve the manure problem. And the solution worked. But, in the process, they created air pollution, gridlock, the destruction of the center of our cities, parking lots, reliance on foreign oil, global warming, war and as a consequence, possibly the end of the world. The problem was narrow, but the solution was wide. To say the least.

There is another kind of trouble that can arise from the simple use of this pattern. It happens when you attempt to solve each individual problem separately. For instance, a radio has all these little problems: you can't remember your favorite station, you need a different treble and bass setting for different songs, you need a remote control, and so on. Hundreds of little problems, each of which can be solved simply with a button. Each solution works fine. But pretty soon you have this radio with fifty buttons on it and it has become so complex you can't figure out how to turn the thing on. In that sense, it is a dangerous pattern to use, but as you can tell from the design of the Plenitude, it is the easiest to get paid for.

IT'S A THING OF GENIUS

I had a vision and just had to do it.



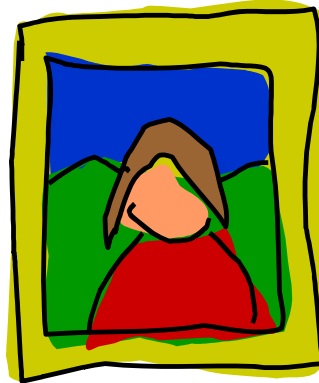
1947: Chester Carlson invents the copy machine.

A vision comes to a special mind.

The second pattern is: *Innovation is a thing of genius.* When getting up in the morning, or while taking a shower, or while staring at a blank canvas, or while pounding at a keyboard, *visions* simply appear in the mind of the innovator. Wonderful visions, so powerful that the innovator *has* to do them, is *compelled* to realize them. They are special visions and in many ways above critique or even reason. It is considered a high moral act to follow these visions; it is immoral, and in some cases even *illegal*, to destroy something that came from such visions (think of burning a Picasso). This pattern relies on two pre-conditions: first the belief in a special mind, the mind of genius. This genius can be inherent, or it can be the result of practice and training, usually both. Second, it relies on a deep personal belief in one's own visions that compels the innovator to make them real.

In 1938, Chester Carlson invented the copy machine. It came to him more or less as a vision and it would take 20 years or dogged pursuit before somebody would buy it. In fact, for most of those twenty years, when he was alone with his vision, people said it was a bad idea. "Who needs such an expensive machine? We already have carbon paper." But Carlson did not give up. He *believed* in his vision. It came from a mental process that he trusted. It did not come from the world, except to the degree that the world was processed through his gray matter.

It's a Thing of Genius.



One way you can think about it is what
problem does the Mona Lisa solve?
What would it mean to user test it?

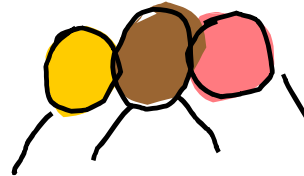
Focus groups and user testing were done on the idea of the copy machine and they all failed. The copy machine seemed to solve no known problem. There was no necessity that forced the invention. It was, quite simply, a vision. The Mona Lisa also was not the answer to a problem. It also may have failed user testing.

Of course visions are not about solving problems. But here is the weird thing, the unexpected thing. People like products that come from visions. In many cases truly new things *only* come from visions, they don't appear step-wise by solving one problem after the other. And we have a special feeling towards products that come from visions. We put them in museums, for instance. Collectors give millions of dollars to possess them. Entire industries are founded on them. The Barbie doll, was another product that which was the result of a vision. There was no problem that Barbie solved. There was no clamor for a busty doll. But when Ruth Handler saw the European prototype, she *knew*, she had a vision.

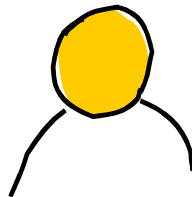
It's a Thing of Genius.



Genius Block



Too many geniuses



Too early/late



Too crackpot

A few of the well known problems
with geniuses.

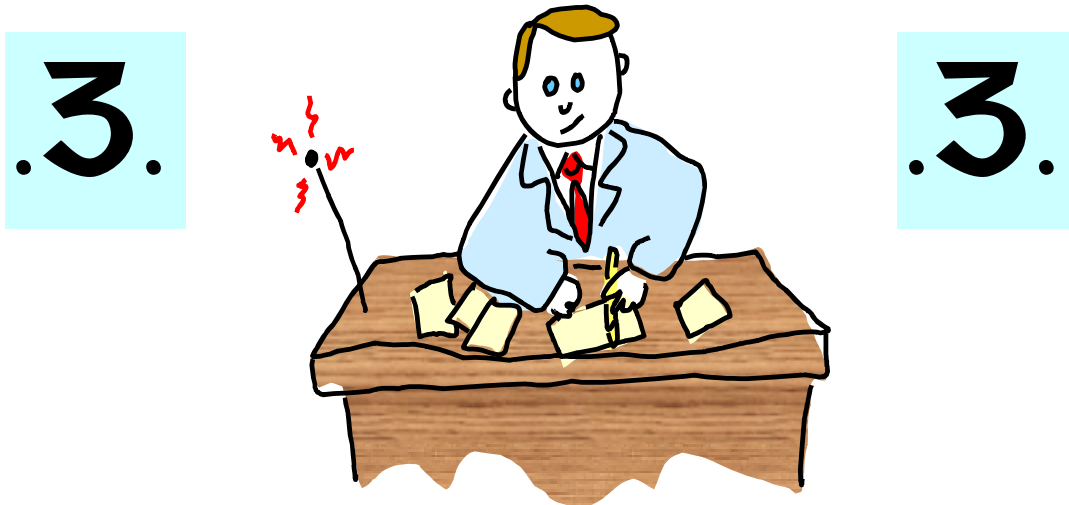
If you're a corporation it seems to make sense to devote some of your energy towards creating things of vision. Xerox PARC was set up around this model of genius. Collect a whole bunch of geniuses, put them up on a hill in a white building, separate them from all the *problems* that might be out there, and see what visions they will have. *Corporate Problem One:* its hard to know what to do with a vision.

Corporate Problem Two: It often happens that if you hire a genius they will get *genius block* and then you're stuck with somebody with no new ideas and a high salary. *Problem Three:* It turns out that if you collect a whole bunch of geniuses together in one place, the visions don't multiply, very often they subtract.

Four: A company can build too much of an ivory tower. While visions don't flow directly from problems, they often grow, like a pearl, from an irritating grain of sand. *Lastly:* It's impossible to tell the difference between a *crackpot* and a *genius* until visions succeeds. Until 1959, nobody knew if Chester Carlson was a crackpot or a genius. Success is only relative to the world. Released too early it can fail; released too late – well then it is too late. These are the dilemmas of corporate *research* centers to which genius has been relegated. Ghettos purposely far from where the work, as the rest of the company sees it, *really* gets done.

THE BIG KAHUNA

Scientific deduction of stuff from 1st principles.



Ubi-Comp and the Ubi-Man.

The third pattern is something I continue to refer to as *The Big Kahuna* despite its unfortunate association with Sixties' surf movies. *The Big Kahuna* is the derivation of *new stuff from first principles*. From BIG giant ideas. From laws of the universe (or at least laws of human nature.) From inclusive theories of everything. From induction. As if induction were real.

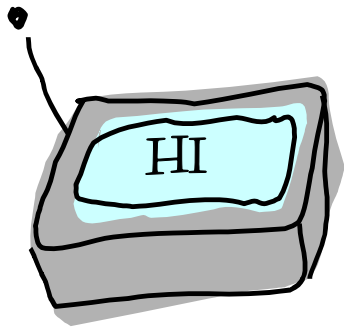
Ubiquitous Computing, the research program I worked on at Xerox PARC, was based on a *Big Kahuna*. Dr. Mark Weiser first formulated this idea. His Big Kahuna went something like this:

In the future, networked computation will exist and it will be tacitly, universally and invisibly embedded in the everyday objects of the world.

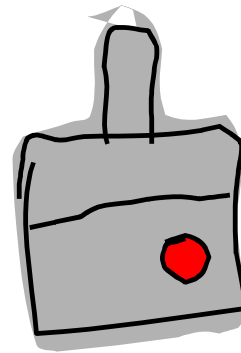
It is a wonderful vision, and I believe it will eventually will come to pass. But what this *Big Kahuna* did not come with, what no *Big Kahuna* comes with, are the details. How does this idea, this force, this direction, get realized?

The Ubi-desk. The Ubi-chair. The Ubi-paper. The Ubi-shirt. The Ubi-pen. The Ubi-man. These are what flowed from this *Big Kahuna*. In a way, the Big Kahuna sets up an alternative set of laws of *universal laws* from which one creates and invents. It is an invention that presupposes more invention.

The Big Kahuna



Meeting destroying
email.



Big brother.

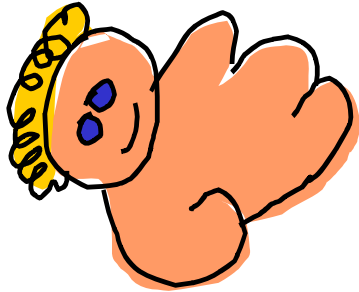
Ubi-comp and two of its discontents.

While *The Big Kahuna* is a particularly strong and compelling way to create new products for the Plenitude it has an associated series of problems. Most of these derive from the following truth: Our culture, perhaps any culture, is defined by a *collection* of interlocking and often contradictory *Big Kahunas*. Any attempt to create product based just on one sends you into immediate collision with the others.

When the ubiquitous computing team created *The PARC Tab* the design was based on the principles laid out in Weiser's Big Kahuna. *The Tab*, the proto-PalmPilot, was like a pad of paper intended to tacitly disappear into the daily work environment. But there was another Big Kahuna at play: *Humans will communicate with other humans if possible*. What *The Tab* really did was allow e-mail to be read at meetings, and so, instead of invisibly helping meetings they totally disrupted them. Meetings collapsed in a frenzied clicking of message reading.

The *PARC Badge*, another ubi-invention, which we thought of as simply allowing ubi-objects to know where the people were, was not how the 200 or so journalists who come to look at it saw it. They only saw the literary *Kahuna* usually referred to as *Big Brother*, and that is what their headlines all blared.

The Big Kahuna



Soft dolls don't sell.

Dinosaurs are for boys.

**The laws of humans are not like the
laws of molecules.**

People are not like molecules, and so Big Kahunas, which seem so much like laws of nature, don't work as well as the laws of physics. Its not that they don't work at all, they do, its just that they are subject to the same winds of change as the rest of the culture. Of the Plenitude.

Here's an example from the toy world. When I first entered that strange world, it was well-known, it was a given, it was a law, it was a *Big Kahuna*, that soft baby dolls don't sell to young girls. Hard to believe but true. At that time all baby dolls then were made of hard plastic. Soft, cloth dolls, seemed old fashioned, from another era. No self-respecting mom would give their modern daughters a stuffed doll. There was something, well perhaps *unsanitary*, about it. We even tested little girls and sure enough, hard dolls won every time.

Partly because of this *law* Mattel passed on the cute and very soft Cabbage Patch doll when it was offered to them. They said, "No, no, it's a soft doll. They won't sell. It's well-known they won't sell." They even tested it and sure enough little girls wanted hard dolls. Another company bought Cabbage Patch and it sold through the roof. Two years later, if you did market testing, only soft dolls would sell big.

And before Barney it was a well known Kahuna that only boys bought dinosaurs.

THE FUTURE EXISTS

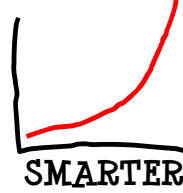
We just have to intersect it at the perfect moment.

We know that computers will be:

.4.



.4.



We know what the future will be and
our job is to intersect it at
precisely at the right moment.

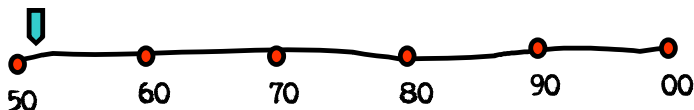
This is a pattern that you will find manifested and spoken about in engineering and research departments all over the world. Sometimes it is so strongly put that it almost has almost an other worldliness about - that the future actually, already *exists*. That the job of the designer or engineer is to simply intersect that future at exactly the right moment. Neither too early or too late. That the future itself is a given, it is simply not yet realized.

For instance engineers *know that* in the future computers will be faster, smaller and smarter. It is known that there will be more transistors per millimeter of chip, which is sometimes known as Moore's Law. There is little debate on these things, the only debate is precisely when they will occur and what technology they will use when they occur.

And who will make the big bucks.

The Future Exists.

But the future doesn't exist. It is not reified. It is story we tell ourselves to know what to do when we get up. It is sort of mutually constructed and quite flexible. None-the-less, without a better idea, its not a bad sophistry.



The past is also constructed.

This is actually a very valuable pattern, particularly because it works so much of the time. I don't want to minimize it. It allows certain interesting methodologies. One is called *buying into the future*. It turns out that technologies of the future usually exist today except they are extremely expensive. If you want to design desktop software for the future you can buy a super computer today to do your invention work on. Five years from now, the power of the super computer will be on everybody's desk and no bigger than a pencil sharpener. We know this to be true.

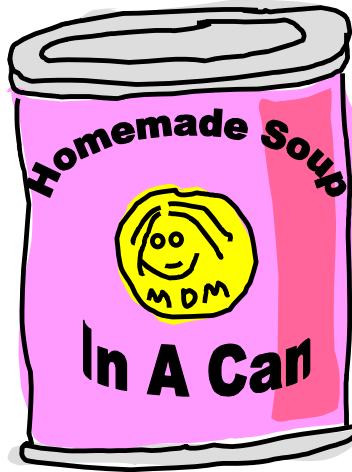
The problem with this pattern is simple. *The future doesn't actually yet exist*. Its just a story that we tell ourselves to help us get up in the morning and moving in the right direction. Events can rapidly alter that future, particularly ones that flow from the *Its A Thing of Genius* pattern. When we designed the first ubiquitous computing artifacts, for instance, there was no World Wide Web. Its sudden appearance made our work look as if it was heading in the wrong direction. As if it was following the wrong story.

And so we created a new story about the past and now it fits in perfectly. It is not just the future that doesn't exist; *it is also true about the past*.

COLONIZATION

Find the un-owned; package it; sell it back.

.5.



.5.

Find the un-owned. Package it. And then
sell it back. This amazingly works.

This is the fifth pattern of innovation and for the young engineer, scientist, artist or designer it is the perhaps the hardest one to come to terms with. When I give talks at colleges on this topic there are often audible gasps from the young innovators in training. I call the pattern *Colonization* after the *Situationists International's* use of the word. The *Situationists* were a small, radical group of French philosophers who saw the Plentitude as a massive civilization-wide *Spectacle*.

Here's how you innovate using *Colonization*:

First, you look around the world and you find things which are un-owned, or barely owned, or lightly owned. Surprisingly, even in the Plentitude, in the *Spectacle*, this is possible.

Second, you bring these un-owned things into the corporation and into the maws of their design and engineering groups. There you improve it, rationalize it, package it, gussy it up, make it smooth and consistent.

Third, amazingly, you sell it back to the same people who once used it, for free, while it was un-owned. I realize that this is hard to believe that innovators do this and that it works, but it is true and it does.

Colonization

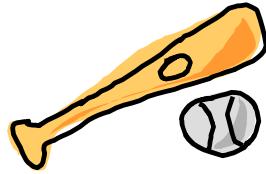


But something of essence is lost in each case. What makes real homemade soup wonderful is the variation and the work.

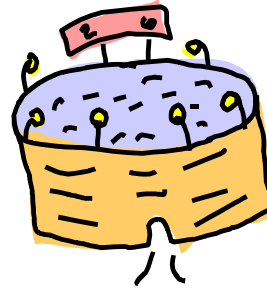
Campbell's Home Cooking Soup, which can be found at any super market, is a reasonable example. This soup is not made at home, anybody's home, believe me. It is made in what we must consider to be almost the opposite of a home. It is made in a giant automated factory. Somebody at Campbell's was looking around for new product. He or she saw that people were making soup at home. They saw that people not only liked homemade soup, but they thought it was a good thing. The people at Campbell's thought, "Hmm, what if we could sell them homemade soup? They wouldn't have to go to the trouble of making it, and of course we would make some money. We could mass produce it so that people who never would make homemade soup can have some. We will make the Plenitude, richer, more complex, more human, *homier*." I'm quite sure the soup does sell very well.

Of course, *Campbell's Home Cooking Soup* is not homemade soup. That does not imply that it is bad soup (I eat it actually.) It does save time and it is healthier than eating a bag of potato chips. But you can actually still make homemade soup for free. It fills the kitchen with wonderful smells. Every bowl is different adding variety to life. The vegetables are fresher and hence healthier. There are less added ingredients of the chemical kind. You can make it with a younger member of your family creating family bonds. So who cares that it now exists in two forms: the free form and in its Plenitudiness form. For those students who are still cringing, just make sure that as much is added as is taken away.

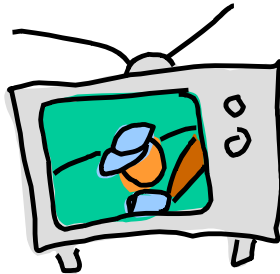
Colonization



1) Play for free in the backyard.



2) Pay to watch in a stadium.



3) Watch for free on TV.



4) Pay to play interactive baseball at home.

The real history of baseball.

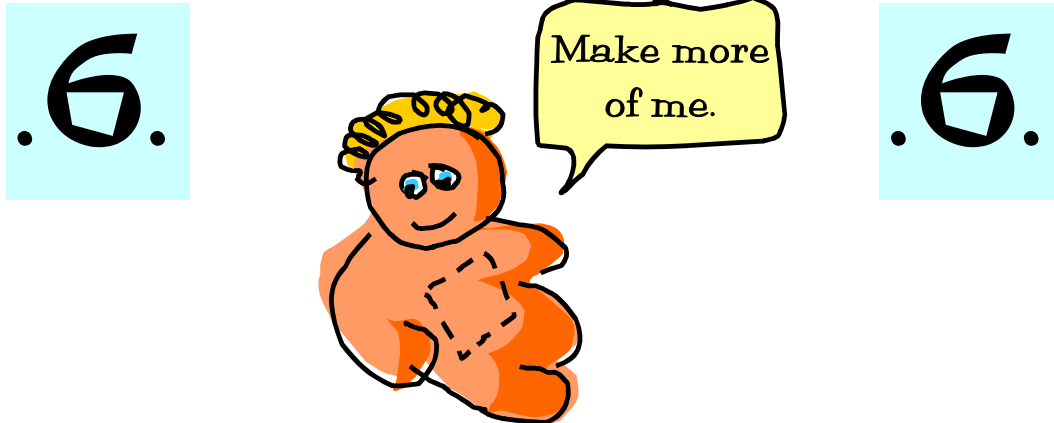
It was a magazine article that alerted me to the colonization of soup. It was my wife who pointed out the strange odyssey of the colonization of baseball. Baseball, like most sports, was created, and thrived, because it was fun to play. It is free to play once you have a bat, ball and gloves. You can just go out into the backyard and choose up teams. Its enjoyable and healthy. It also turns out that it was fun to watch other people play. At some point companies started to charge for watching games and “I’m going to a ball game” came to mean I am going to go and *watch* a ball game being played. Colonization had begun.

Then oddly, because of advertising, baseball began being broadcast on television, where you could watch it for free without even having to leave your living room. Not only were you not swinging the bat yourself, or throwing the ball yourself, but you weren’t even *near* other people in this otherwise highly social game. The only cost, as the web folks now say, was allowing your eyeballs to watch some ads. At his point it became clear that something pretty large had been left out of the pot and the video game industry stepped in to Colonized Colonized TV baseball by making it *interactive* and charging \$40 per cartridge.

But, you can still go in to the backyard and play real interactive baseball for free!

STUFF DESIRES TO BE BETTER STUFF

Humans are how stuff makes more stuff.



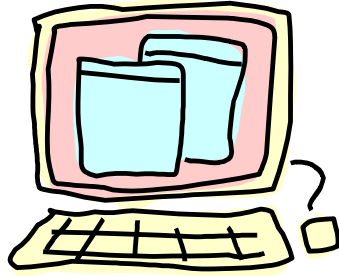
Or why successful dolls always become talking dolls.

The sixth pattern is one is an important one, though one that is not easy to believe, particularly for the non-innovator. For those who have never sat at an inventor's bench it must seem almost mystical. The pattern is this: *Stuff Desires to be Better Stuff*.

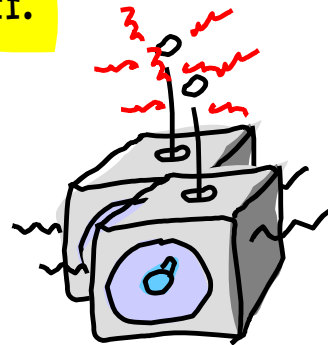
As a designer or an engineer, you're often presented with an product that already exists (in the Plenitude) and your job is to make next year's version. Or sometimes it's not even part of your job. You're just looking around and you see some stuff. But what you really see is what that stuff *should be*. Or perhaps you see what the stuff itself *wants to be*. You will hear engineers say something like: "I know what this needs." By realizing the stuff's own needs, the innovator helps to make that stuff better. This process makes the history of any product look a lot like biological evolution. It is as if each year's model of car gave birth to next year's model of car, only slightly evolved.

Good designers and engineers open themselves up and let the stuff around them rant on about what they, the stuff, wants to be. What is really strange is how consistent stuff's desires are. For instance, all dolls want to be talking dolls. If a new doll is introduced, and is successful, then three years later there will be a talking version. It was the doll who told the designer that this is what it should be.

Stuff desires to be better stuff.



Computer programs always develop email readers and browsers.



Corollary: technology wants to become product. Its voice is very loud.

Products want to be baroque, but people want the simple (mostly).

And all computer programs desire to be e-mail readers and then to become web browsers. The engineers and designers working on them only make it happen.

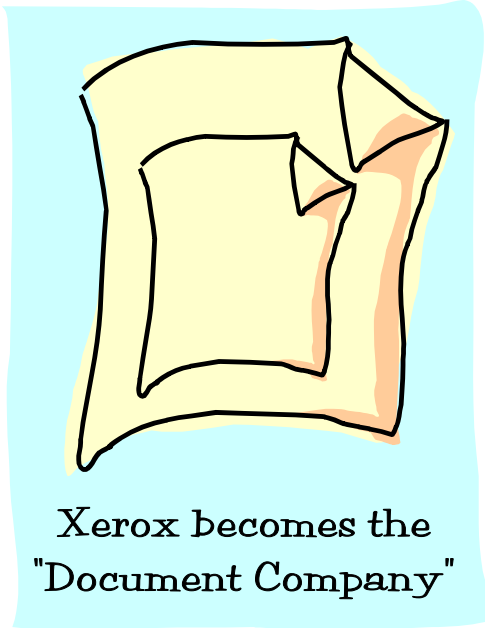
But here's a corollary which is highly relevant if you work in a corporation: *Technology Desires to be Product*. As an engineer in a corporation the problem often presented to you is not that there is such and such problem in the world; rather it is *we have such and such technology and it desires to be a product*. Artists also sometimes feel this desirous pull. They will see a new material, or an image, or a device, or a piece of drift wood and they can hear it calling out to be made into art. The artist feels it pressuring them. It is a wonderful feeling.

The problem with this pattern is that stuff usually desires to be more complex, to be baroque. The engineer can hear stuff asking for three more buttons, or for a little jack on the side, or for a web browser to be included. The real problem is, that by and large, people desire the simple. They don't want more complexity. And so the battle is joined on the workbench. The engineer must struggle to say *no*.

CHANGE THE DEFINITION

Language and metaphor create/are the world.

.7.



.7.

The seventh pattern is *Change the Definition*. It is the pattern that designers often evoke when they work on corporate identity construction. There is something fundamentally different between *Xerox The Copier Company* and *Xerox The Document Company*. It is more than a name change. These changes allow their respective companies to innovate in new areas, to develop and create in new ways, to behave differently. In a very real sense it changes the frame of imaginable invention.

But it has an effect on products, even existing products, and how we treat and use them. To call a cigarette a “nicotine delivery system” changes how we think about it, how we use it, how we advertise it, how much we will pay for it and what legal structures we put around it.

Change the Definition.



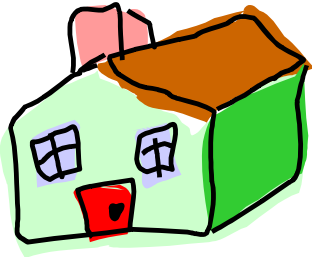
Or why banks don't sell hamburgers.

The definition of a product (or more precisely, a product genre) determines to a large degree what it can and cannot be. It sets up the frame of expectations not just for the customer, but for the producer as well.

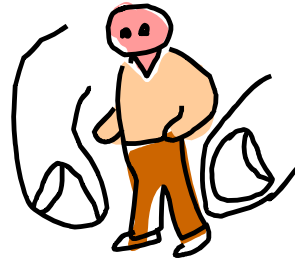
Why, for instance, don't banks sell hamburgers? They sell all sorts of things, but why not hamburgers? This might seem like an odd question, but consider this: Seven-Elevens, and other convenience stores, sell money. They have little ATM machines sitting in the corner spitting out twenties at a \$1.50 per hit. Not a bad business.

I once gave this talk to a group of bankers. After I asked this question one of them raised their hand and said that they had just gone into a deal with Starbucks and that they *would be* selling coffee and sandwiches at certain of their locations. They had changed their definition of bank to a place of *life enhancement*.

Change the Definition.



House is a
“machine for living.”



Doll is a “physical
fantasy token.”

Language alters the object and its trajectory.

It was Gropius, architect from the Bauhaus, who called houses “machines for living” and in doing so opened up new vistas as to what you could design, or create, or innovate and still be making a house.

When I was at Mattel a group of us began calling dolls “physical fantasy tokens” meaning that they were little representations in the physical world of the complex goings on of a girl’s inner mental world. They helped to stabilize and realize the girl’s imaginative play.

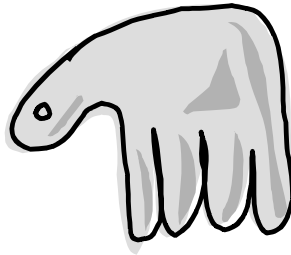
Years later, while at PARC, we began to look into devices to help people remember things. To help them reify their memories in the real world. They were called “physical memory tokens.” I called them dolls.

Change the Definition.

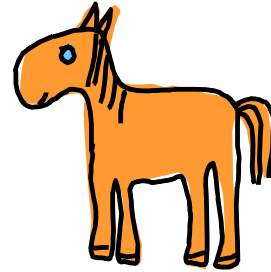
The Problem is:

HORSE

The word horse



A drawing of a horse



A real horse

Are not really the same things. Language
is only a tool in the world.

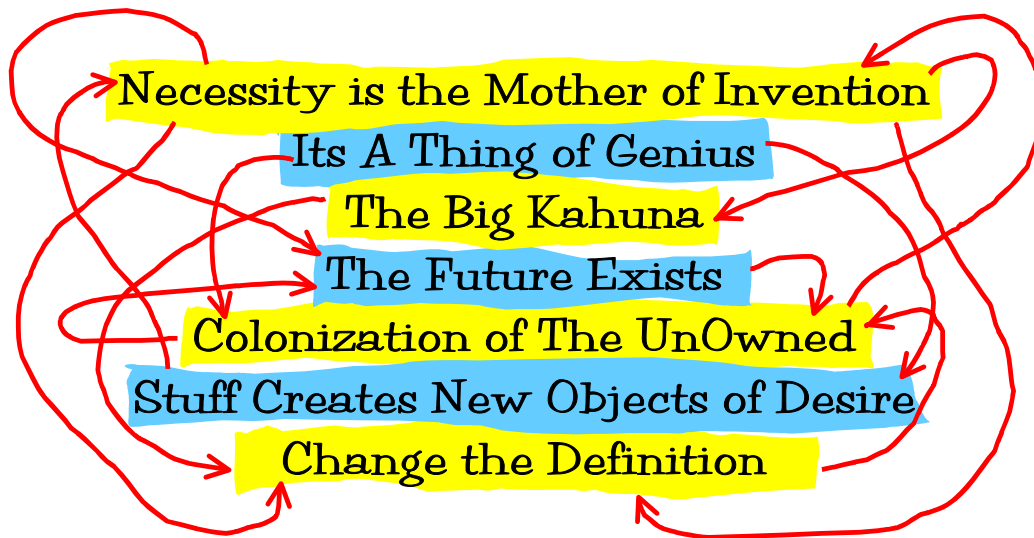
There is a problem with all of this, of course, and that is the real world is not the same as the world of language. They do not match up one-to-one. Rather, I would say, that language is not a representation of the world, it is a tool in the world.

Unfortunately (or fortunately, since I think it makes art possible) we have tiny little brains that can barely tell the difference between the word *horse*, a drawing of a *horse*, a photograph of a *horse* and an actual *horse*. It is why we cry at the movies, or even more amazingly, laugh at the little black marks in a book.

The advertising world attempts to change the definition of a cigarette, for instance, by placing it in the proximity of a cowboy and his horse. The cigarette becomes the great outdoors and even freedom itself.

The problem is, it isn't. So, if you are the one to choose the new definition, choose wisely.

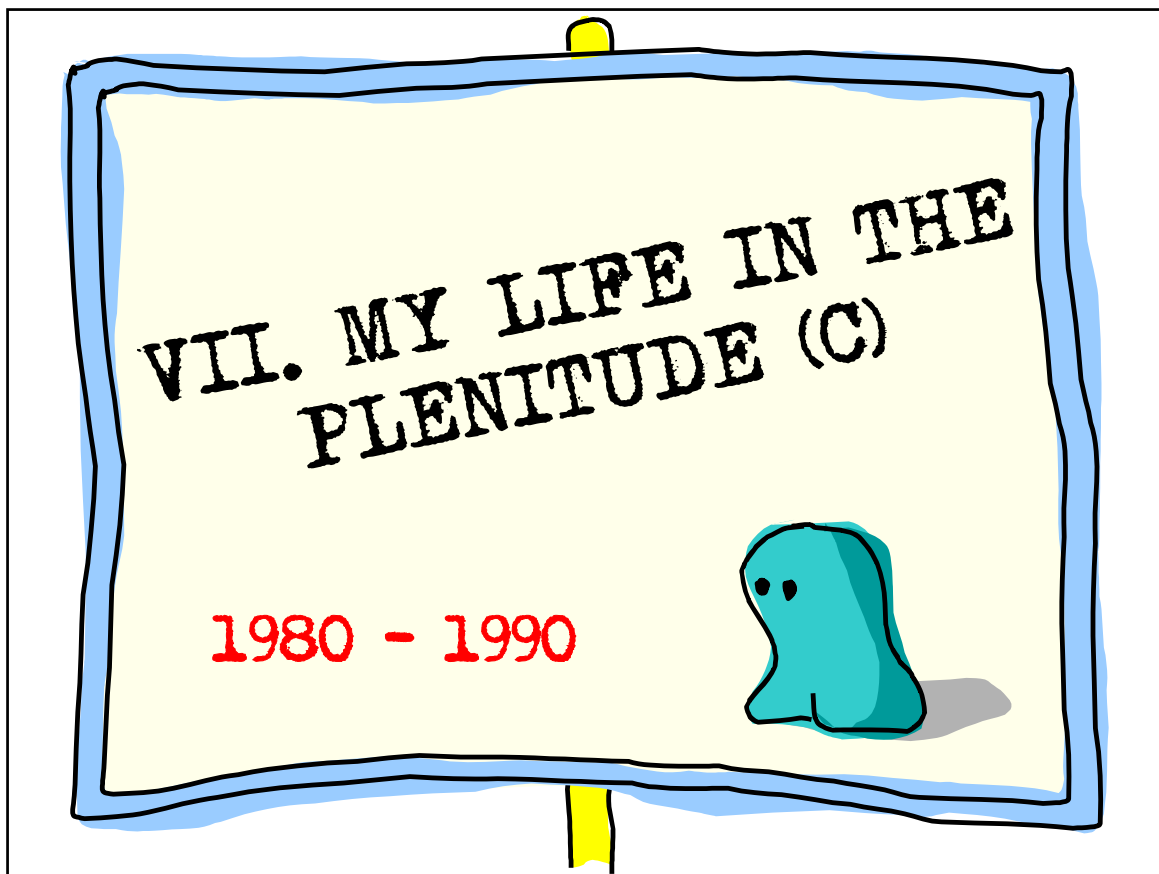
INNOVATION IS A COMPLEX

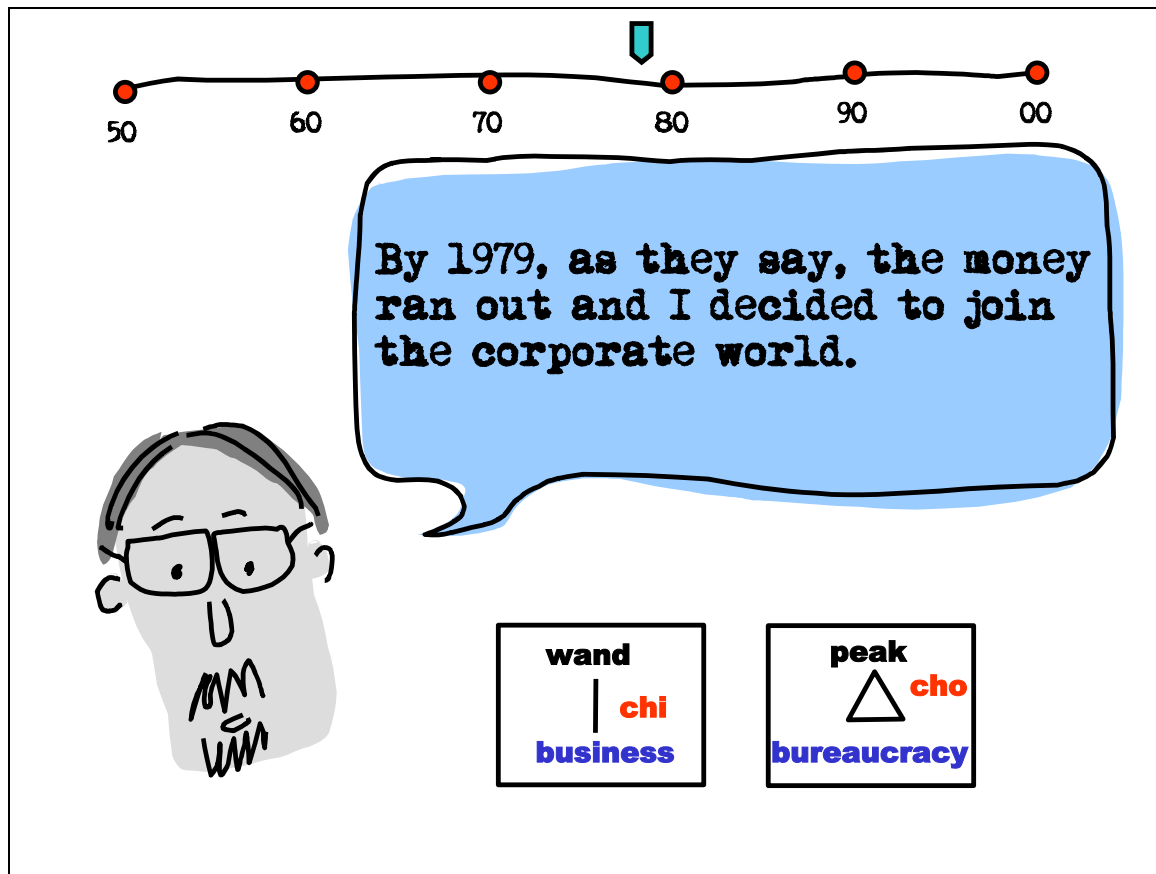


MELANGE OF PATTERNS

And those are the seven patterns. Certainly others come to mind, but seven is a good number. I want to once again reiterate that the seven work together. It's not like you can just use one; they blend and interact in a complex *mélange*. What changes from creative profession to creative profession are not the patterns, but the proportions of their use.

Together, they are *way too good* at making new stuff and the result is the Plenitude around us.

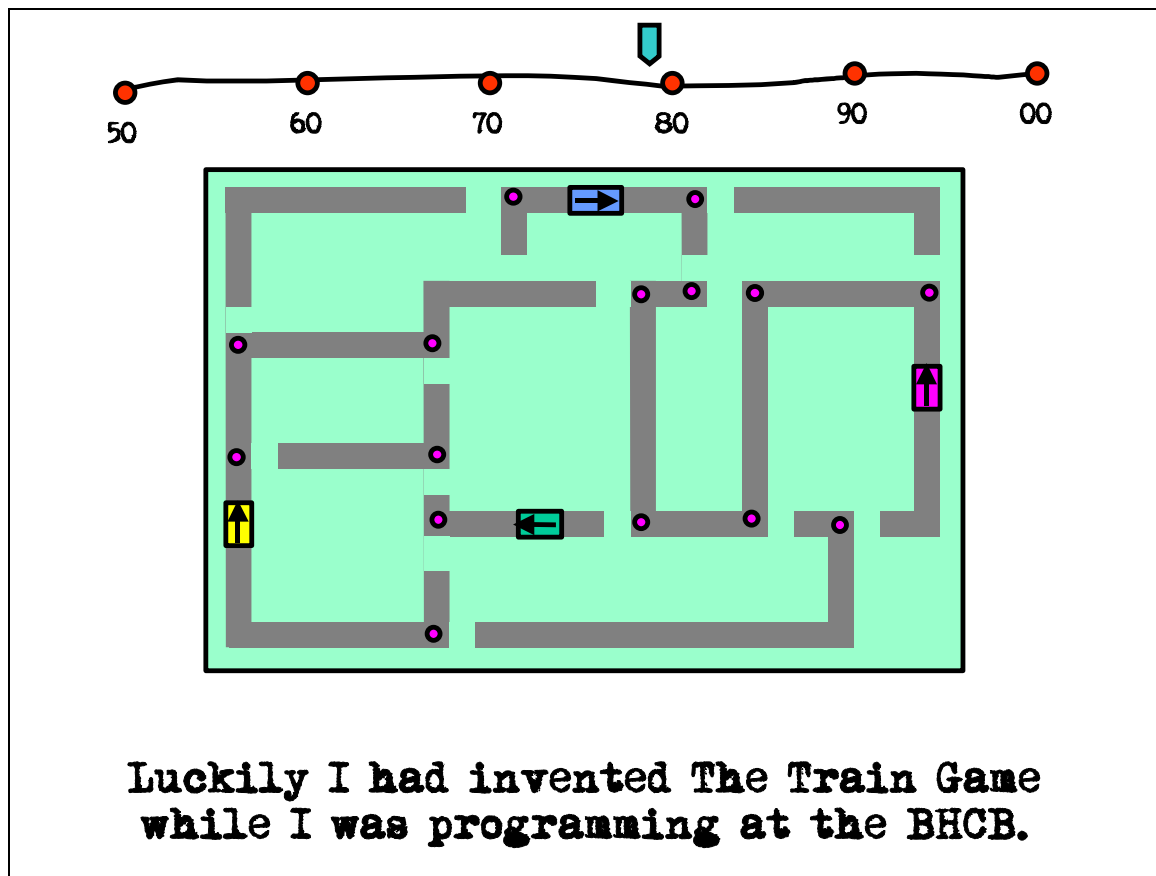




The way I usually put it is, by 1979 the money had run out. I had no real job, just pick-up stuff. I had made some money writing a program that calculated the heating and cooling loads in residential homes. I taught a little electronic music. I tried working as a computer sales guy. What I didn't have, and what makes a good deal of the art world work, is a *trust fund*.

Perhaps as a consequence, or perhaps out of intellectual curiosity, I become increasingly attracted to something called *business*, and in particular that part of business called *corporations*. It was the corporation that made the stuff that *my people*, the middle class, wanted. It was also the corporation where my people worked in an un-apologetically hierarchical meritocracy.

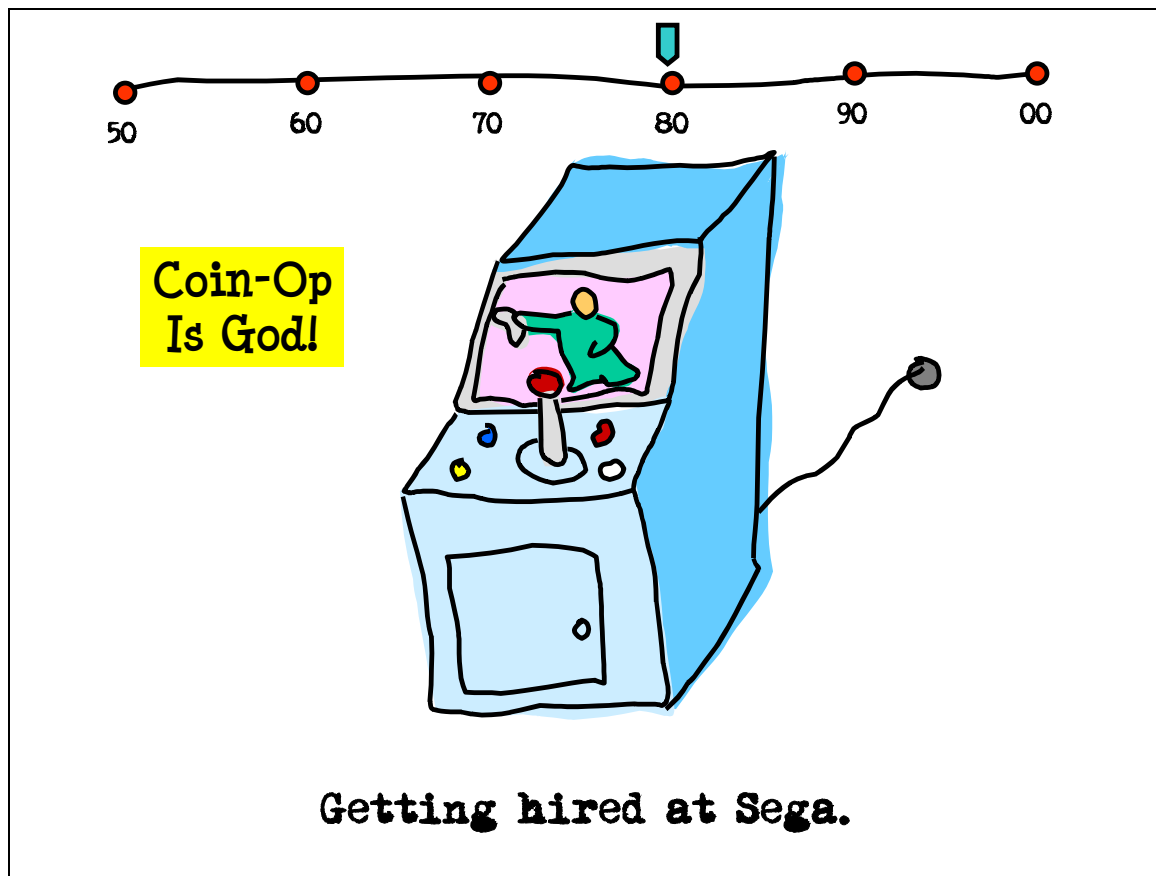
I compared corporation to a medieval cities. They were surrounded by a thick walls, often with real guards. Inside the people were working, living, playing, making, as one. Outside the walls were the *others*: corporations, and consumers. The sweaty, collaborative, chatty, gossipy, collective warmth inside the walls contrasted sharply with the individualistic, lonely, elitist, dog-eat-dog world I inhabited as an artist. The corporation was Rome and I wanted to be in the Coliseum stands and not in the arena. I wanted to help make the Plenitude.



Of course saying you want to enter business and actually entering it are two different things, the second being rather difficult as I discovered. While I found business exotic, and hence desirable, business found me exotic and not. It was through a fluke that I finally made it past the walls and into my first company.

One way I made money during my years as an artist was at the Better Heating and Cooling Bureau (BHCB) writing programs that calculated heat loss and gain in residential homes. We did our work on Apple IIs and to learn the system I did what many have done: I wrote a game. Called *The Train Game* it had little trains, actually colored blocks, that moved around a track. All the player could do was flip the switches to keep the trains from crashing.

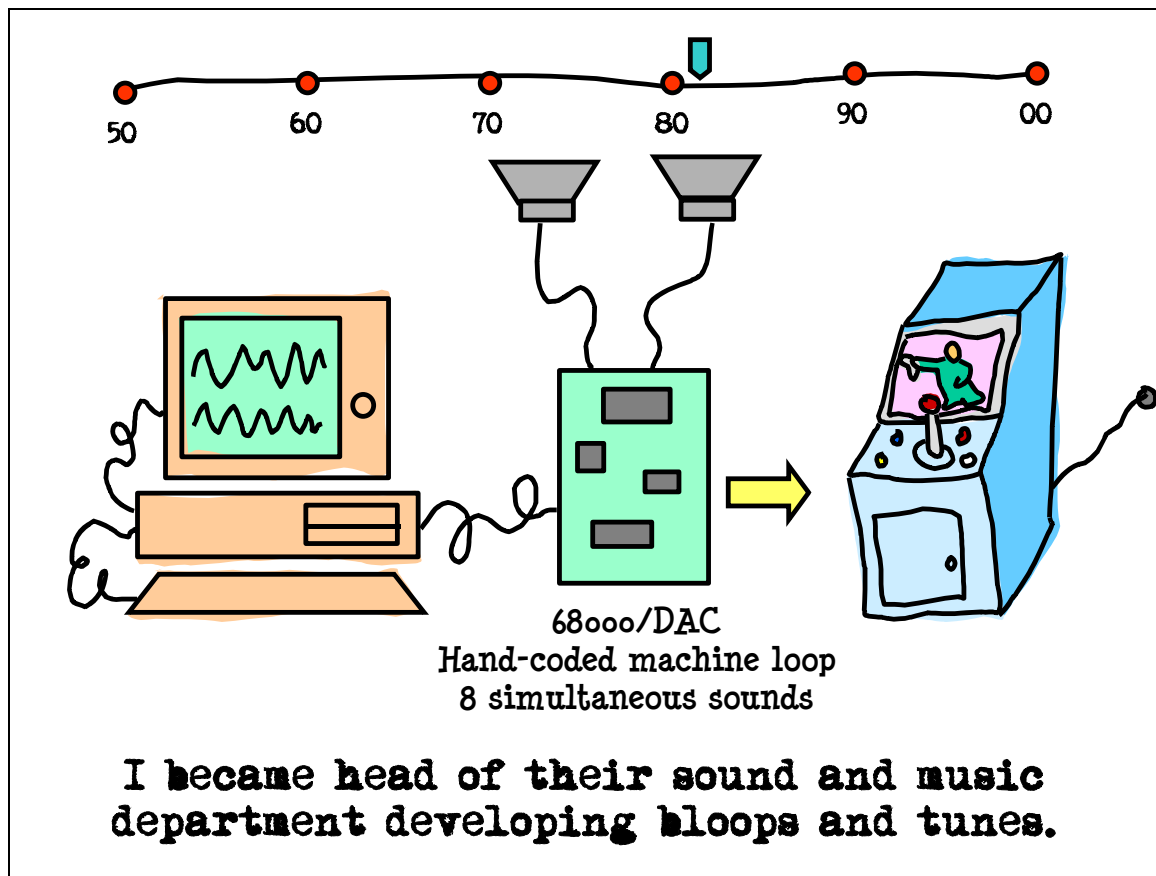
It did not occur to me at the time that video games themselves were part of business. They seemed like a new form of art, unexplored and wild. It was a new genre that relied on new pleasure centers being discovered and exercised by the burgeoning field of human-computer interactions. But it was an art form the people wanted and would pay hard earned money to buy. It was like being at there at the invention of the movie, seeing for the first time a person alive on a glowing screen.



In 1979 my wife and I were living outside of San Diego in the little surfer town of Cardiff-by-the-Sea. In the local paper one day there was an article about a sleepy little game company called *Gremlin* which had just been purchased by the un-sleepy corporation called *Sega*. Gremlin was located only a few miles away. I made a disk of *The Train Game* and headed down the freeway to their headquarters. In my mind's eye they would buy it, I would become a millionaire and I could then, at a more leisurely pace, figure out how to join the world of business.

They were interested in my game in a sort of vague way. Puzzle games (the category *The Train Game* fit into) were not a big thing at arcades which were primarily haunts for over-active teenage boys who liked to shoot and drive. Shoot and drive fast and hard. *Not* crashing trains (the goal of my game) was not a particularly interesting thing to do. But what did interest the people at Sega then was my degree in electronic music. They had never heard of electronic music, let alone met somebody with a degree in it. By the time I left that evening I had been hired into their sound and music department to help make the boops, beeps, swooshes and splats that so characterize this class of entertainment.

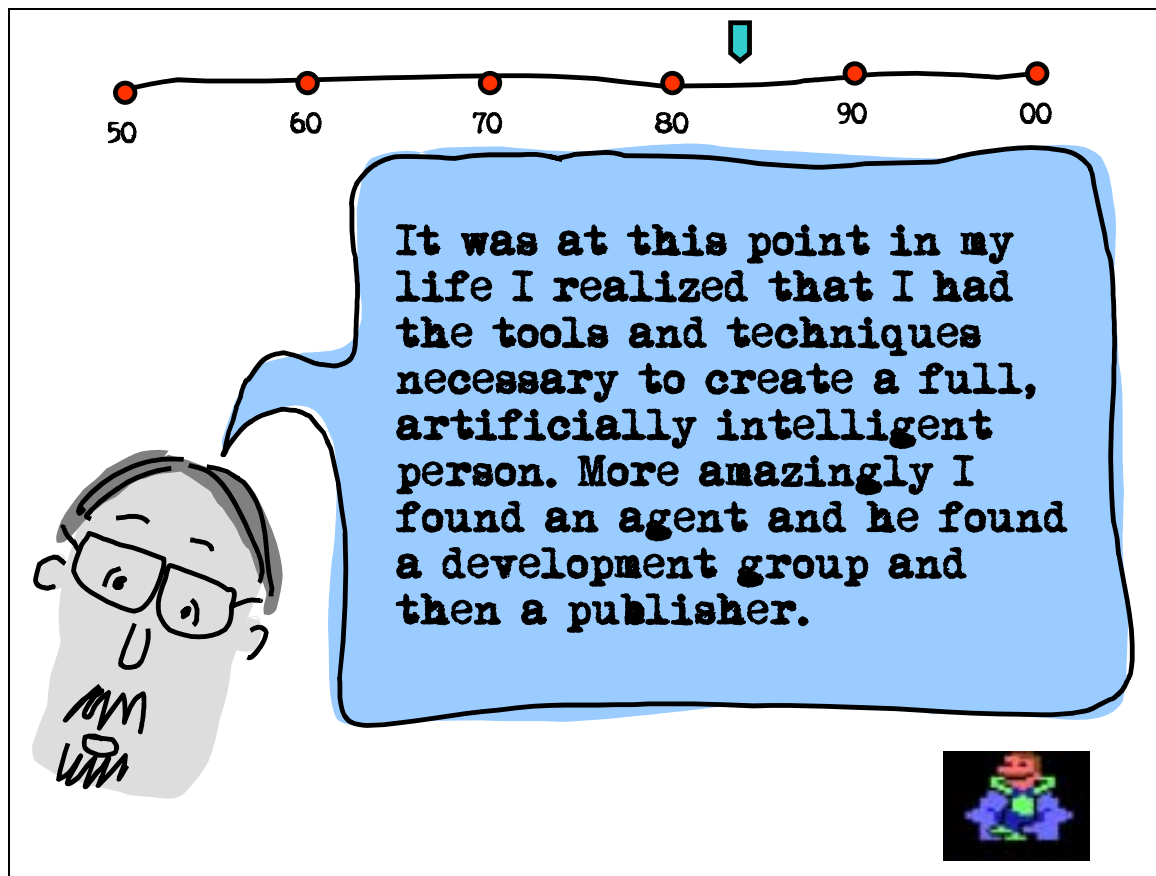
More importantly, as I explained my new job to my wife, I had successfully made the leap from starving artist to corporate employee.



I worked for Sega for almost four years, slowly rising, as any good employee does, from coder, to manager, to eventually becoming the head of the sound and music department. Besides the bleeps and bleeps themselves, I developed a sound and music operating system for a universal sound board based on the then new 68000 class of processors. It was capable of producing eight simultaneous sounds or musical tracks. We coded the thing in pure assembly language for speed and we created the development station to make and test the sounds.

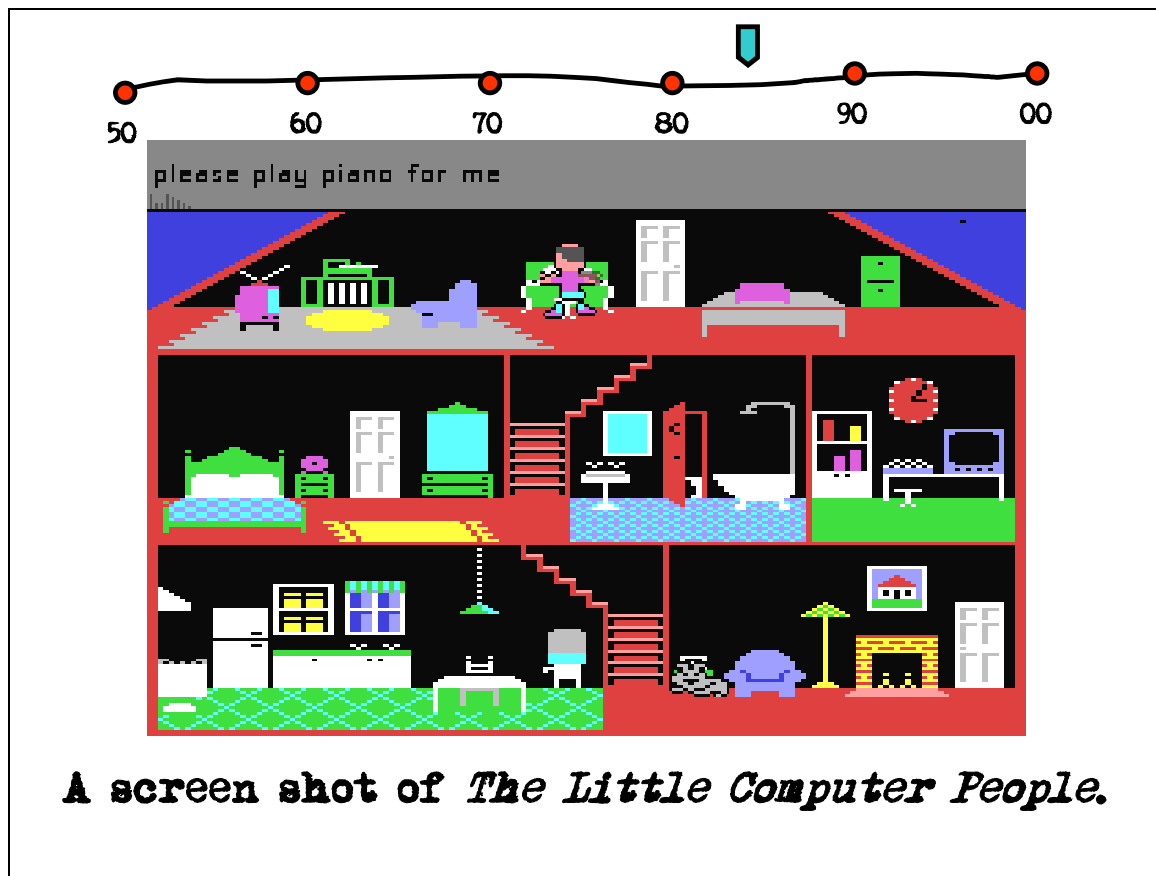
What was a huge shift from the art world was how my ideas were realized. In the art world, while I was concerned about what other artists thought of my pieces, my primary responsibility was to a kind of personal integrity and staying true to my own visions. In the world of games, I was primarily concerned about whether the kid in Des Moines liked the idea enough to feed his quarters into a machine. We would test his interest in the product using all the techniques of modern capitalism, and if the idea was found wanting, we would *change the idea* until either the quarters fell or we killed the project.

In both art and games there was invention and there was a concern with the reception of the invention, but the first looked mostly inward and the second mostly outward. I had, in a word, entered deeply into the world of *Design*.



What came to me first was the name: *Pet Person*. I wanted to create a little pet person on the computer screen. One that you could talk to, play with, feed, pamper, watch, engage with, play games with, be happy and sad with, just be with. I didn't want a video game character that you controlled. I wanted an independent and independent minded soul. It was, at the time, a radical thought. First, it was completely unclear why such a thing would be interesting. Computers were not about watching things; they were about doing things. Screensavers hadn't been invented yet. Secondly, it was generally assumed that it would be impossible from a programming standpoint to create something as complex as a person. We were not talking mainframe computer. We were talking about a 1 Megahertz 6502 (e.g. slow) processor with 64K (e.g. small amount) of memory.

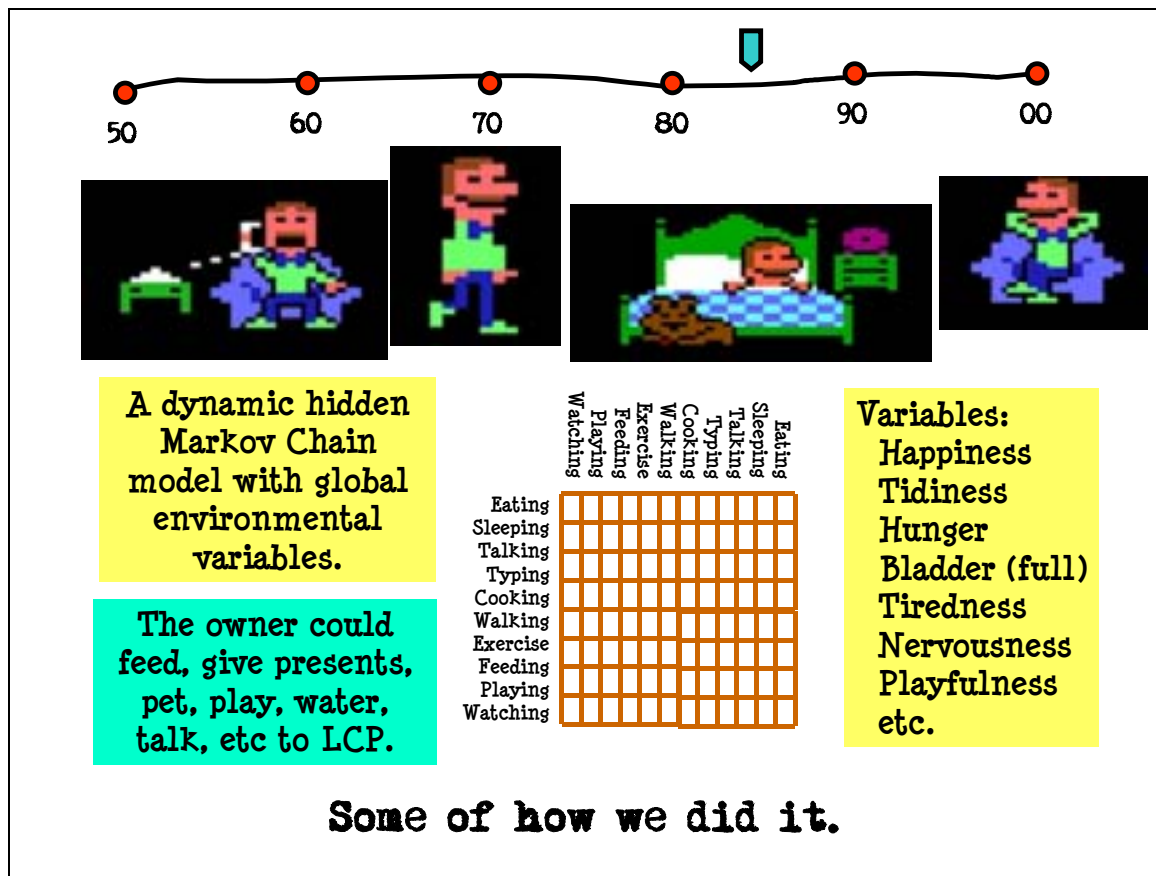
What made me think I could do it was my belief in the expressiveness of cartoons and my theories of algorithmic symbolism. I believed that I could construct some programmatically small procedures that produced complex behavior and that I could express that information with a cartoon guy. Shockingly, when I think back upon those days, was that an agent actually believed me. Malcolm Kaufman raised the money to pay for the development; Wickstead Design programmed it up; and then Activision bought it and produced it. They called it *Little Computer People*.



Here is a screen shot from the Apple II version of the program. Downstairs you can see his living room and kitchen. In his living room he would sit in his chair. Using *cntl-P* on your keyboard you could pet him on the head and he would get happy. He, in turn, would pet his dog. The PP would make fires in the fireplace (he would have to go outside to chop the wood.) The front door played an important part: when you sent him food or presents (*ctrl-F* or *ctrl-t*) they would be delivered via the door. In the kitchen he would cook breakfast, lunch and dinner. He would drink water, do the dishes and at the table he would play games with you: poker or war.

Upstairs was his bedroom. Just like real people he needed to sleep every so often or he would get cranky. He would turn green if you forgot to feed him (we had decided that he wouldn't die.) In the morning he would exercise to stay fit.

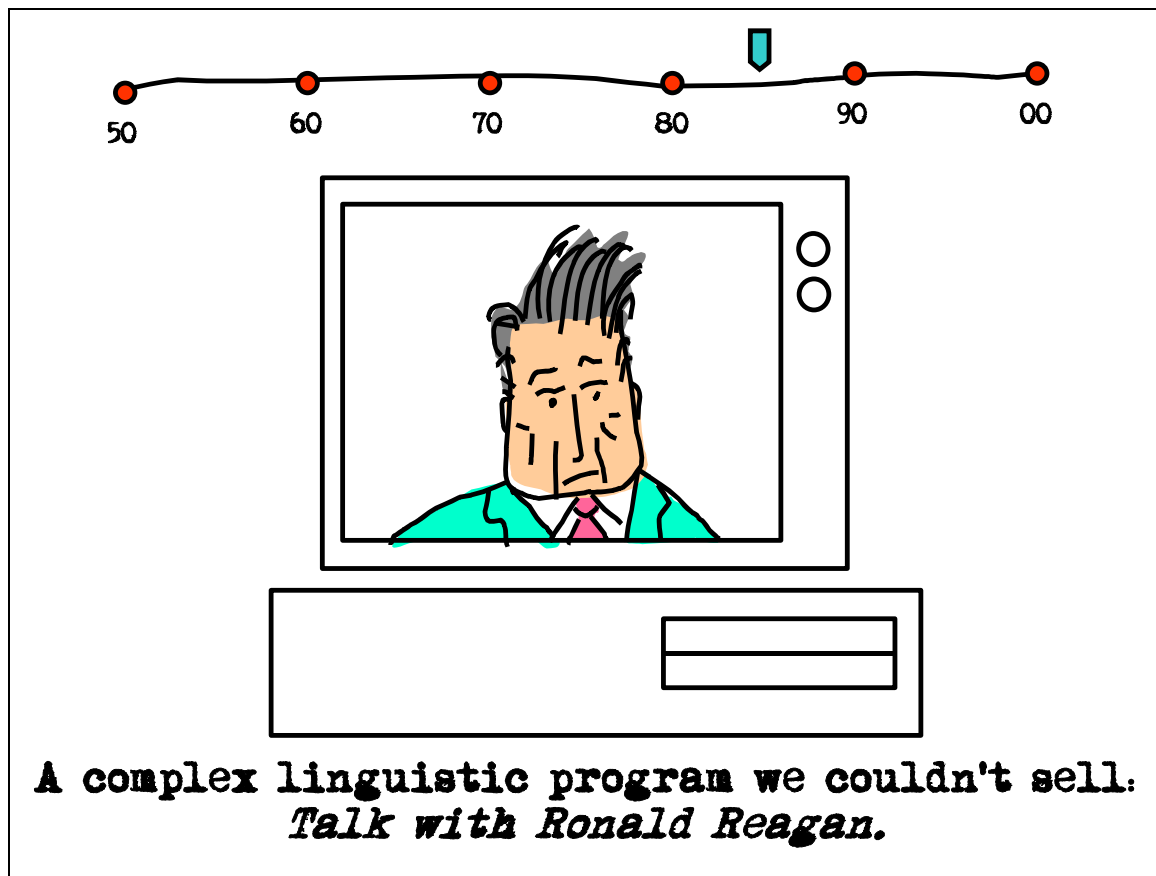
The toilet was placed in a separate little room so he could close the door for privacy. When he took a bath he jumped in and out quickly (G-rated.) In his study he worked typing his autobiography. You could type messages to him and he would respond. Communication across the real/virtual barrier. The attic was his play room. He would play the records you would give him (*cntl-r*) and read the books you sent him (*cntl-b*). He would play piano for his and your pleasure. He was my autobiography.



Every little computer guy was different. They had different haircuts and they had different facial hair. They wore different clothes of different colors. Each had a different name (I think that there were about 100 different names.) Some were messy and would leave stuff lying around. Others were clean. Some worked a lot, some played the piano a lot. Some liked to interact with their owner, some were private and would just as soon you not look at them.

There were about sixteen *globals* that defined his *personality*. They tilted his behavior towards one thing or the other. He also had *needs*. He needed to eat, for instance. At first the need was weak (mildly hungry) but as time progressed, the need strengthened until he ravaged the 'fridge. He had needs for sleep, eating, going the bathroom and for a few other things. Each little guy also had different *desires* such as being petted, playing games or watching TV. Desires mostly just fluctuated around some norm, but the fluctuations defined who he was.

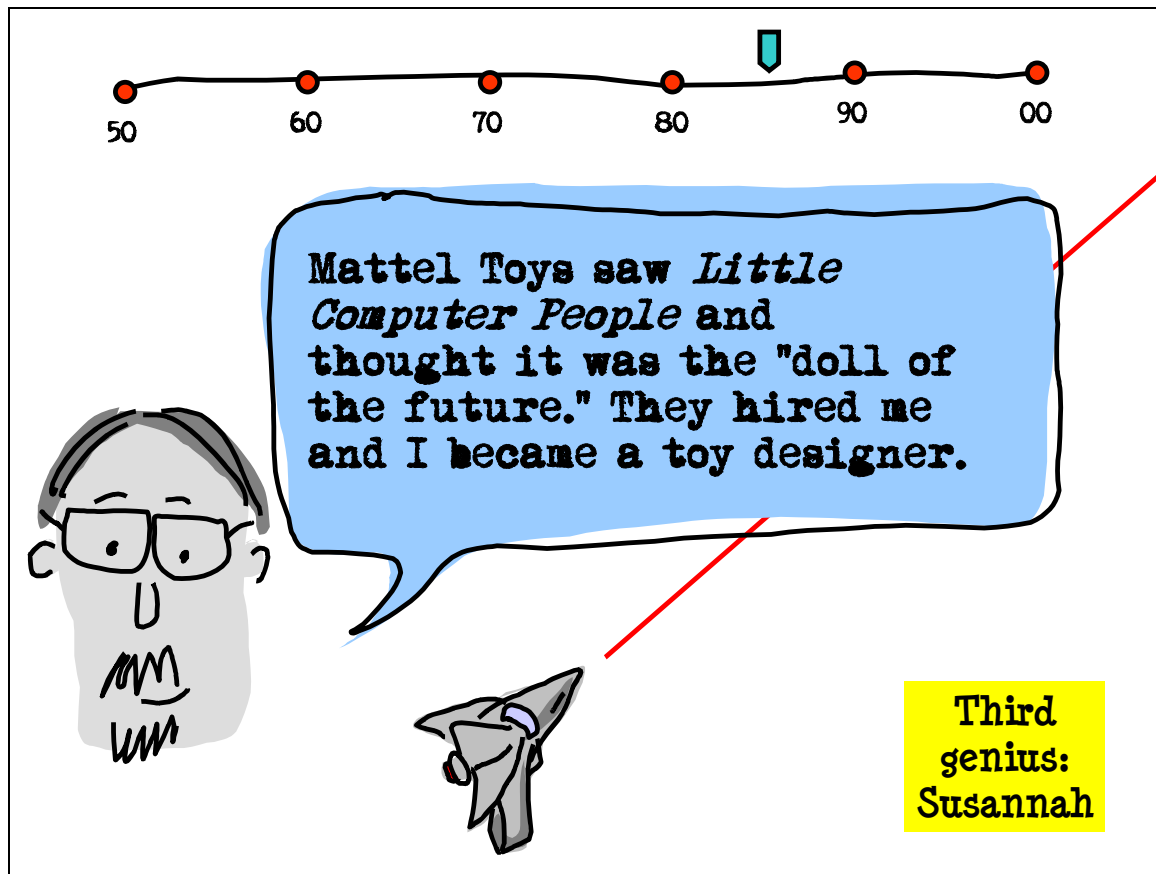
The inter-play between personality, needs and desires was what made him a Person, albeit, a Pet Person. At the heart of the program was a matrix that determined his personality. The cells of the matrix contained percentages indicating the likelihood that such and such would be followed by such and such. These percentages, part of a dynamic Markov chain, would fluctuate over time. It was a *soul* in the Plenitude.



Little Computer People was a critical success and it was highly influential, including being one of the inspirations for *The Sims*. I was studied in the basement of the MIT Media Lab. It had a cult following, cults being a specialty of mine. But it was not a financial success and my agent, as agents do, ginned up a new and wacky project that might be. Unlike the art world, ideas don't necessarily come from some deep recess of your soul. They can also come from a brainstorming session, or from some thought your agent had over his morning coffee while reading *The Journal*.

The idea was called *Talk with Ronald Reagan* and it would give the user the chance to converse with a simulacrum of the then President. While such natural language programs are notoriously difficult, we assumed it would be easier in this case, since if there was any problem, the character could simply start gossiping about a star he once knew or a recount a movie plot he suddenly remembered.

It turned out that no publisher actually wanted such a game. The liberal ones were appalled and the conservative ones didn't want to make fun of their hero. And both were concerned about the possibility that he might die before the shrink-wrap hit the store shelf. There are many reasons why stuff in the Plenitude dies.

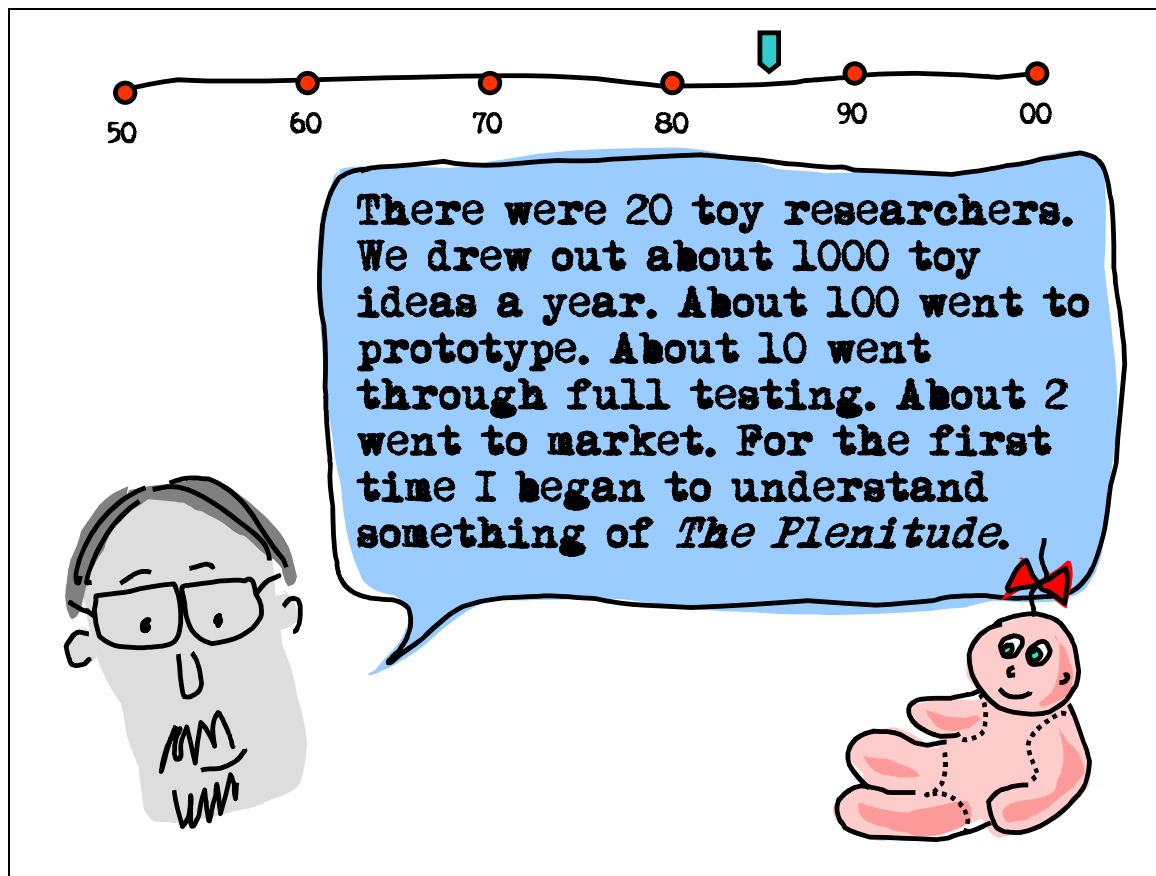


So once again, as it did at the end of my art career, the money began to run out. This time I was living in Los Angeles, just off of Melrose. It wasn't cheap to live anymore.

Through a friend of a friend I was put in contact with a group of researchers at Mattel Toys. It turns out that they had discovered *Little Computer People* and were studying it. They thought of it as the doll of the future. They were right, by the way, but were off by some ten years. In the Plenitude there is a concept called *too early to market*. It was problem that often befalls me. I'm about ten years before the money.

After much difficult negotiation and waiting I was hired into a little band of researchers called *New Business Concepts* or *NBC*. When I joined there were about twenty in the group and run by Susannah Rosenthal. Susannah was the third genius I had the pleasure of working for in my lifetime. She was a toy genius - a toy visionary really. She too was ten years ahead of her time.

But in the meantime, she gave a bunch of us time travelers a place to be while we churned out stuff for the modern child's life.



NBC was a small group quite literally at the edge of Mattel. We were housed in an old warehouse several blocks from the main Mattel building. Toy design is money and you can't allow new ideas escape. They had constructed a tilt-up inside of the tilt-up providing two levels of security.

Our charter was two-fold. *First:* to invent toys using new technologies, new theories, new materials, new play patterns. Computer toys, talking toys, interactive TV toys, toys with "shape memory metals", toys with new foam rubbers, toys with lasers and toys with CD-ROMs before there were CD-ROMs.

Second: to extend the concept of what a toy could be. We looked at old people toys and dog toys. We looked at educational-entertainment toys and we looked at toys for adults. We studied baby toys. We looked at kids break-dancing and wondered if we could make toys for the nascent hip-hop market.

We peered into the future and cobbled what we saw together on our workbenches. Ten years later, of course, we would seethe in anger as others made the big bucks on *our* ideas. Being *too early to market* is both a badge of honor and an error in judgment. It is almost an artistic act.

During the course of a year each of us was expected to come up with oh, say, fifty toy ideas. One a week was easy. Invention, innovation, is a mode of being and once one slips into it, it is hard to stop. In loose brainstorm sessions we could machine gun out ideas one a minute; it was a fast draw competition. It is in fact all too easy to create new stuff. The hard part is to throw out. To firmly kill a bad toy idea was almost impossible.

Twenty people with fifty ideas a year. Of these 1000 ideas I would say that about 100 got drawn up in beautiful, marker drawings or prototyped in styrene, epoxy and cannibalized toy parts. These drawings and models were our primary mode of communication among ourselves and with upper management. Words would take you only so far. This was a very visual culture.

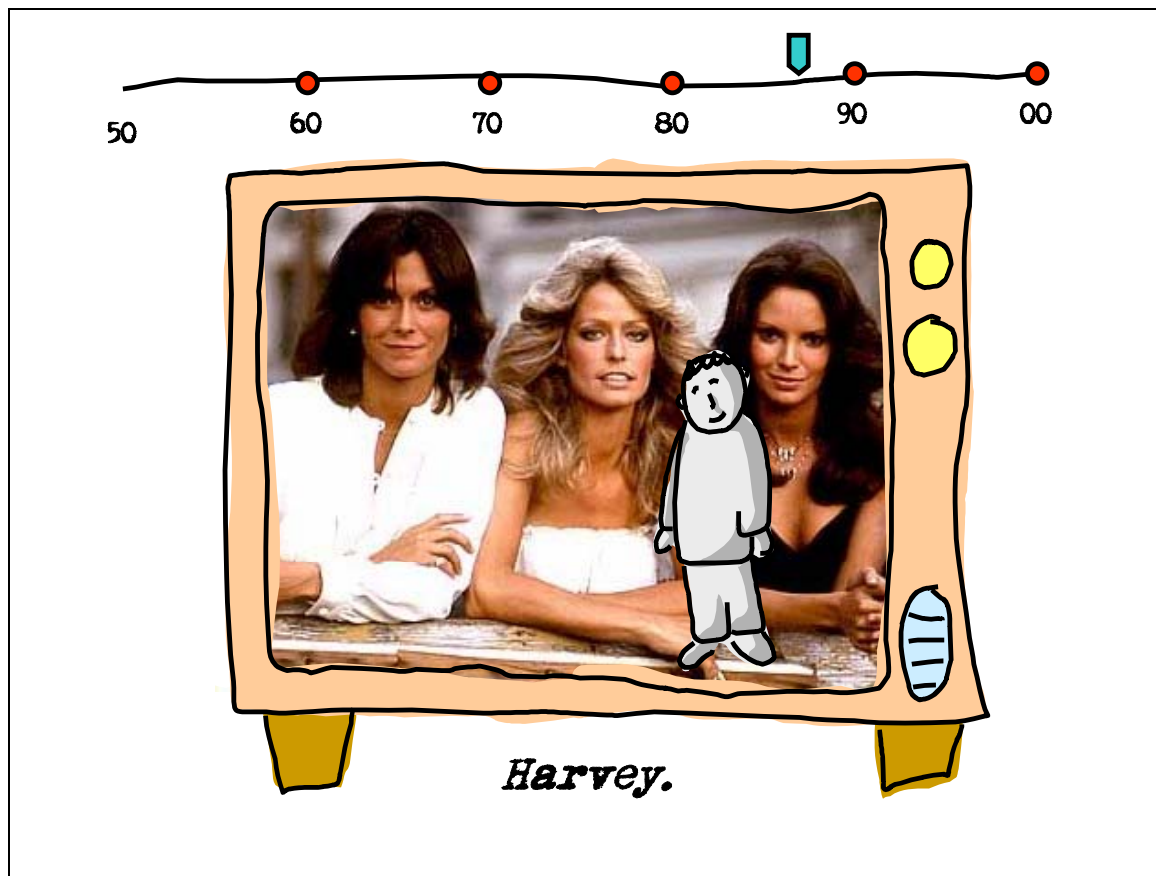
From the 100 ideas that made it this far, perhaps 10 were fully designed out to the point where somebody might call them a real toy. That is, to the point where Mattel marketing would actually care. When suddenly they did care, in came the toy testers, the focus groups and the hired kids. In came the moms, the safety experts, the costing guys and the engineers. Each of these was an *enemy* which one had to get around. One by one the toys would fall. Moms hated it. Kids didn't like the color. Costs too much. Doesn't beat the current best seller. Appeals to too small a demographic. Some marketing guy somewhere doesn't want action figures this year because one of his kids told him that they were dead.

Only about 5 of toys made it through this mine field and into the Mattel machine where they got worked on, and over, by *real* toy designers and engineers. They would get turned into toys we barely recognized and that often appalled us. These were our babies being mauled and mistreated.

In a good year, only 2 or so of the 5 toys that left home would actually make it to market, to the store shelves. There were years when none of our creations made it. We had a vast graveyard of unused, unconsummated marker drawings, enough to supply the world with new toys for a hundred years.

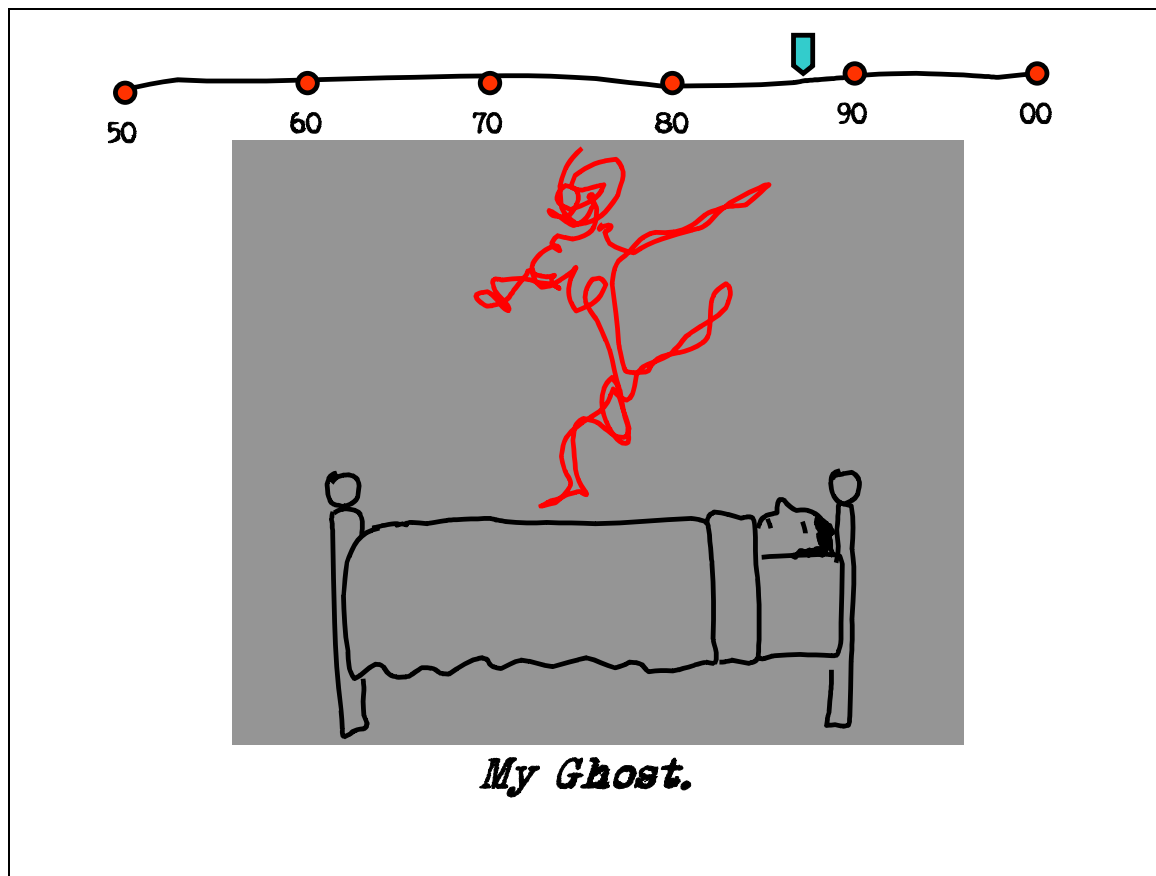
It was the massiveness of the *design carnage*, the realization of how fecund we were, which was my first inkling of how the engines of creation worked to produce the Plenitude. Creating new things wasn't hard, it was easy. Half of the ideas we came up with were easily ideas which *could* have gone to market. But they died. Who cared? Within the Plenitude it simply doesn't matter. Creation is like falling off a log.

What designer could walk into Toy's R Us and not think to themselves: "If all these toys don't make kids happy, what can I design that will?" And the answer is simply: *New Stuff*. That's what the kids of the Plenitude want. New Stuff. By the following Christmas 80% of this year's new stuff would be gone and there would have to be yet newer stuff. The Plenitude is not just about lots and lots of stuff, it is also about a rhythm of creation at evolutionary speeds that takes your breath away.



So what kinds of toys did I design? I guess the simple answer is that I tried to design computer toys that didn't look like computers. I wanted the mysterious effects of computation, but I wanted it in non-mysterious objects. When computer chips became no bigger than your finger nail they could be in anything. They could be in coffee cups; they certainly could be in cars; they could be in toys. They could be in the everyday objects around us. The truth is our little humanoid brains would have no trouble making sense of the computational-enabled bedroom slipper. We would find ourselves saying things like *its smart*, or *responsive*, or *interactive*. Our brains think that it is fun. Interactivity exploits one of the mis-wirings of our minds: if something moves and reacts based on invisible forces (like the calculations of a small computer chip) we think it's alive. Our economy is now based on this mis-wiring.

Harvey was an intelligent cartoon who lived on your TV set just in front of the broadcast image. He was drawn in a black and white wash, New Yorker cartoon-style. He could walk around, watch the show and even tell jokes about what was going on using an interesting trick (still secret.) The trouble with Harvey was that he was too powerful. Once you had a friendly guy in front of the TV image there were all sorts of things you could do from playing games to, well, blocking out the commercials of rival TV toy companies, or turning expensively produced dramas into comedies that featured Mattel. In other words, who did Harvey work for?

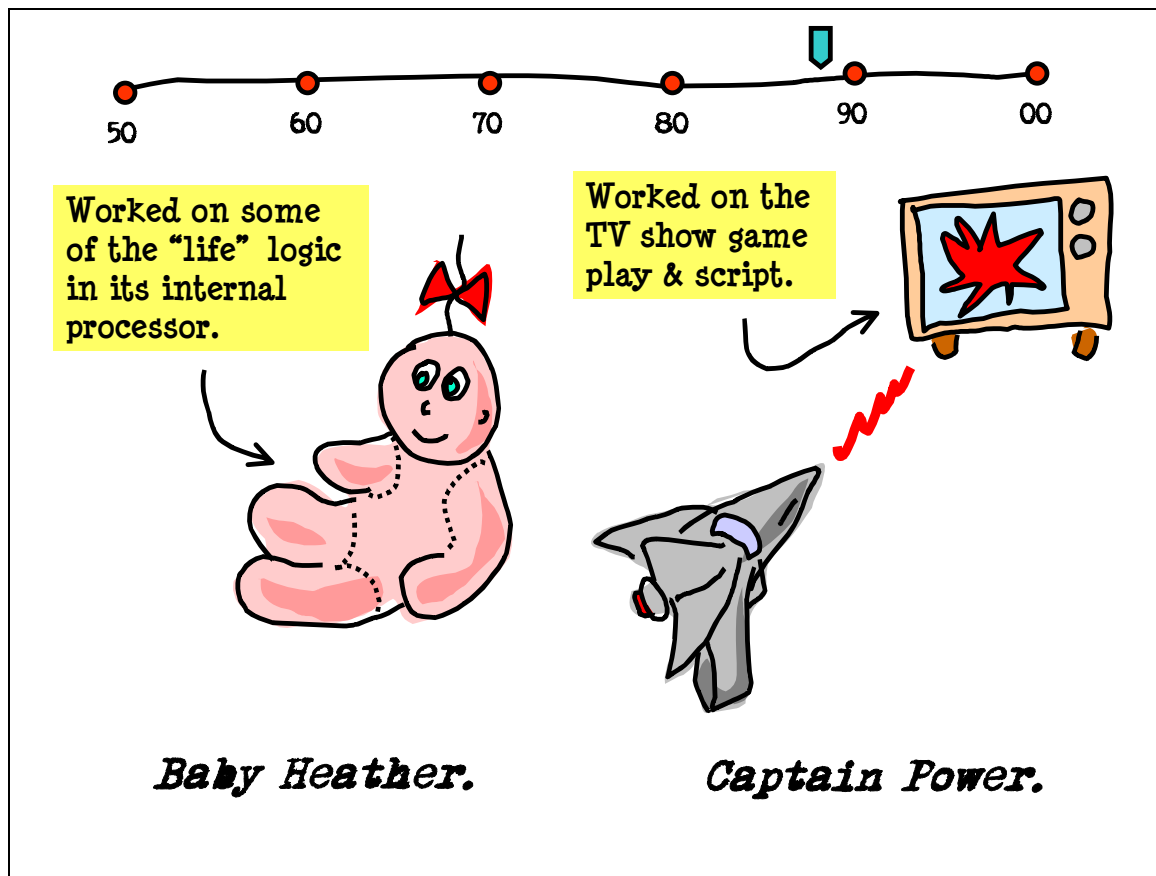


Harvey never made it to the factory, nor did another, more interesting attempt to create a friendly, intelligent personae. *My Ghost* was to use a computer controlled laser beam to draw an animated character over the child's bed while the kid slept. *My Ghost* responded to his child's voice, positions, and motions while in bed. When we tested the idea in focus groups the kids they loved it. *My Ghost* would be their virtual bed time friend, their night time buddy, their own personal spirit. It would be their glowing red guardian angel.

But when the focus group moms heard that *My Ghost* used a laser, they said something like: "No way am I going to have a laser in Joey's room," only louder and with more force. In their mother's imagination they saw the computer going wild and burning out the eyes of their children. And you have to remember that it's the moms who buys the toys.

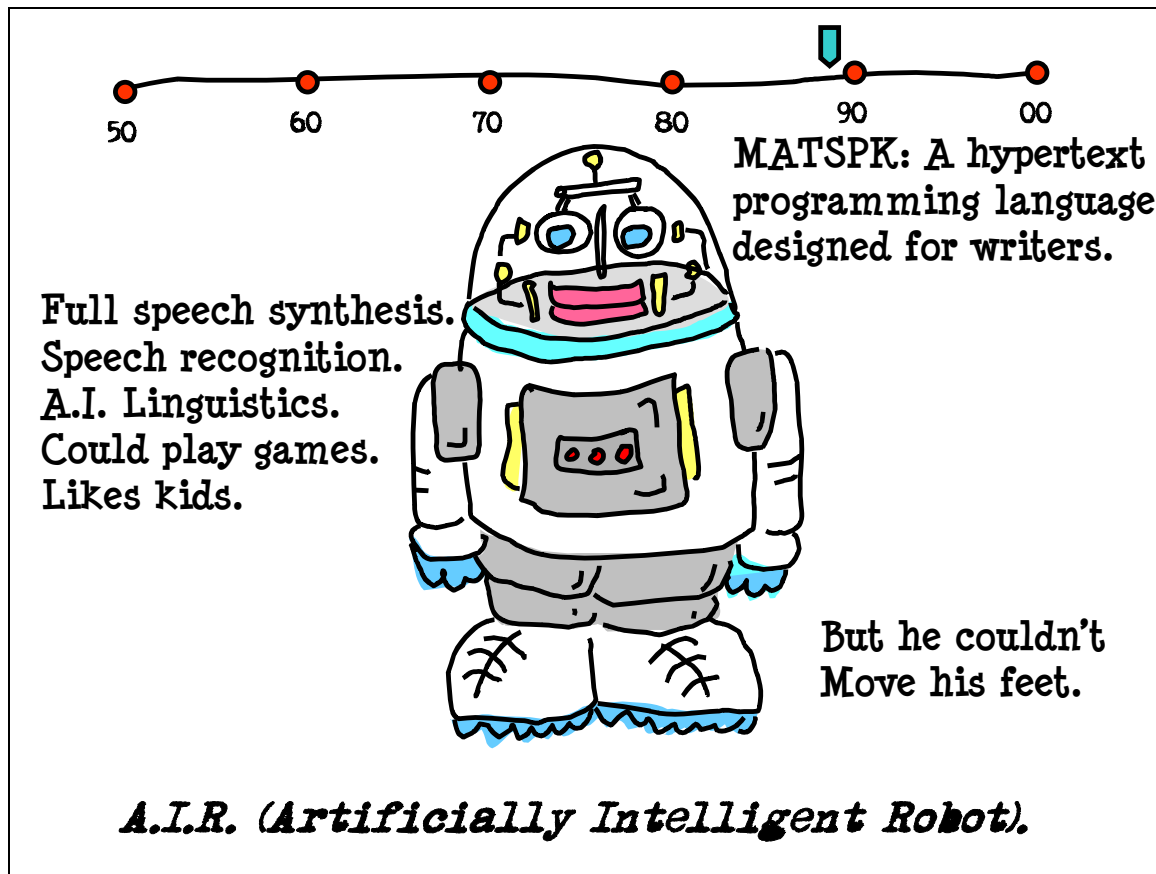
Now we also know that whining works as a method of getting mom to buy you what you want.

But whining doesn't beat lasers in the bedroom. Not by a long shot. Project dead.



Besides my own toys I had the pleasure of working on toys created and designed by some of the best toy designers in the world. Tiger Toys had brought in *Baby Heather*, an interactive baby doll that grew up, from 6 months to 3 three years old, as you played with it over a couple of weeks. I did a little consulting on the daily life of a talking baby doll having done a *Pet Person* myself once.

Captain Power was an interactive TV toy created by the highly talented vehicle group in NBC. Using a rocket ship that looked suspiciously like a gun, you could shoot at a broadcast TV show and, amazingly, the show could shoot back. If you got hit three times your rocket ship/gun would blow up in your hand! And all this without wires or special hardware. I helped to work on the game play of the TV show, a hopeless task at a Toronto video studio, which my friend Novak soon took over. The director could care less about where the actors were supposed to stand so that some invisible kids somewhere could shoot at them. They were interested in drama.



It is interesting what can go wrong in toy design. In my third year at NBC I began to rework some of the ideas that had popped up during the Talk-to-Reagan project, the heart of which was an interactive conversational engine (programmers love calling their creations “engines” - it sounds so physical) and the scripting language that went with it.

A.I.R. (or the *Artificially Intelligent Robot*) was a beautiful, soft robot with a clear head with lots of moving parts including eyes, mouth and eyebrows designed by a Mattel master doll maker named Abo. Some of the mechanicals were engineered by Caleb Chung who went on to design *Furby* ten years later. Unlike *Reagan*, where you had to type in your question, the kid could speak to *A.I.R.* and *A.I.R.* would understand the words using voice recognition. While the robot could only distinguish maybe twenty words at a time, it could speak fluently back. It turned out that for games like *Tic-Tac-Toe* this was more than enough. *A.I.R.* would say something like: “I’ll put my X on the Red square. Could you put it there for me? Thanks. Now where will you put your O?” Then the kid would say: “Blue” (meaning the blue square on the board.) The computer inside *A.I.R.* would run through its script and then say something like, “Blue! No Way! Not Blue! How could you!? I’m dead. Hmm, well maybe not dead. OK, OK, I’ll put my X on Green. No wait. I take that back. I’ll put it on Orange. Could you place my X on Orange. Thanks.” And so on.

We made it soft and almost cuddly because we wanted kids to think of it as a smart friendly robot and not a computer in a robot's body. We worked with Tiger Toys to design it and it was being built in Hong Kong when the plug was pulled.

What went wrong? Well, a collection of things:

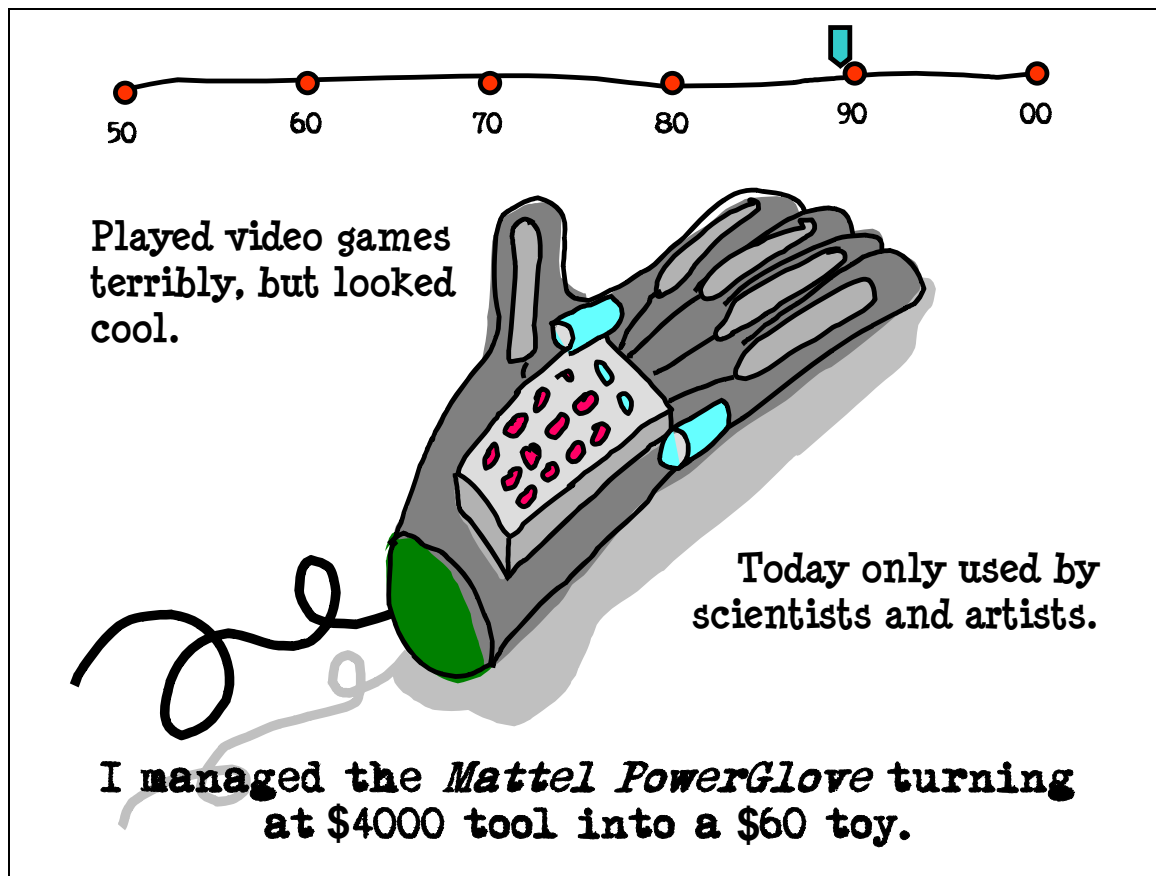
First, Nintendo released their NES system at about the same price as our robot. Its hard to beat interactive TV with a robot, even if it had a charming one. The NES system promised an unlimited number of game worlds while *A.I.R.* was just one, silvery guy.

Second, the voice was a little hard to understand. You could get used to it, but at first it seemed garbled. Sure its always hard to talk with another species, but the Plenitude gives you little leeway. There was already too much stuff. One small problem and you're history.

The *third* problem is that human language is filled with all sorts of "What did you say?", "Could you repeat that?", "What do you mean?" and so on. They are called *conversational repairs*. Not only is it hard to talk with a robot, it is hard to talk with another human and much intelligence and repairing is used trying to make sense of what your best friend is saying. The problem was just too complex for a soft, cute robot even if you talked very very very slowly.

But the *fourth*, and most the important reason for its demise, in my opinion, was that it couldn't move its arms and legs. "What kind of robot can't move," the kids asked? "Whose going to buy that?" By making it in the shape of a robot we set up the expectations of full *robothood*. In retrospect I now see that it should have been an egg. A robot egg. You could talk to a robot egg and no one would expect it to be able to move around and pick up stuff. The egg would have seemed *brilliant!*, he says way too may years after the fact.

Toy design is like design in the rest of the Plenitude. It's ruthless and most stuff dies. The Plenitude's graveyard of species that didn't make it is a hundred times as big as the species that did. And it just doesn't matter. Even after the die-off we still have way too much stuff.



Unlike art, where ideas are supposed to arise from within the artist and hence should have a uniqueness about them, in the product design world ideas can come from anywhere and the more people who already have the idea the better! So when *Virtual Reality (VR)* suddenly emerged from academic research and on to the popular magazine stands, it was an easy step to say: “Hey, lets make it a toy!”

It was Jaron Lanier who, while not inventing *VR* per se, did invent the *VR*-trope. He suggested that if we fully close off all our sensory organs from the *natural* world and replace those sights and sounds with computer generated input controlled by the motion of our bodies, in particular our head and hand motion, then it would be *indistinguishable from reality*. In fact, in some very real sense, it would be reality. It would be *Virtual Reality*. In Jaron’s charming, but odd vision, we would no longer even need language since we could reconstruct the world whenever we needed to express something. If we needed to say something like “a lobster sitting on a red rose” we could simply make a lobster on a red rose.

But more to the point, we wouldn’t need the Plenitude anymore, for we could construct a *Virtual Plenitude*. You want a hundred cars, each one as big as a house, you got it. The only rub, bigger than you first might imagine, is that the *VR* system itself has to exist within *this* Plenitude.

That the technology at that time was not even close to being able to doing any of this hardly mattered. It hardly mattered that you actually felt somewhat sick in a *VR world* (and we really did call these simple cartoons *worlds*.) Or that the whole language replacement idea doesn't work. None of this mattered.

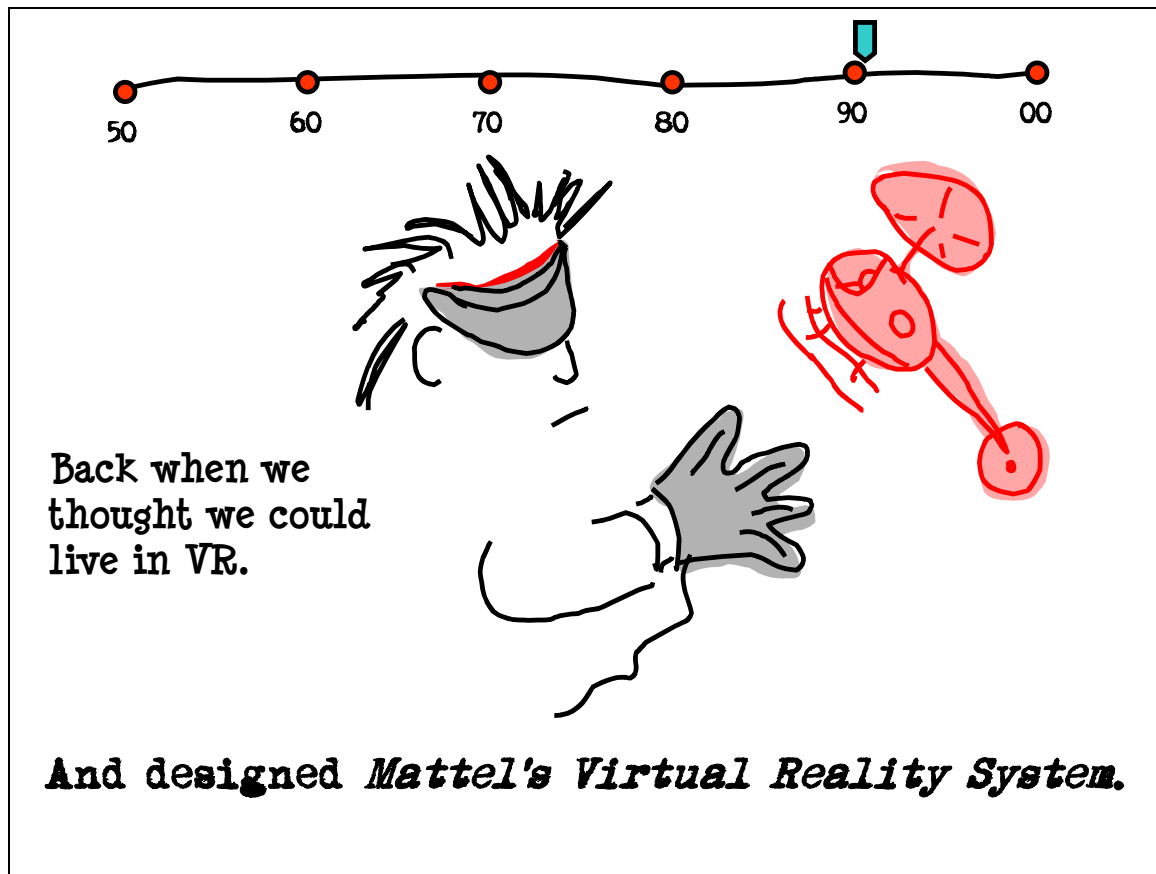
What mattered was that the idea was super cool and that there were real computer systems that could get a shadow of the *VR* idea working, though expensively.

It wasn't many weeks after seeing Jaron speak on these things when a toy design company came to Mattel wanting to license to us a VR system including Jaron's *DataGlove*. The *DataGlove* had come to represent VR in some way even though the real key to VR was the head motion detector not the hand motion one. In the end Mattel licensed the *DataGlove* but passed on the full VR system. I was given the task of managing the project, of specifically taking a \$4000.00 piece of equipment and selling it for \$80.00 at Toys R Us as the *PowerGlove*.

Since we had not bought the technology to create the actual 3D part of the Virtual Reality we had to have the *PowerGlove* control something else. It was decided that it should control the Nintendo Entertainment System. We tried to make it so that it could control any video game from driving (pretend the Glove was moving a steering wheel), to platform games (your hand is the character, move up to jump); to shooters (well, shoot.) We also decided to re-do one existing street fighting game and to design one game from ground up (*Super Glove Ball* - designed by Novak.) The Glove had standard modes for regular games; but it also had programmable modes which we just threw in there because we could.

From a manager's perspective it was a fight for it was very late project. We had less than a year to produce what would normally take two, or even three years even *if* you knew the technology. Hey, a Hawaiian Barbie Doll takes two years to engineer. And we were inventing the technology on the fly.

In the end we got The *PowerGlove* out for Christmas and it sold well. I think no money was lost. We all had grown older, much more than a year's worth. It changed the world a little; it changed us a hell of a lot. The *Glove*, needless to say, was a terrible video game controller; the hand is just too slow compared to the thumb. What *was* surprising was that by the second year the *PowerGlove* could be found in scientific research labs all over the world, replacing its more expensive father, the *DataGlove*. And it could be found being used by artists in performance pieces and musical events. It was theatrical. It was programmable. And it referenced the magical realm of *VR*, where we could all live for the rest of lives, creating roses and lobsters at will.



The tidal wave of VR was in full curl, catching and carrying everything with it. Through the *PowerGlove* I found myself part of a movement. But it was an odd movement: there were social theorists and critics positing a full VR future as if it was a net positive, and in some cases, as if it already existed; there were computer and graphic hackers; there were large companies like SGI and Sun; there were toy Gloves and kids playing with them; there were artists waving their arms around; there were breathless magazine articles and even more breathless books; and in the middle of everything there was the Military. The Military had already invented VR, really good VR, to simulate everything from aircraft to tank warfare. They were just doing human factors engineering for warriors. It never occurred to them that they were engaged in a philosophical argument about the nature of reality itself.

The result of all of this, and the more or less successful launch of the *PowerGlove*, was that I spearheaded a project in NBC to create a real toy VR system. One that you wore goggles for. One where if you turned your head around you saw what was behind you. Or if you looked up you saw the sun. Sure it was monochromatic (red and black), sure it wasn't stereographic (turns out that didn't matter much), sure it didn't use the *PowerGlove* (joysticks being better and cheaper for games), but it did have stereo sound (important actually) and head motion detection. *VR* is really all about head motion those in the know, know.

We got a helicopter game up and running. You were the helicopter. You could fly all around the black and red world shooting tanks. We showed it to the President of Mattel. We helped him fly his VR helicopter way up into the sky. We showed him how to look down. On the ground the buildings spelled out **M A T T E L**.

I think it is fair to say he never got it. I think he thought he was watching a movie and that the tanks came into view they way they do on TV; just wait for the director to send them in front of the camera.

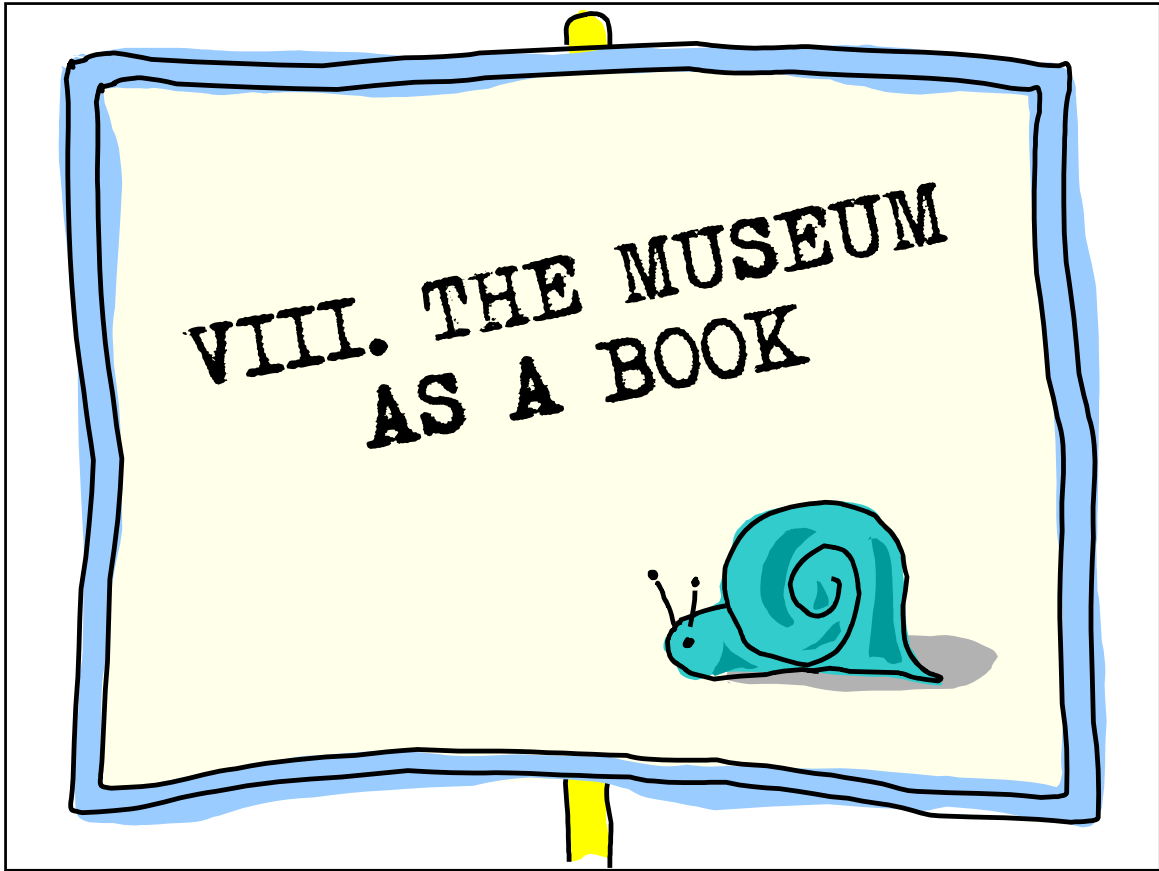
And certainly nobody believed that we could sell a \$500 dollar VR system. Anyway, the last time Mattel had gotten into video game business it went bankrupt. Corporations have institutional memories that create institutional responses. It is one reason why the products from different companies look different.

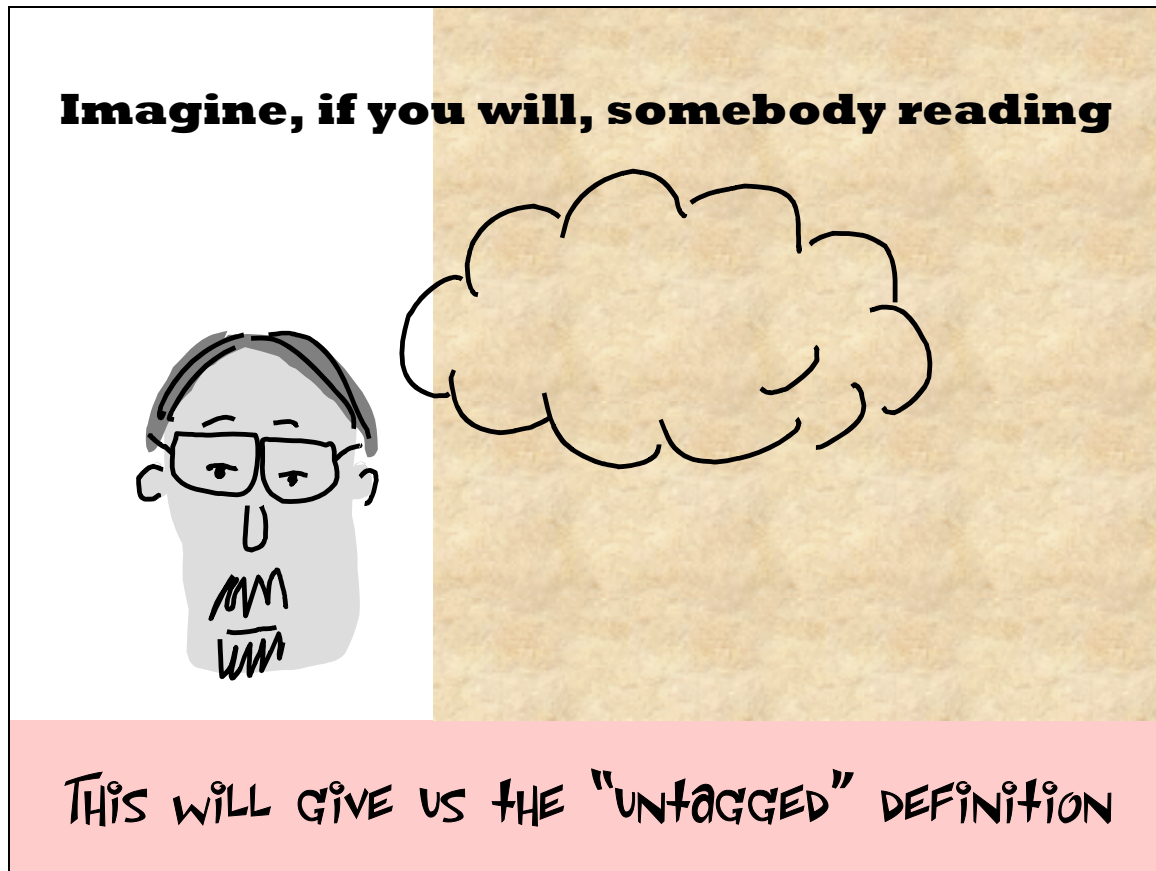
The VR system was the last straw.

NBC, under the brilliance of Susannah, was seeing way too far ahead for a toy company. We now know, in retrospect, that we were, once again, about ten years ahead of our time. Designing ahead of one's time in an interesting methodology, but it is not appropriate for toy design. Toy design is about designing for now. And in general, if you want to become successful, and not just famous, designing ten years out is not a good strategy.

But there does turns out to be a very small, and highly rarified, group of folks in the Plenitude that do work in the ten year out time frame. They are usually segregated from the rest of the Plenitude in little walled villages at the edges of the big corporations. Or sometimes in warren like nests in the basements of university departments. Their job was to think about, and invent stuff, for the Plenitude that that average people wouldn't see for a decade. Little protected engines of *innovation*. If the Plenitude itself has an art form, it is made in odd places called *research laboratories*.

I was about to stumble into one of their encampments.





Reading is one of those large cloud-like words that has been rolling around history for five thousand years or so and has picked up many meanings and shades of meaning. With a word like *reading* it is often useful to find the center of the cloud, what can be called the *untagged* definition. That is the definition without any modifiers.

One way to find the untagged definition is to picture the image that is elicited by a simple sentence using that word. In this case picture the sentence: "*Somebody reading.*" Not the words *somebody reading* but somebody actually reading. The image conjured will tell us a lot about the center of the cloud.

I should point out how rare it is that we actually picture the image a sentence. When we say something like: *Could you go to the store and get some milk*, we rarely picture the entire sequence happening like a movie. For the most part, language is a *tool* in this world and not a parallel representation of the world with well known equations of correspondence. Otherwise *Homemade Soup in a Can* would be a crime and not an engine of economy.

**A woman,
Alone,
Silent,
In a chair or bed,
Reading a novel,
Totally absorbed.**



PERRY, Lilla Cabot
American (1848-1933)
"Woman Reading"

When asked to picture *Somebody reading*, most people, but by no means all, picture something very much like Lilla Perry pictured. First of all, they picture a woman. It turns out that reading is slightly *gendered*, though not as deeply as the word “sewing” is. *Somebody sewing* is almost always a woman.

Second, they picture the woman alone. She is by herself, if not literally, then at least figuratively. My own mother, who had five kids, was able, when she was reading, to *not hear any of us* or the blaring TV. She was alone with her book.

The woman is reading silently. She is not reading out loud to herself, her kids, her lover, or a room full of people, though we know that all of these are possible. It is possible you could have pictured an actress reading her lines on stage in a rehearsal, or a newsperson reading from sheaf of papers, or the one literate villager reading letters to the other villagers, but usually to have that happen we would have needed to tag the word *reading* to mean these things. We would have to say something like *She read the script out loud with passion* to conjure up an actress rehearsing.

Our woman reader is reading while sitting in a chair. Many people picture her reading while laying in bed. In fact, many people can only picture people reading in bed (it is their argument against e-books, that they would be uncomfortable read in

bed.) But in either case she is in repose, calm and un-agitated. Few in America picture her reading standing up and reading propaganda posters pinned to a wall. There is also a recurring lovely image of *reading while walking* that is often found in movies. The heroine goes to her mailbox, gets her letters, opens one of them, and reads it while walking back to the kitchen. She sometimes faints. Few image this.

The woman that most people picture *reading*, is usually reading a novel which is our archetype reading material even though we spend more time reading newspapers and magazines than novels. If you own a computer you spend even more time reading its screen. The novel is a book, pages bound with hard covers. Books have a special place in the Plenitude for they were one of the first mass produced items. The printing press, for all of its other historical importances, also marked the birth of factory culture. Some say that the Plenitude starts with, and is defined by, a Plenitude of pages. That the ethereal skill of literacy is the ground on which the Plenitude rests. Certainly without it, it is hard to image the corporation.

For most people, not only is the woman reading a novel, she is reading an un-illustrated novel, one without pictures or drawings. A hundred years ago almost all novels were illustrated and would contain line drawings or wood cuts. Today, except for the book's cover, which has become hyper-illustrated, the illustrations are almost all gone, even in books that were originally illustrated, like Dickens. However, except for novels, all most all other reading *is* illustrated. Certainly magazines and newspapers are. But so are history books, biographies, comic books, text books, recipe books and operation manuals. The web is famously illustrated. But most people picture the un-illustrated novel when imaging untaged reading.

Lastly, and most importantly, people picture the woman reader fully absorbed in the book. And that might be putting it too lightly. She is completely engrossed in a constructed, virtual world that arises from the text. The book itself has disappeared for her. So has her chair, the room and her life. She is lost in the text. This act of becoming lost in the text is highly prized in our culture. It is considered a creative act as well as a sign of a good book. I have heard parents argue against illustrated books because they don't allow the *child's imagination to work fully*. To create a virtual world from text is considered more imaginative, e. g. better, than falling into a drawing or watching a movie.

I don't know when it was discovered that reading long passages of text caused such complete hallucinations, but today it is considered one of reading's most important properties. A book that doesn't transport, well, its just not very good, is it?



**BUT READING HAS CHANGED
OVER TIME AND PLACE**



Once was...
Male,
Out loud,
Group,
Standing up,
Highly social.

While this is the common, untagged image in the West today, it is not how other people in other times imaged *Somebody reading*. Reading, and how we think of it, has changed over time and place. Not so long ago, five hundred years, the untagged definition of reading would have been very different. For one thing, it was primarily only men who knew how to read and they were mostly monks and bureaucrats, and not leisurely female students that Perry painted.

Secondly, much of the reading that was done, was done out loud. There were those who thought reading *silently* was the work of the Devil. More importantly, reading was often done as a group and it was combined with discussion, annotation, argument, writing, study, questioning, eating and grouching as these scholars are doing.

The key however, was that one did not fall into the virtual, hallucinatory, world of text. Rather text was part of this, the corporal world. It was tool, a physical presence, part of life. Reading certainly hasn't always been considered a good thing for everyone, let alone itself being considered a creative act.

TODAY READING IS DIVERSE



We even read our fruit

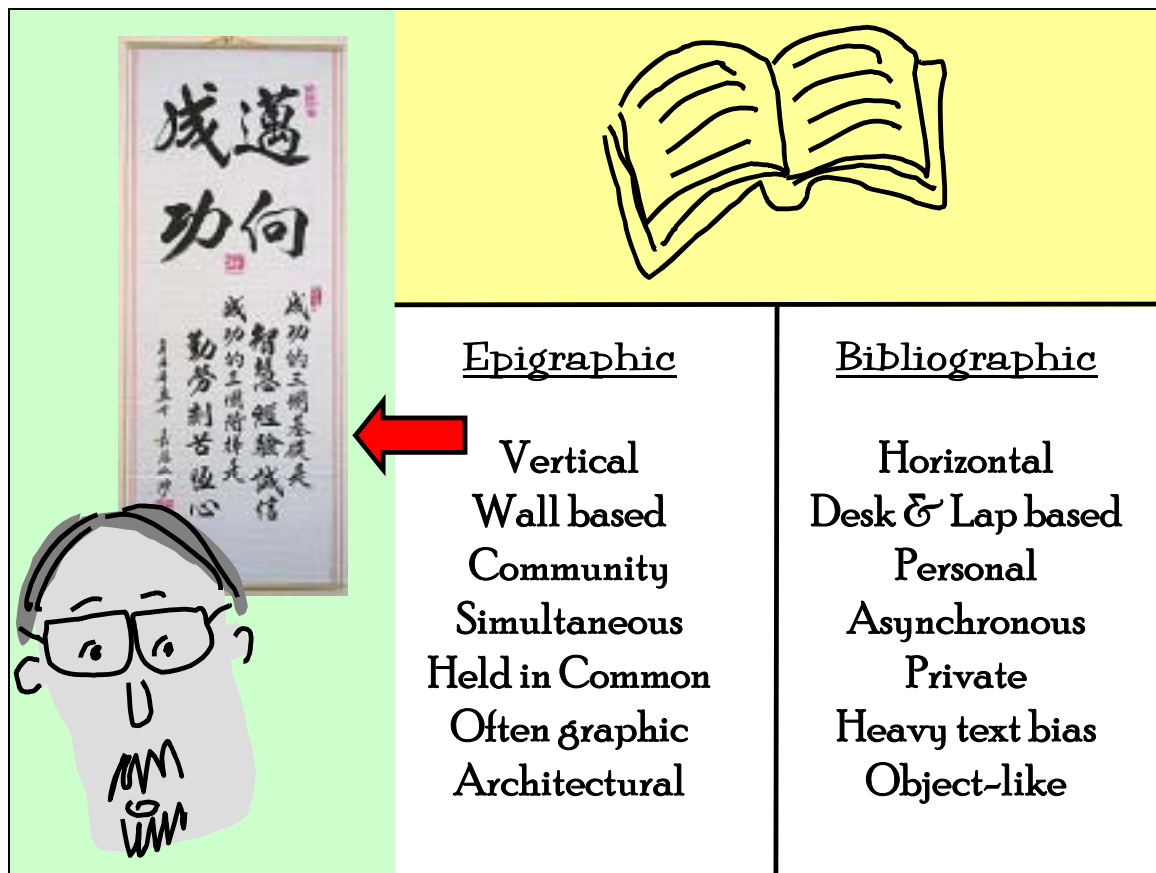


But even in our own culture, and in our own time, *reading* is hardly the unified experience our untaged definition might lead us to believe. There is, for instance, a tremendous amount of reading out loud, including synchronously in church, individually to children at bed time, and of course, almost all TV shows are people reading to us off teleprompters.

Our environments are heavily signed, and we can't help but read the signs, from billboards selling us the Plenitude to EXIT signs telling us where to go in case of disaster. Almost all the streets in America are signed; we have become a living map. A remarkable number of laws can be read in place. SLOW. DON'T CROSS. STAY OUT. Instructions for usage are everywhere as well. PRESS 5 FOR POPCORN. INSERT BATTERIES HERE. START.

We spend more time reading heavily illustrated newspapers and computer screens than we do reading novels. We also read T-shirts, menus, TV-guides, scrolling news across the bottom of TVs, playbills, dashboards, the web, letters and junk mail. By law every manufactured item the Plenitude has to be labeled with words naming the country in was made in (and if clothing, how to wash it.)

Even our fruit is covered with words.

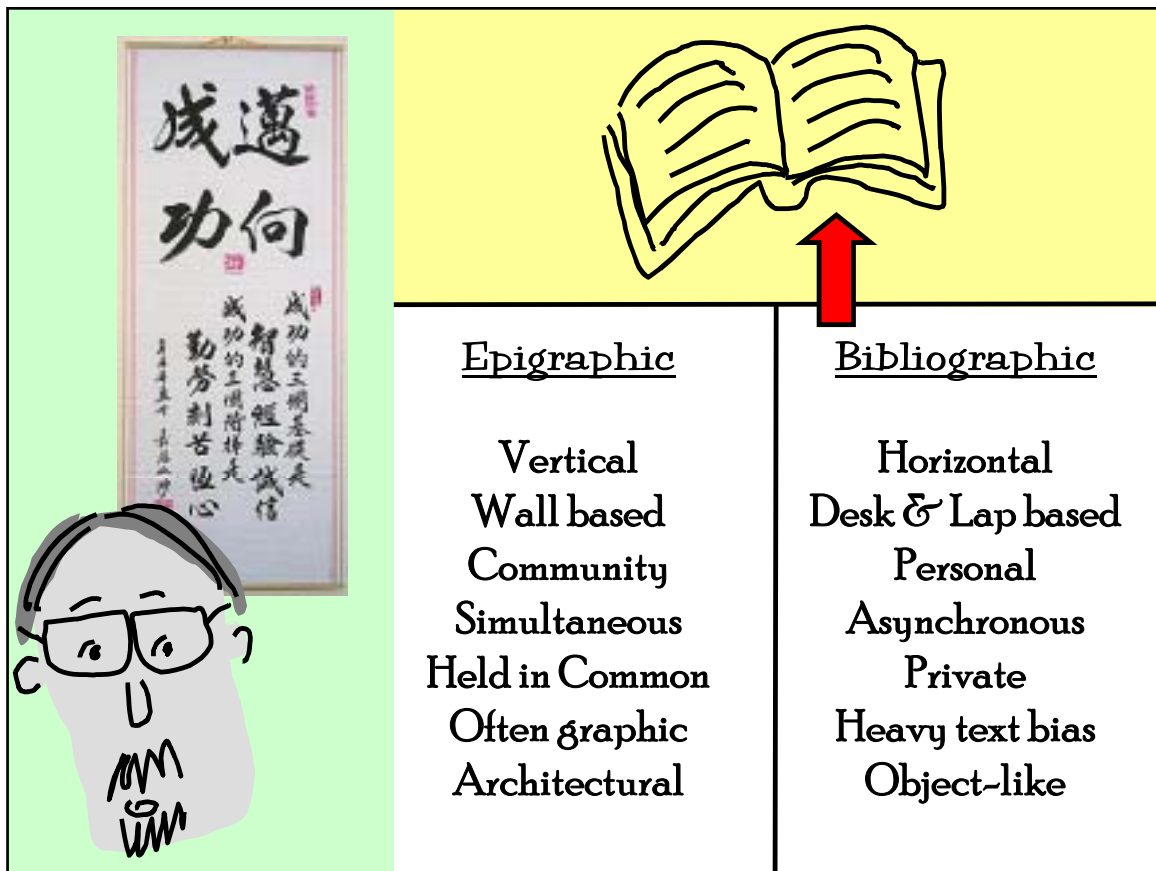


Scholars divide cultures into two groups based on their general form of reading: the *epigraphic* and the *bibliographic*. No culture is all one, but they do tend to drift to one end of the spectrum or the other.

The epigraphic cultures are *wall readers*. Their reading is vertical and the lettering is relatively large. Because it is on walls groups of people can read it simultaneously, or near simultaneously, and it is held in common by the group. It is often read as part of a ritual.

Epigraphic writing tends to have graphics embedded within it and the illustrations are more or less part of the text. Calligraphy is often a major art form in epigraphic cultures, blurring the boundary between text and art. And because it is on walls, it often becomes part of the wall. The chiseled words on Greek buildings are symbolic of an epigraphic culture, a referent we still use when we want to say: “important”.

Japanese and Chinese cultures are classically *epigraphic*, but so were Medieval cathedrals with their frescoes and stain glass windows. Elementary school classrooms are highly epigraphic (we seem to learn the alphabet off of walls) as is the rock-and-roll poster culture. Museums, with their ubiquitous signage, are also highly *epigraphic*.



Bibliographic cultures, on the other hand, are paper readers, magazine readers, book readers. They read horizontally off of desks, tables and laps. Their writing is printed on relatively small sheets of easily foldable paper. The reading is done by more or less privately (the book cover does inform other people what you are reading.) Reading over a shoulder is considered borderline offensive. It's private reading, the knowledge gained is yours, only later to be shared in conversation.

Bibliographic writing tends to be heavily text based with lots and lots of sentences. Images, when there, are clearly delineated from the texts, often with borders around them. There are strict conventions around captioning and how the images, when they appear, are related to the text. The fonts themselves are machine-like (not calligraphic) with all "a"s being the same as all other "a"s. While different fonts do carry different meaning, they are often thought of as secondary to the hallucination.

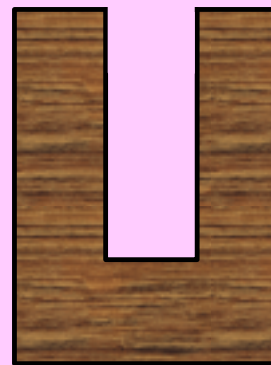
Unlike epigraphic wall writing, *bibliographic* books are first class objects of the Plenitude which you buy at special stores and keep on special shelves. They are given as presents and treasured over long periods of time. It is impossible to throw away books in *bibliographic* cultures; they are powerful talismans.

In literate households of the Plenitude there is often more weight in books than in any other form of stuff. They fill the most boxes in a house move.



THERE ARE MANY FORMS IN BETWEEN EPIGRAPHIC AND bibliographic, including COMPUTER MONITORS, NEWSPAPERS, MENUS, PRAYER BOOKS, ETC.

CORPORATIONS ARE MOVING FROM bibliographic (MEMOS) TO epigraphic (PowerPoint.) THEIR BOARDROOM TABLES REFLECT THIS CHANGE:



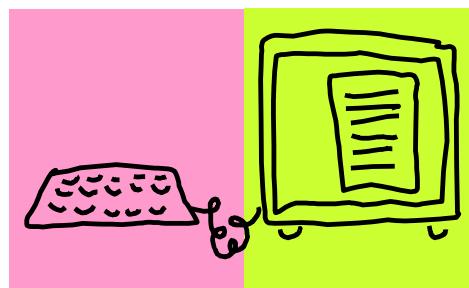
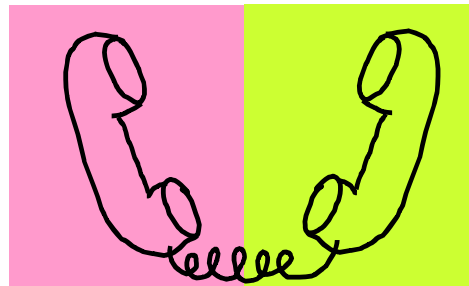
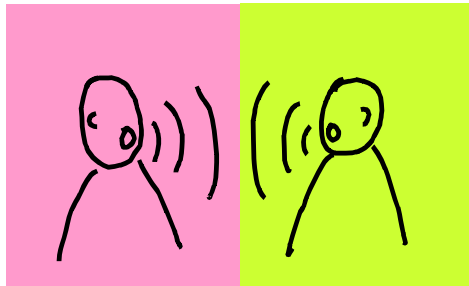
There are many kinds of reading between epigraphic and bibliographic. Computer monitors are an interesting case study since they appear to be *bibliographic* but have slid into a vertical, *epigraphic* position. Hence, reading a computer over somebody's shoulder is not quite so bad as reading a book over the shoulder.

A more interesting example is from the corporate world. Ten years ago information was disseminated within companies via memos which are highly *bibliographic*. You would receive many memos a day. If there was a meeting, you were supposed to read your memos *before* going to the meeting. Once there, you would sit at an oval table with your memos arranged in front of you like a deck of cards.

In the intervening years the corporation has become *PowerPoint*-centric which is an *epigraphic* form. You read PowerPoint off the walls. You are not supposed to read PowerPoint presentations before you get to the meeting since, like all epigraphic writing, they are a social form to be read communally together. Such presentations have actually changed the architecture of the boardroom table which is now U-shaped allowing the wall to be better viewed.

Unlike memo culture, people clap after verbally augmented *PowerPoint* presentations. They rarely did that for memos.

We often say that content modulates medium.

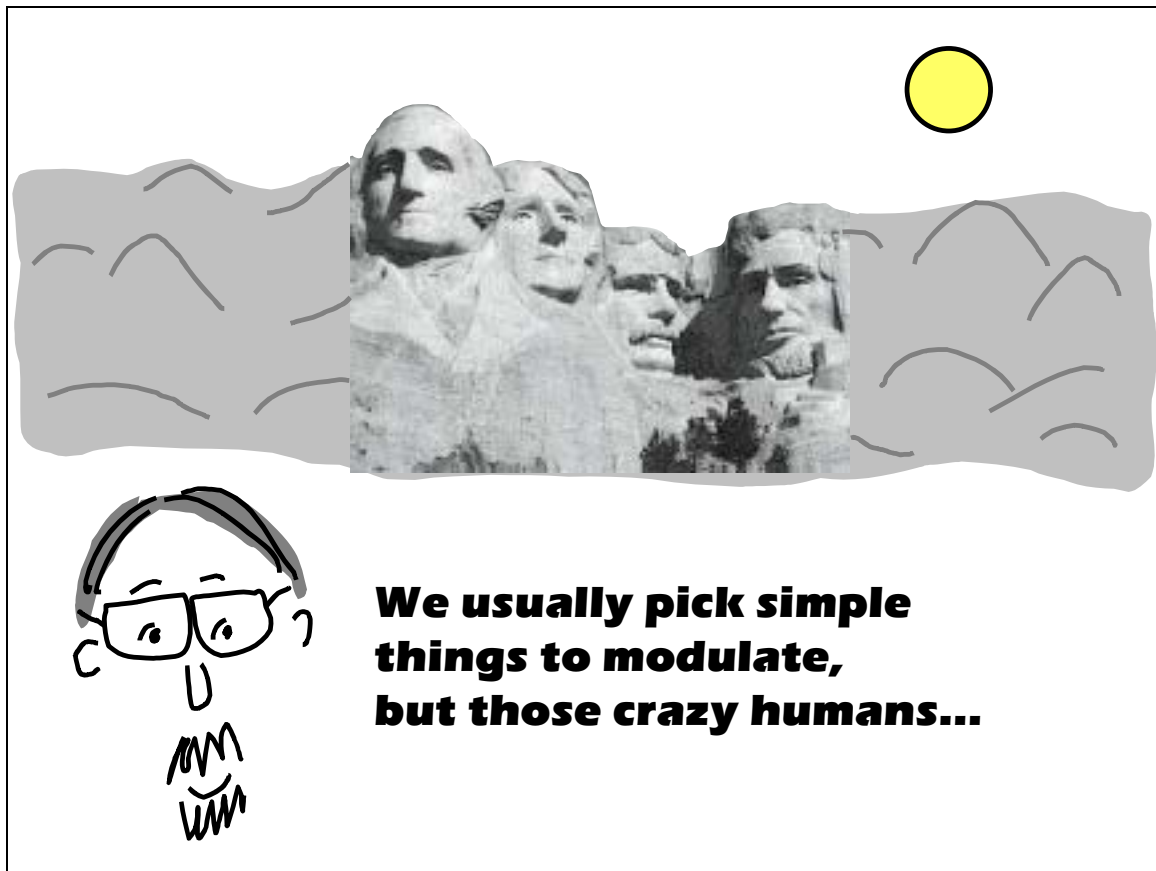


Sometimes once, sometimes over and over.

In the West, at the beginning of the new millennium, we divide the Plenitude into two: *media* and *content*. They have the following relationship to each other: content *modulates* media. The air between us is the media. When I speak out loud I am modulating that media. When I stop talking the air is still air. My voice was the content.

A telephone is little different. My voice, the content, modulates the phone and the phone wires. When I stop talking the phone is still the phone. The wires are still wires. Same is true for a computer screen. My email modulates the pixels on the screen. Then some other content modulates the screen, perhaps a spreadsheet. But when my computer is off, the screen is still the screen.

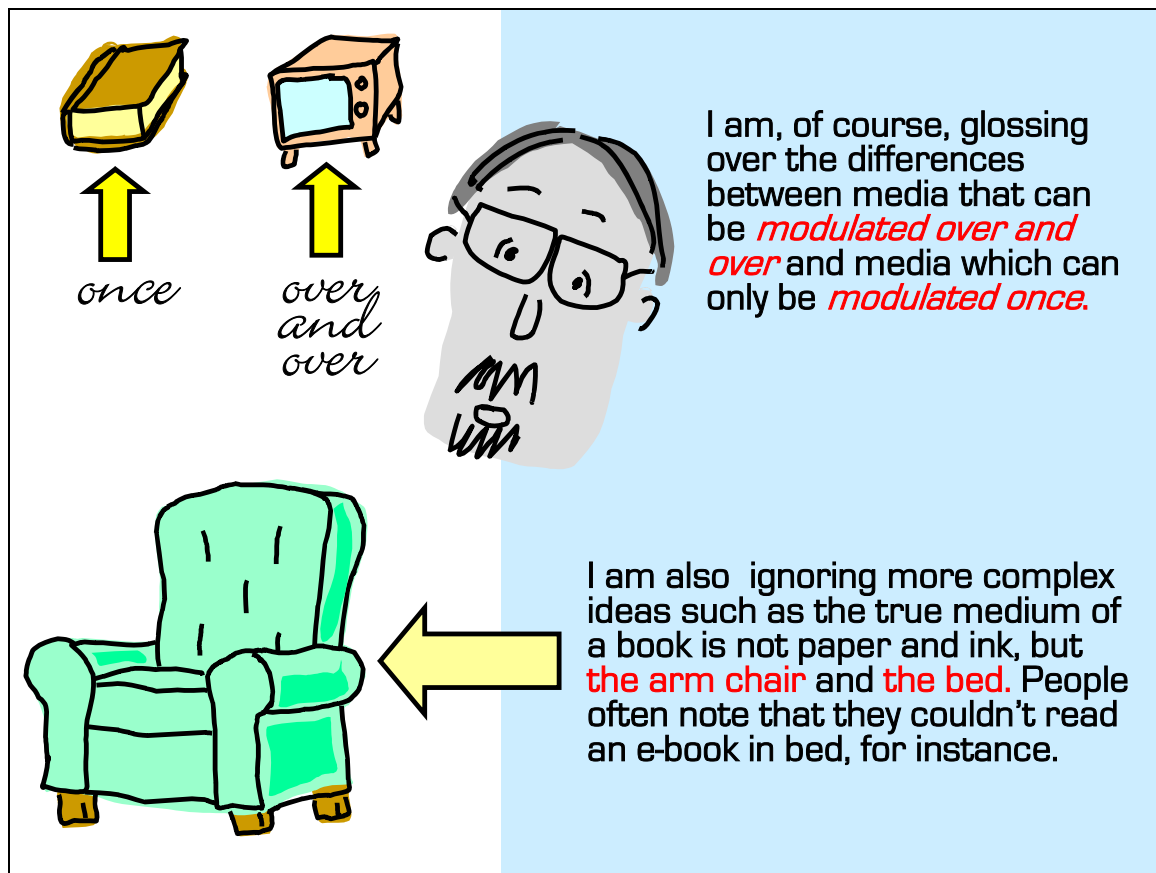
Books are different being in the category of *modulate-once* (as opposed to *over-and-over*) media. The printer organizes ink (using a printing press) to modulate the paper. The paper is modulated only once (though we can imagine an erasable book.) We have little problem understanding what is the content (the novel) and what is the medium (the book.) The Plenitude, however, is in a transition from a modulate-once to modulate-over-and-over book. The copyright wars are about this transition.



As Jaron Lanier, the father of Virtual Reality once said, we usually pick simple things to modulate for our media. That is, media should be easy to modulate. Air, for instance, is easy to modulate and through evolution we have developed the mechanisms to modulate it with our vocal chords and to pick up the modulations effortlessly with our ears.

When we invent, engineer and build media we usually follow this same principle. Telephones and computers and easy to modulate. Making these *PowerPoint* slides was relatively easy, for instance. Now making and manufacturing computers and phones is hard, and quite complex, and a different problem.

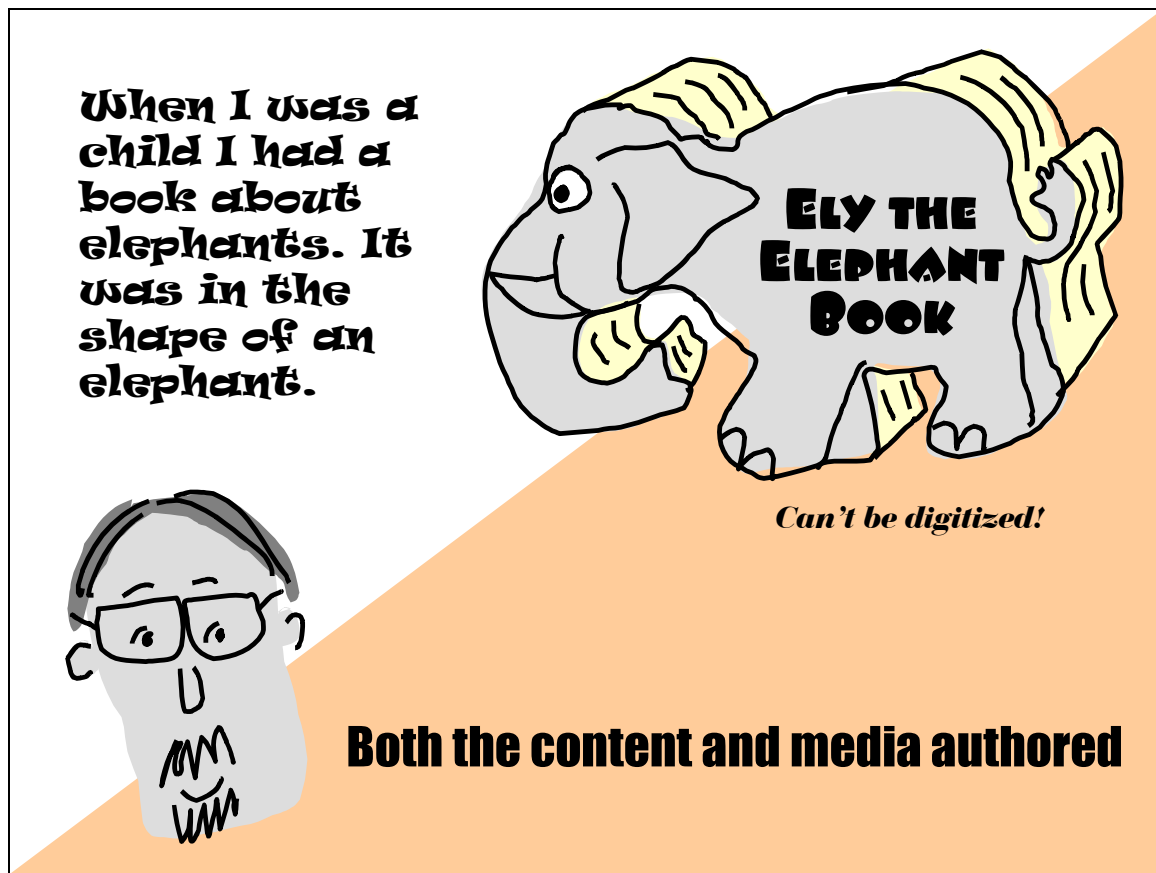
But we are crazy humans and we will modulate just about anything to get our message, our content, across. We will even modulate the side of a mountain. This is so crazy that people will come from all over the world to see it.



Needless to say I am glossing over many things. I am certainly glossing over many aspects of the *modulate-once* vs. *modulate-over-and-over* problem.

I am also ignoring more linguistic aspects of the question. For instance, there is a way of looking at books where we would say that the overstuffed arm *chair is the medium* and the *book is the content*, making the *chair* a modulate-over-and-over medium. Thinking this way may help us to understand why e-books have not caught on. Too many levels of media.

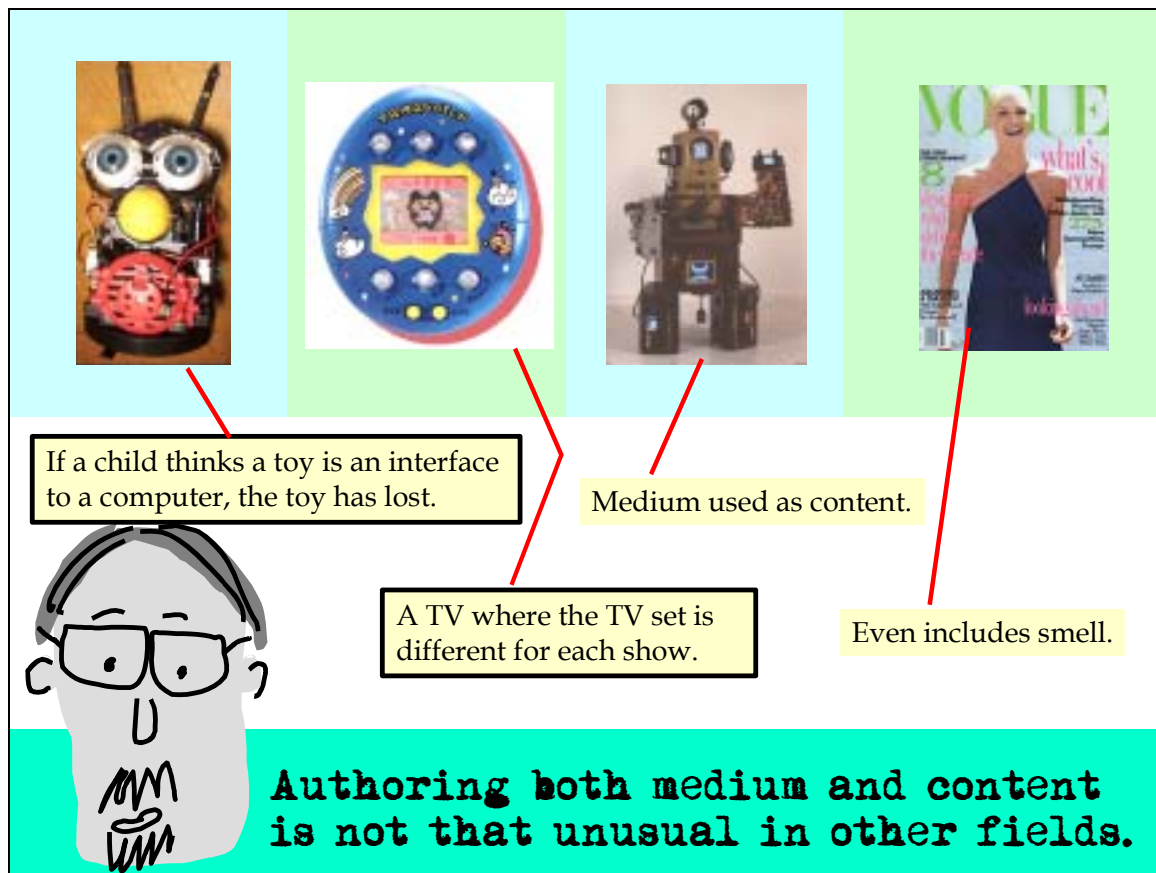
I am charmed by these musings, but they don't fundamentally alter the basic schema. Content modulates media.



When I was about five years old I had a book about elephants. The interesting thing about the book, in terms of this discussion, was that it was in the *shape* of an elephant. What does that mean? That means that the author *authored* both the medium and the content. He or she wrote words on the pages, and he or she modulated the medium of the book itself. Both were about elephants.

The author did not modulate the medium randomly; the author modulated the medium in such a way that resonated strongly with the content. If the author had made the book into the shape of a *tiger* instead of an *elephant* it wouldn't have worked.

The content and the medium became one. It is impossible to determine where one starts and the other stops. We see in the elephant book that content and media are actually *just two points on a continuum* and that the meaning is carried by both.



If a child thinks a toy is an interface to a computer, the toy has lost.

A TV where the TV set is different for each show.

Medium used as content.

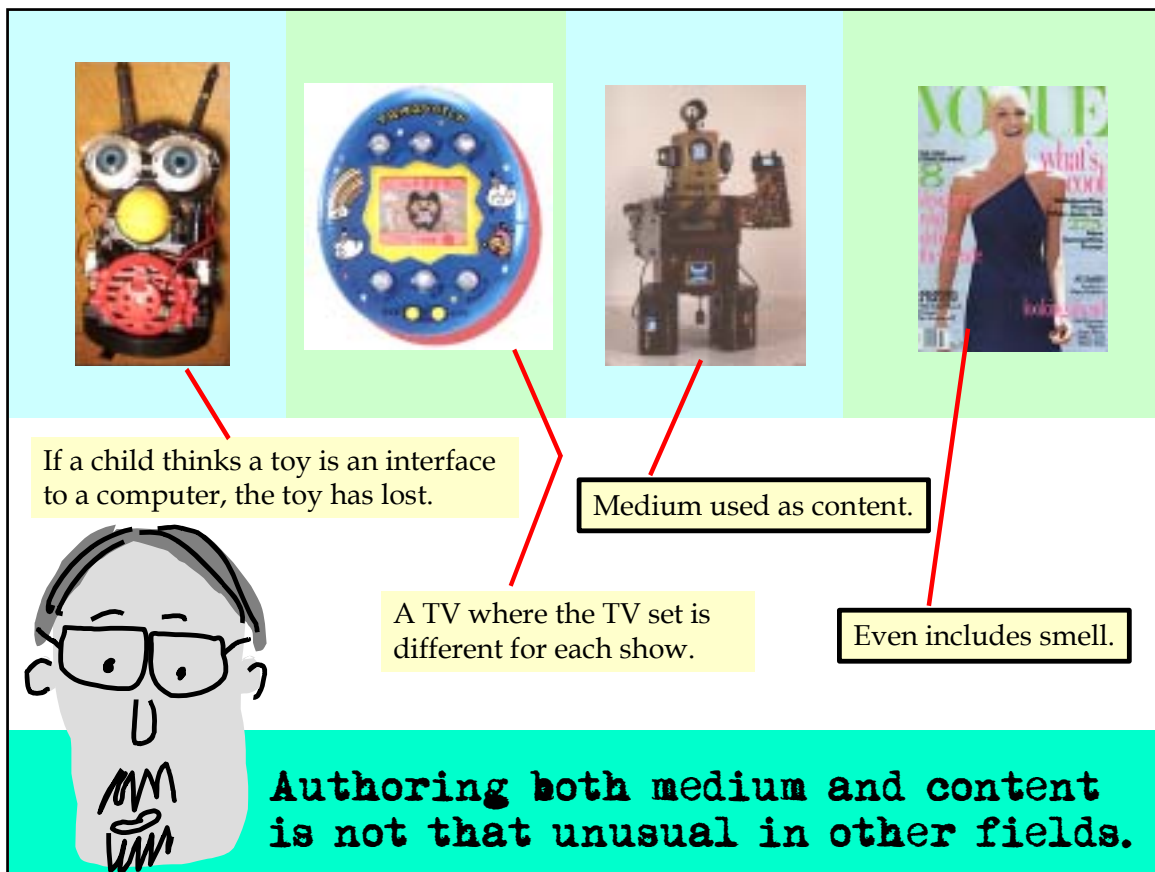
Even includes smell.

Authoring both medium and content is not that unusual in other fields.

This idea, that the author can author, can modulate, both the medium and the content in such a way that they can barely be distinguished from each other is not a new, though it is rarely expressed this way.

On the left is a stripped Furby - a talking mechanical doll. One way to think about Furby is that there is a computer inside and that the skin is a user interface to that computer. But if the child thinks that, you've lost. In reality, the content (the code and text inside) and the media (the fuzzy stuff on the outside) are all one. They make *sense of one another*. To break them into media and content is to misunderstand it. It is much like misunderstanding a piano by assuming that the keyboard is the *user interface* to the piano. The keyboard is part of the piano.

When people hear this idea, they often ask me questions like: What are you saying, *that every TV show should have its own TV*? I answer, well, maybe. After all, isn't that what a Tomaguchi is? Those little animated bobbles that kids wear off their backpacks and that need to be taken care of. Each one is really a little interactive TV show. Each TV show has its own little specially designed TV set on which it is displayed. It is one thing, show and set. It doesn't help us to think about it in terms of media and content.



If a child thinks a toy is an interface to a computer, the toy has lost.

Medium used as content.

A TV where the TV set is different for each show.

Even includes smell.

Authoring both medium and content is not that unusual in other fields.

The third image is a sculpture by Nam June Paik. It is made of old TVs. The TVs, which used to be the media, are in this sculpture, the content. The content, the shows playing on the TVs, have become sort of like the media. They are what contains and makes sense of the TV sets. Or rather, it makes no sense to divide it into media and content. Actually, for most sculptures this is true. While the stone, or metal, or wood can be thought of as the medium and the shape it is modulated into the content, this is a false rendering. When the sculptor says something like, *"the elephant was in the stone, and I just had to find it,"* he or she is not kidding around.

Lastly we have *Vogue Magazine* where every page seems to be of a different material and some of the pages even have different smells. There are fly-away cardboard inserts and packets of lotion that need to be opened. The object is highly modulated in many ways through many dimensions. It is perhaps the most complex document the Plenitude produces. There is a well known reason for this extra expense and effort. Advertisers intuitively understand that the modulation of the media helps sell products. Paper choice is part of the meaning; it is part of the content. Meaning bleeds back and forth.

Without getting into the discussion that can easily turn into an argument, let's say that what I am talking about is the **author** using both the medium and the content, together, to reify **intent** and **meaning**.



Let us say that when most authors write they have an *intent*, or actually multiple intents. I realize that this is contentious, and may not always be absolutely true, but it is true enough. What they write has meaning, or actually multiple meanings. With rare exceptions, without intent or meaning, they wouldn't write in the first place. The intent or meaning may not be to create the novelistic hallucination, or to present a moral frame, it may be simply to become famous.

The suggestion here is that meaning and intent are carried by *both* what is traditionally called the *media* and what is traditionally called the *content*. I am also suggesting that there is tremendous leakage of meaning and intent from the media to the content and back again.

In fact, what I am really suggesting is that except for historical and situational reasons, they are the same thing. It's just that one is a little easier to modulate than the other.

Which raises that question, *what does it mean to modulate the medium itself?*

From McLuhan: Different Media have Different Msgs



MEMO



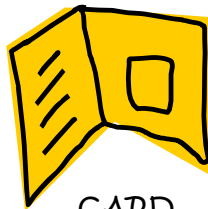
EMAIL



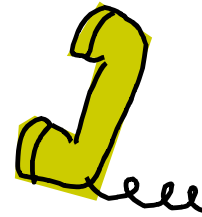
POWERPOINT



THE WEB



CARD



TELEPHONE

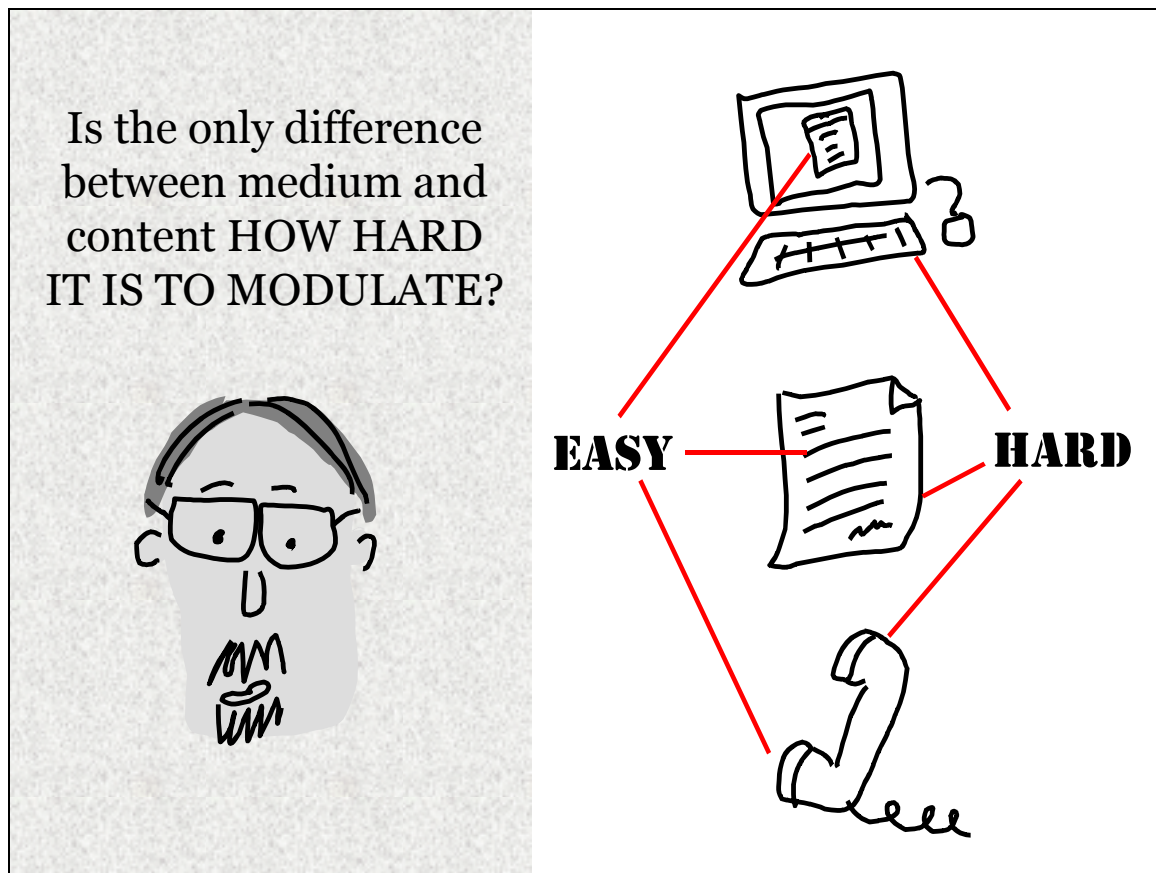
YOU'RE FIRED!

We know from McLuhan, and from our own observations, that different media have different messages, or give different meanings, or add in their own meanings, or however you want to say it.

I was recently let go, a kind of polite form of being fired. Here's what I know. The same message "You're Fired" would be very different if:

I got a memo that I held in my shaking hands and read "YOU'RE FIRED!" or I clicked open an e-mail and there in 12 point Times Roman were the words "YOU'RE FIRED!" or if I went to a meeting, coffee cup in hand, and up there on the *PowerPoint* slide were the words in bold, sans serif "YOU'RE FIRED!" or if I went to the company web site to check on the latest stock price and there in small print were the words "The following people have been fired" and there's my name, or if I opened my mail at home and there was a very nice *Hallmark* card, inside of which, in nice flowery print, were the words "You're fired" or if, as it actually happened, I was in Minneapolis and I pick up the phone and on the other end somebody said, "YOU'RE FIRED!" (Well, actually, they said, "YOU'RE LAID OFF.")

These do not have the same meaning.



What McLuhan said, of course, is that the medium *is* the message. We can tone that down and say that it *adds* to the message, or *alters* it. But what he didn't suggest, at least as far as I know, is that the media is itself *authorable*.

Rather than think about media and content as two separate things, one modulating the other, we can think of them as two points along a continuum. At one end of the continuum are things which are hard to modulate and we tend to call those the *media*. At the other end of the continuum are things which are easy to modulate and we tend to call those things the *content*.

Overt examples of the medium with meaning: The Apple iMac which comes in different translucent colors, one of which is *your* color and it *means* you. Artists who make their own paper with leaves, feathers and colored pulp and which alters the *meaning* of the poems that are printed on it. A futuristic birthday card that when opened activates a phone chip and calls your mom, who sent you the card in the first place. When you talk to your mom through the card the experience is *considerably different* than talking to her on a regular phone.



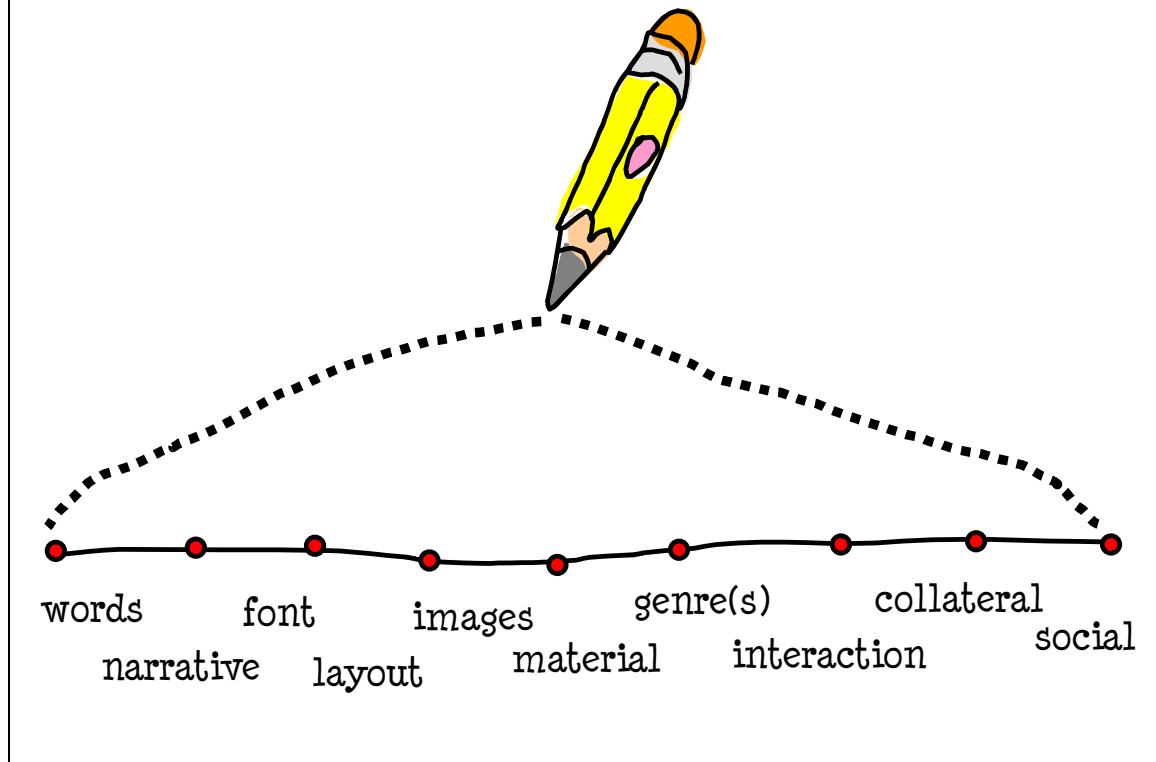
But the new digitally-controlled factory plus component technology allows the medium to be authored. This is the true digital revolution and it is anti-convergent.

Where I live, in Silicon Valley, there is a religion and that religion is called *Convergence*. In the religion of Convergence all media will migrate to a single, all encompassing media which can do everything. Everyone else is a *content producer* for this converged media. Everyone gets to modulate this single, perfect, media.

Not only am I opposed to convergence on moral and aesthetic grounds, it is not even true! The actual digital revolution is different and much more interesting. The actual digital revolution is about digitally controlled factories, including ones in the home, that can produce small quantities of millions of different media/content artifacts at very low prices. Given this capability, authors and teams of authors, will be able author the media and content together, at the same time, as a unified whole, with a single, powerful meaning.

This digital revolution is about diversity, is about complexity, is about deep handcraft, is about collaboration across industries and professions. Its the revolution I am interested in and one that is about to sweep across the Plenitude.

TOTAL WRITING: WRITING ALL THE WAY DOWN.

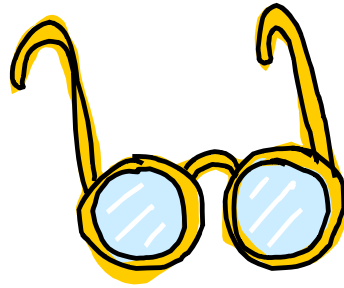


I call the process of authoring both the media and the content simultaneously, such that it all resonates together: *TOTAL WRITING*. It is writing all the way down, not only the words and the narrative, but the font, the layout and the images. It is authoring the materials, the genres, the interactions, the collaterals and even the social settings. Every layer contains part of the meaning and part of the intent. It is all authored and it all works together.

In the real world, of course, one doesn't author, or re-author, everything. Many things in a genre are given and these *givens* are important for they help define the genre. For instance, it is rare when a rock star redesigns the electric guitar (though Hendrix famously did.) It is the electric guitar that is one of the clues that it is rock and roll.

In Total Writing, what one doesn't author anew has meaning too.

TOTAL READING: READING ALL THE WAY DOWN.

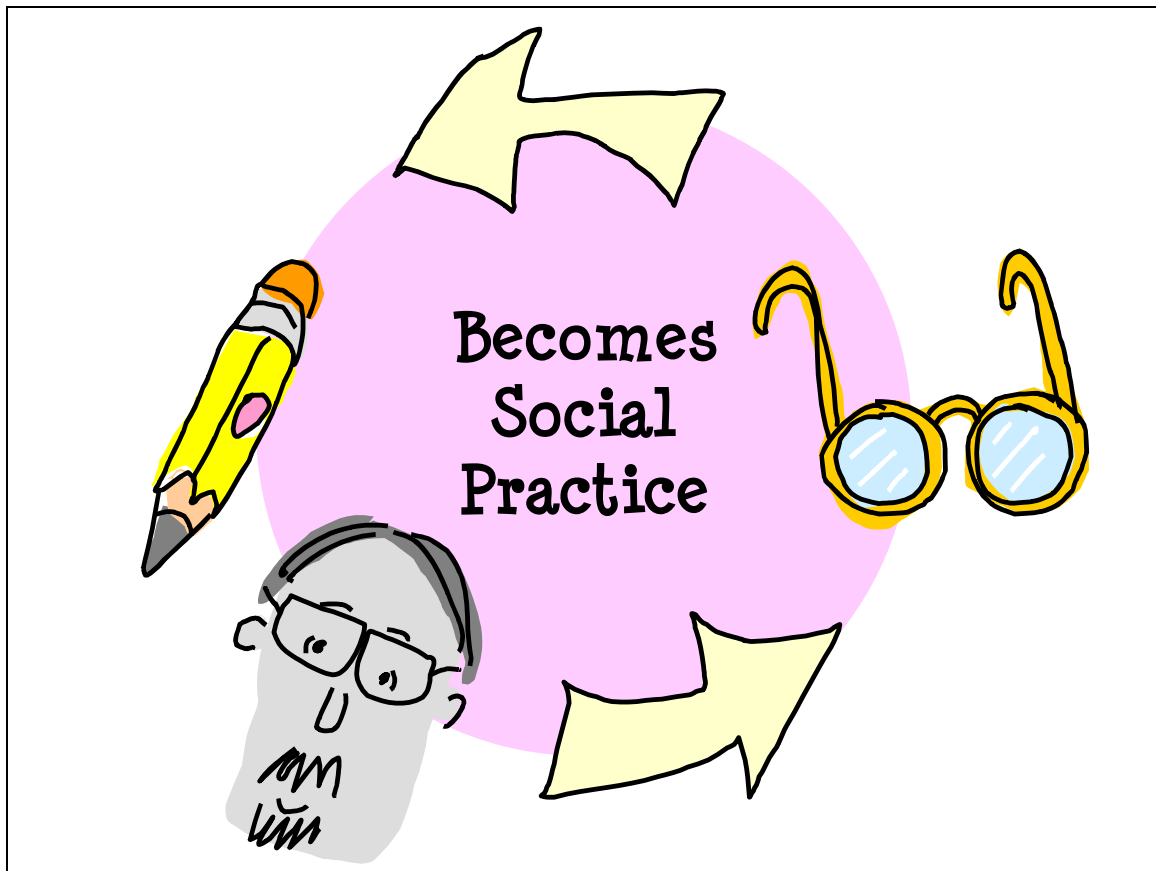


words font images genre(s) collateral
narrative layout material interaction social

If the reader knows that a work is written all the way down, that it is Totally Written, then he or she will read it all the way down and assume that there is meaning and intent all the way down. The reader will synthesize the words, the narrative, the font, the layout, the material, the genres, the interactions, the collaterals and the social settings into a single meaning. If some part of the deep chain isn't authored, they will assume that it was not authored on purpose and that that non-authoring has meaning.

As modern scholars point out, the meaning and the intent that the author tries to effect may be wildly differ from what the reader gets out. But this is rarer than some imagine, for if it were too true, too often, writing and authoring would stop. Humans, with their tightly coiled DNA, their genetic disposition to a common language and their tightly controlled societies, are remarkably alike.

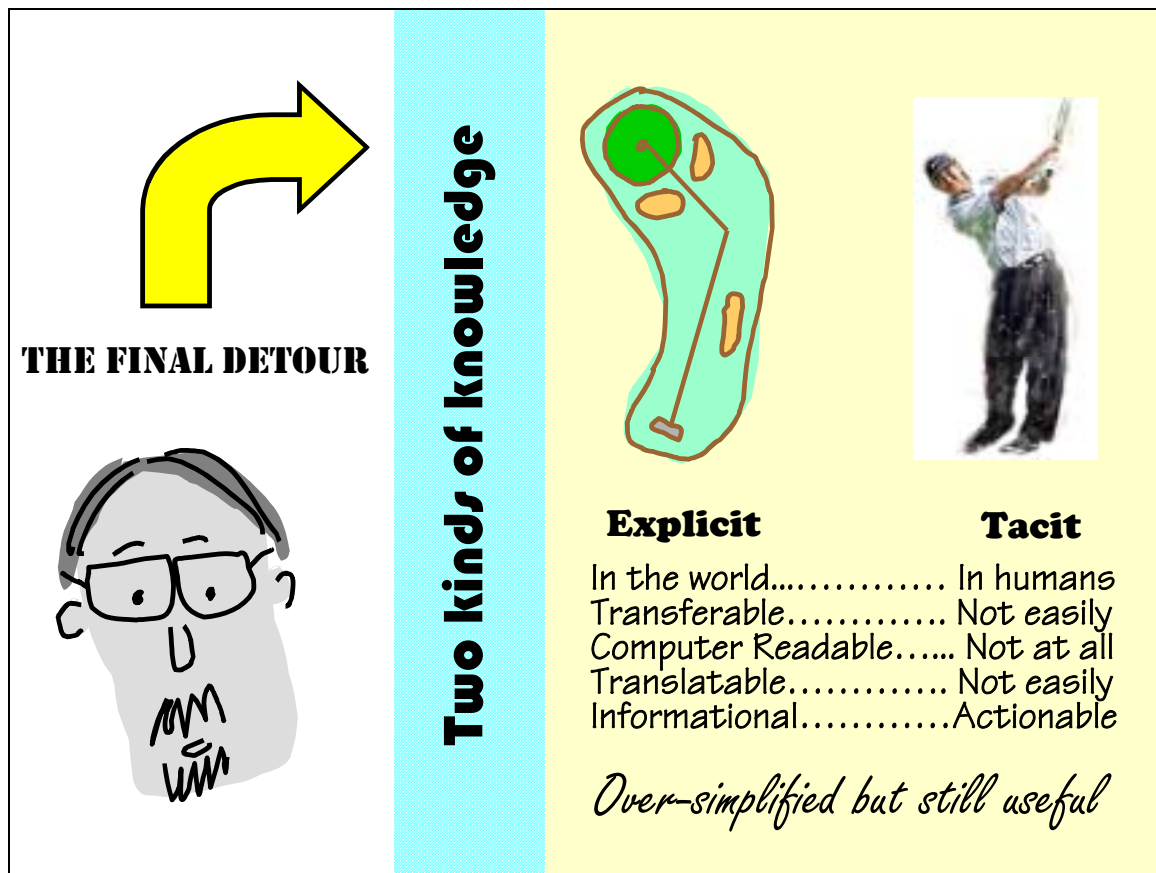
It might take some skill and talent to get the specific meaning and intent what you want from a Totally Written work, but as the advertisers in *Vogue* know, and what they can show on their sales sheets, is that its not that hard.



When authors are totally writing and readers are totally reading (and industry is making money off the whole thing) then we have created a *social practice* that begins to define culture itself, or in this case, redefines the Plenitude.

I do not believe that Total Writing/Total Authoring is something that will happen in ten or twenty years. I believe that it is happening now, but our eyes have become blinded by convergence, by the idea that media and content are different, that the media is stable and meaning free, and that meaning lies entirely within the content.

While this is not true now, in the age of digital manufacturing, it will become even less true.



In the world of the contemporary corporation there is a mini-industry centered around *Knowledge* with knowledge experts, knowledge systems and knowledge workers. Really, I'm not kidding. They re-hash the same old arguments that Plato and Aristotle had, with about as much chance of figuring it all out.

Within the Knowledge mini-industry, it is common for the experts to divide knowledge into two kinds: *Explicit* knowledge and *Tacit* knowledge. *Explicit* knowledge is knowledge that you can write down and read off a piece of paper. You can explain *Explicit* knowledge to someone else and once explained they would have the same explicit knowledge. You can draw often a picture of *Explicit* knowledge, for instance of a golf hole, and then you would know things about the golf hole that are quite, well, explicit. You can say things like "it is 352 years long" or that it "dog legs to the left." Most *Explicit* knowledge can be read and used (and created) by a computer. It can be translated into other languages with little loss. It is highly informational and, in fact, is often called *information*. When you get your restaurant check, that's *Explicit* knowledge. When you look up a number in a phone book that's *Explicit* knowledge.

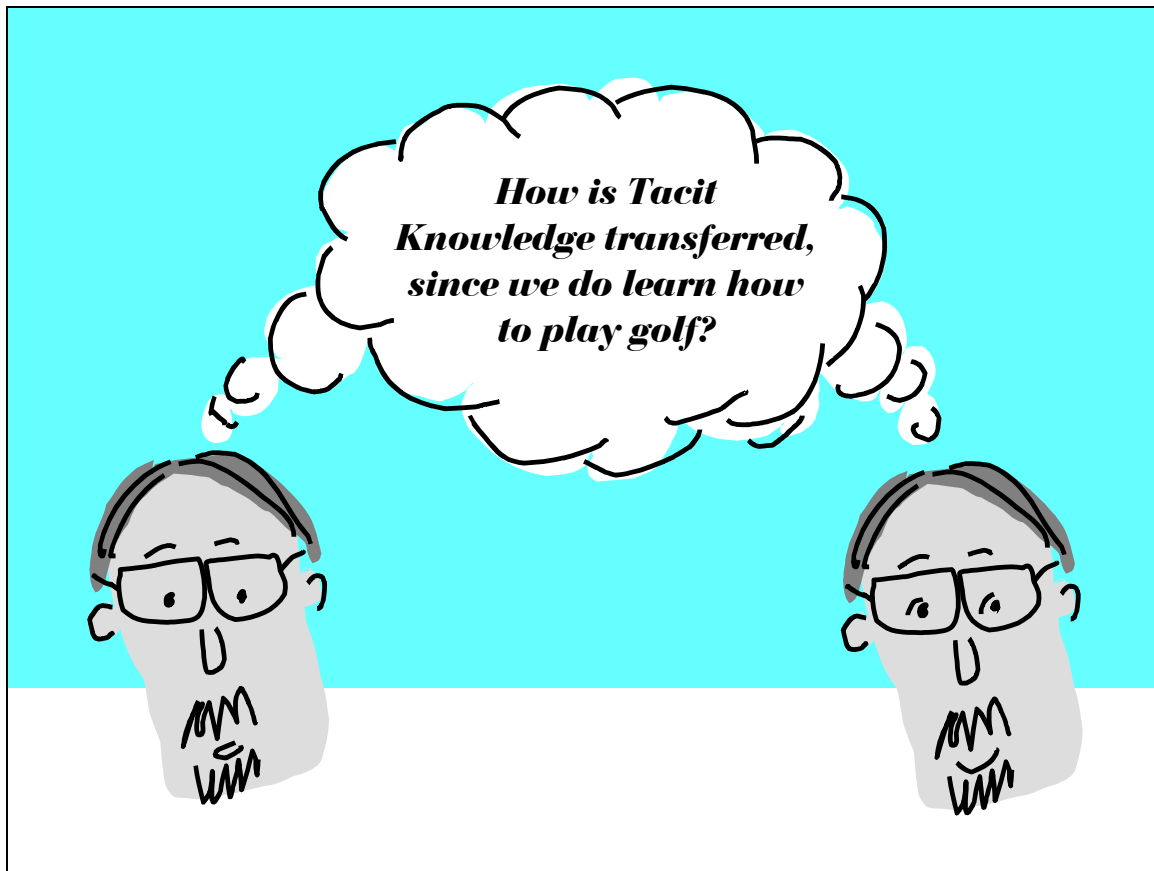
Tacit knowledge is quite different, it is, as the experts often say, *embodied*. Here is a picture of Tiger Woods. Tiger could talk to you all day about how to play better golf

and even if you listened real hard, and took notes, you would not become as good as Tiger Woods. His knowledge of golf playing is *Tacit* and it is embodied. It is in his body, in his nervous system. It cannot be represented in a language-like way.

Another canonical example: not only can't you teach somebody how to ride a bike by telling them how to do it, you probably can't even explain in words how *you* do it. The better you can ride a bike the less you can explain it. If you ever stop to think about how you are doing it, you will fall off the bike. Computers can't learn *Tacit* knowledge and much, if not all, is lost in translation.

Now this distinction between *Explicit* and *Tacit* knowledge is way over-simplified. Not only is there a lot of knowledge in between or which is a combination of the two, but there *are* ways of explaining *Explicit* knowledge in terms of *Tacit* and vice versa. None-the-less, it is a useful distinction and is helpful in understanding why, for instance, certain businesses fail when key employees leave, even if they have left extensive notes.

But here is the weird part: We *do* teach our kids how to ride bicycles and Tiger Woods' dad *did* teach him how to play golf. And while Tiger can't teach to you to play as good as him, he can teach you how to play better than you currently do.



In fact, we transfer *Tacit* knowledge all the time. How could we have a society if we didn't? Our lives are filled with things that are *Tacit* and which we have learned. Much of that *Tacit* knowledge is transmitted via genes, for instance our knowing how to walk. Genetics is how most of the non-human *Tacit* knowledge is transferred in plants and animals. But our knowing how to appreciate a good painting, or how to play hockey, or knowing how to make business decisions, are not transmitted via genes.

So we clearly know how to transfer *Tacit* knowledge. There are even people who we call *good teachers* who, while they can transfer *Explicit* knowledge can also transfer *Tacit* knowledge better than most.

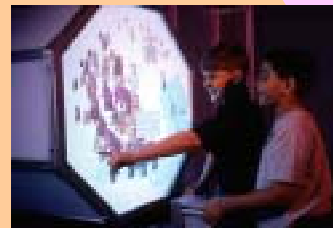
All of this matters because I want to claim that a *museum*, to finally get around to the topic of this chapter, while it transfers some *Explicit* knowledge such as dates and names, it mostly transfers *Tacit* knowledge. To make museums better, you need to improve *Tacit* knowledge transfer.

The museum is one of the points of knowledge exchange of the Plenitude.

EVOCATIVE KNOWLEDGE OBJECTS OR **EKO_s**



An EKO “evokes” knowledge in the reader/user as opposed to transferring it directly.

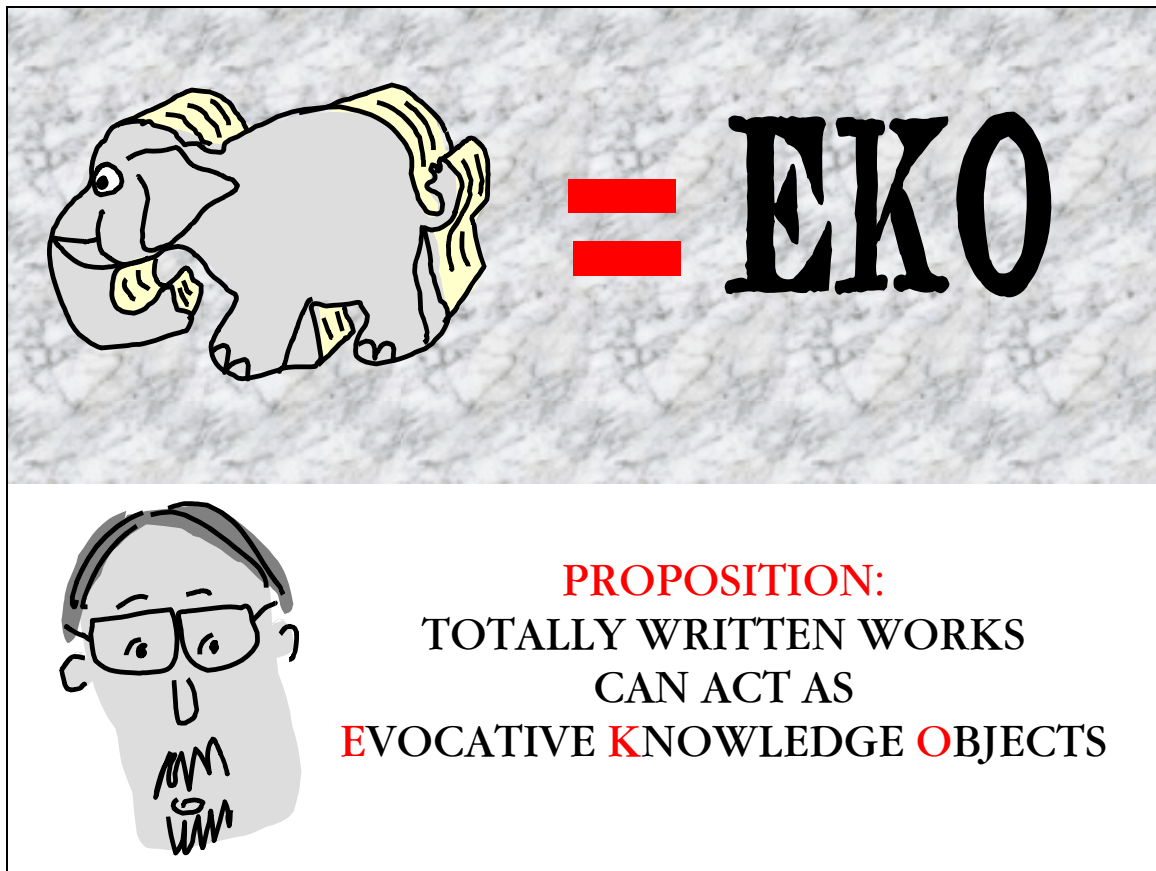


There is a certain class of artifacts which I call *Evocative Knowledge Objects* or *EKOs*. EKOs *evoke* knowledge in those that engage with them. *Tacit* knowledge. Unlike a phone book, which elicits *Explicit* knowledge, the EKO creates *Tacit* understanding. It does this in indirectly.

When the viewer/user/player engages with the EKO he or she works with it, engages with it, figures it out, examines it, manipulates it, plays with it, touches it, smells it, pushes it around, explores it, fights with it, makes love to it, pets it, prods it, uses it, abuses it, whatever. In that process, *from that process*, *Tacit* knowledge is evoked in their body/brain.

The *Tacit* knowledge IS NOT IN THE OBJECT ITSELF. The *Tacit* knowledge was in the creator of the object, and once engaged with, in the user of the object, but not in the object. The object only evokes it.

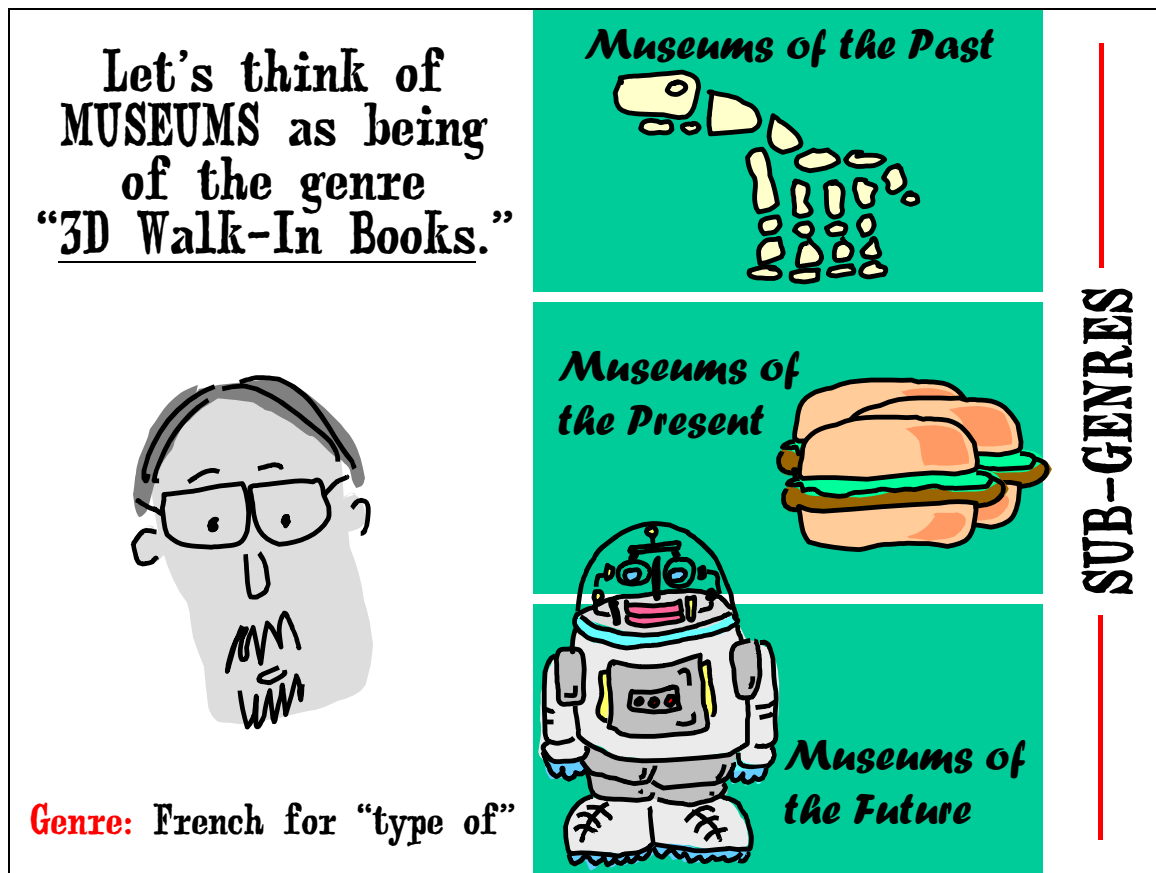
Pictured are three pieces from the museum show *The Experiments in the Future of Reading* (aka XFR). My team at Xerox PARC created these artifacts to transfer some tacit information about reading. They do not explain reading. The tacit knowledge we wished transferred was hopefully *evoked* when the museum visitor engaged them, when visitor totally read them.



As a pseudo-scientist I am compelled to include at least one equation.

What I am claiming is that Totally-written objects, ones where the author *authors* all the way down, can make for extremely effective Evocative Knowledge Objects or EKOs.

It is at that moment when the media and the content blur; when we react to the whole object; when the meaning is *not mediated* but *coupled*, it is then that *Tacit* knowledge is evoked within the reader.



Let's think of the museum not as a building, but of being in the *genre* of a "three dimensional, walk-in book." The exhibits of the museum are the illustrations. But if you go into a museum and consciously look around, you will discover that it also has tremendous amount of writing in it. Its everywhere. The exhibits don't have meaning *except in* relation to all the words. And the words are mostly epigraphic, public-based, wall writing.

The museum genre has many sub-genres. There are *Museums of the Past* which show old artifacts and dusty bones. These include many art museums, historical museums, history museums and the like. There are *Museums of the Present* which show how we live today within the Plenitude. These include tech museums, factory museums, showrooms and so on. And there are *Museums of the Future* which are like magnets drawing us to one scenario or the other. World's fairs are museums of the future; they tell us what to do to help construct the Plenitude to come.

There are many complications. For instance, is the *Holocaust Museum* a museum of the past or the present? Is *DisneyLand* a museum of the present or the future? Is a science museum a museum of the future (space travel) or the past (the big bang)?

3D EMBLEMATA



from
The Domain of Images
By Richard Elkins



**Most Museum exhibits are a form
of Emblemata which mixes text
and image.**

But if we think of museums as a 3D walk-in book, what kind of book is it? I would like to suggest that they are of an historic form called *Emblemata*. *Emblemata* was a book and poster genre that arose in the 1600s and can still be found today.

In the middle of the *Emblemata* page is an obscure image, often somewhat mystical. The picture, while it seems pregnant with ideas, by itself has no meaning. Across the top is a title, also by itself obscure, but which situates the image. Finally, at the bottom of the page is a short paragraph or two, or sometimes a poem. Like all other parts of the *Emblemata*, it too is obscure by itself.

But here's the cool thing. When all three are taken *together*, the meaning becomes perfectly clear. The idea, the moral, the tale, the sentiment, becomes obvious. The meaning transferred is not *Explicit* knowledge since no single part of the *Emblemata* is by itself meaningful. What is transferred is *Tacit* knowledge which is *evoked* as the brain tries to synthesize the three parts. I claim that museum exhibits are *Emblemata* with a 3D illustration in the middle, an obscure title and an obscure explanation. However, taken together they produce the profound understanding which a museum can elicit.

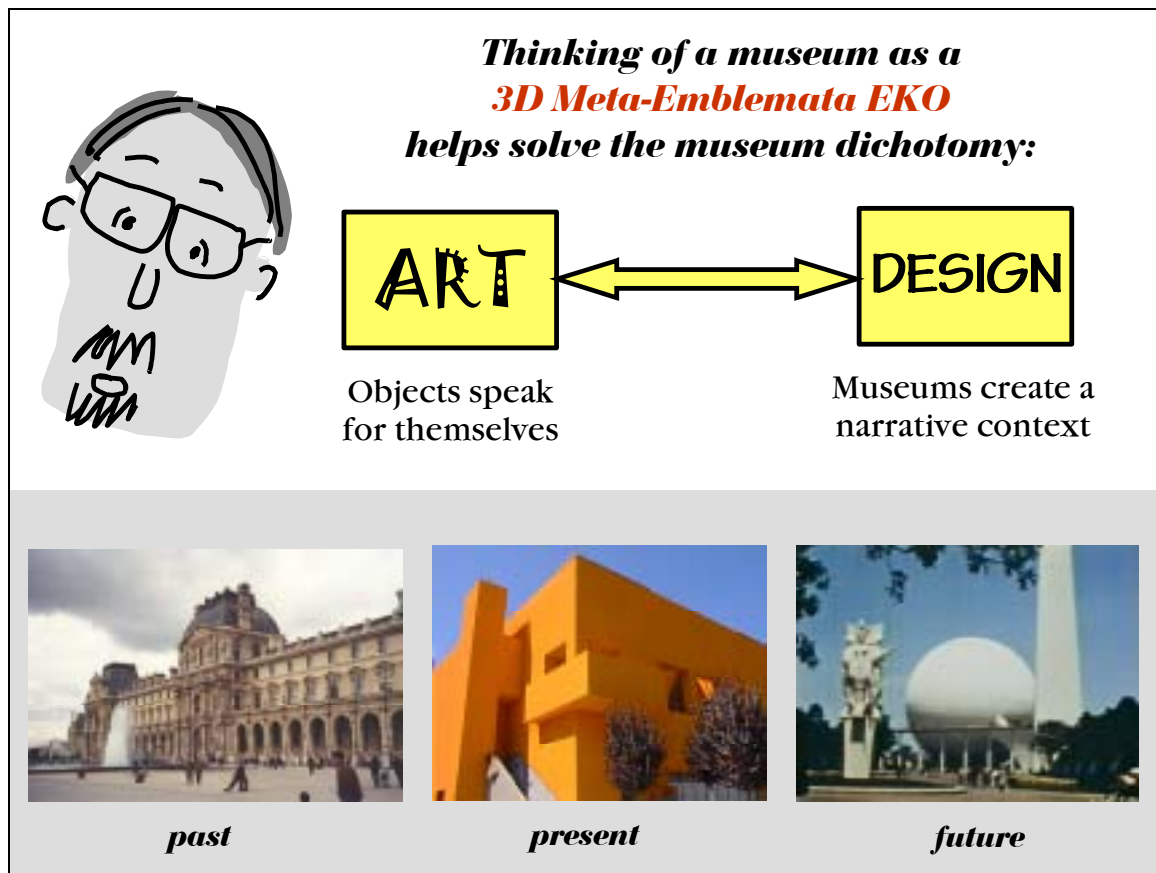
A META-EMBLEMATA SYSTEM



A museum exhibition is really a *Meta-Emblemata* system with many layers of signage and collateral, each layer being of a different genre, each altering and changing the others. To design a museum show is to not to just create the 3D illustrations in the middle, but to author all these other layers as well. Just to name a few (and there are many more) there is the signage naming the exhibit, there is the signage explaining what the exhibit is about, there is the signage explaining how the exhibit works.

The hall in which the exhibit sits is signed with the big theme. There are signs with credits. There are "attract mode" signs to get people to play with the exhibits. There are operating and repair documents for the staff. There are lots of documents for teachers, parents and docents. There are websites, newspaper ads, mission statements and flapping banners on the outside of the building. There are posters at bus stops.

The phrase *Meta-Emblemata* only gives some indication of what it means to Totally Write.



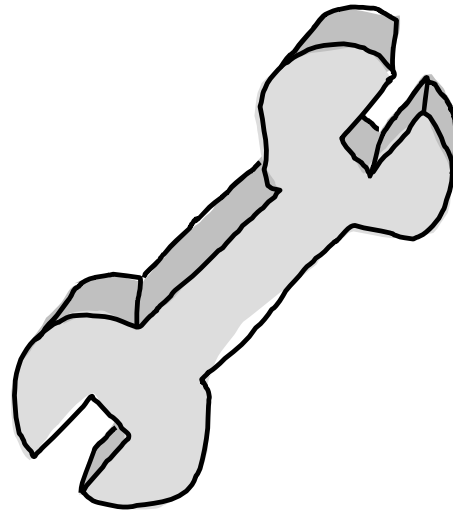
I believe that looking at museums in this way solves one of the more complex problems in today's museums, and that is the inherent tension between their *Art* and *Design* departments.

Artists and curators, working on the art side, often say such things as: "Art should speak for itself" (which is an actual quote from a museum curator.) Now of course, art hardly speaks for itself to them - they read magazines, journals, art statements, papers, critiques, art history books, biographies, all sorts of things to understand and contextualize the work. But they want the average visitor to walk in and have the art speak clearly *by itself*. The *Emblemata* signage, in their view, mutes this.

On the other hand, the museum's signage and explanatory material is created, typically, by a group of designers who also work for the museum. Designers are not the same as artists. The designers are interested in the experience of the museum visitor and not of the naked art work. They want to make the art understandable and comprehensible in the same way it is to the curators. Signage is one of their methods, along with layout, brochures, walking tours and the like.

Museums are totally written objects even at the architectural level. To understand that they are *Meta-Emblemata*, all the way down, is how to combine art and design.

Q: I was recently asked
at a conference on the
future of writing what
tools will the writer of
the future will use?

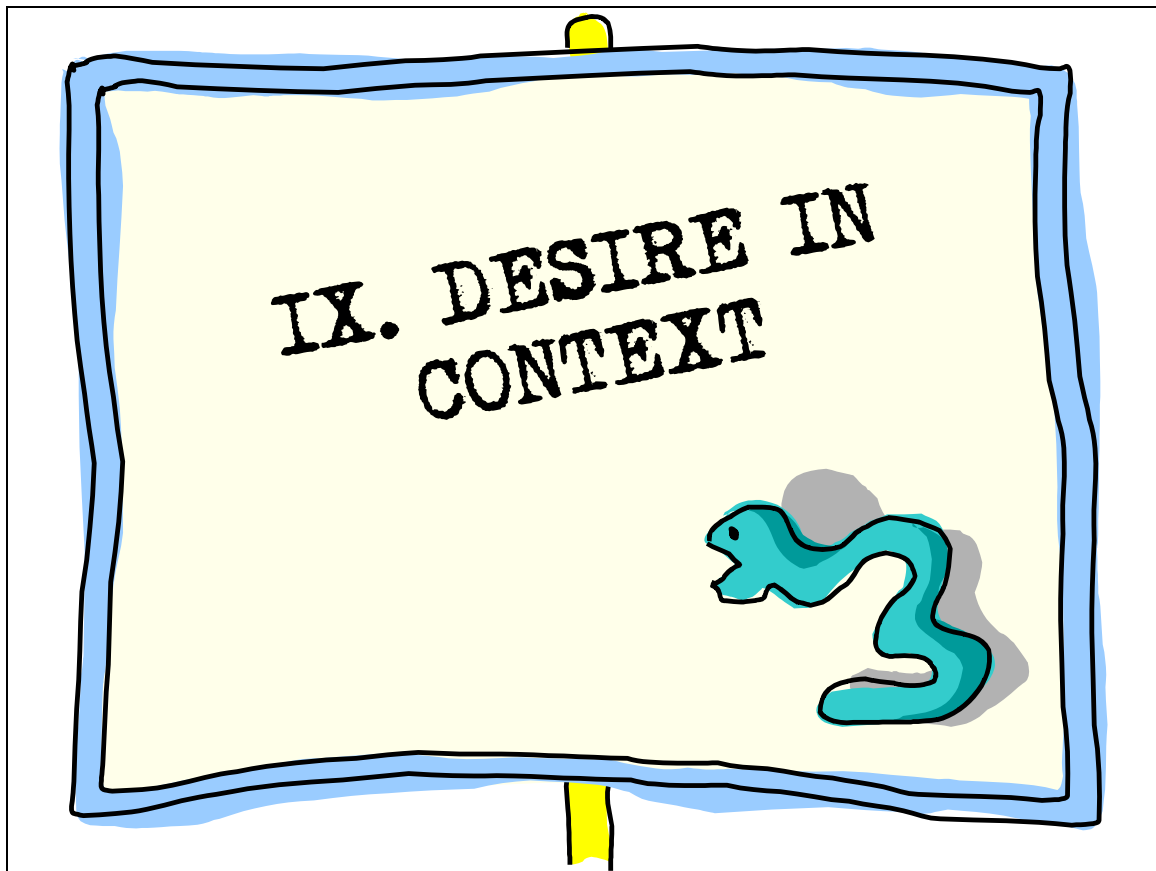


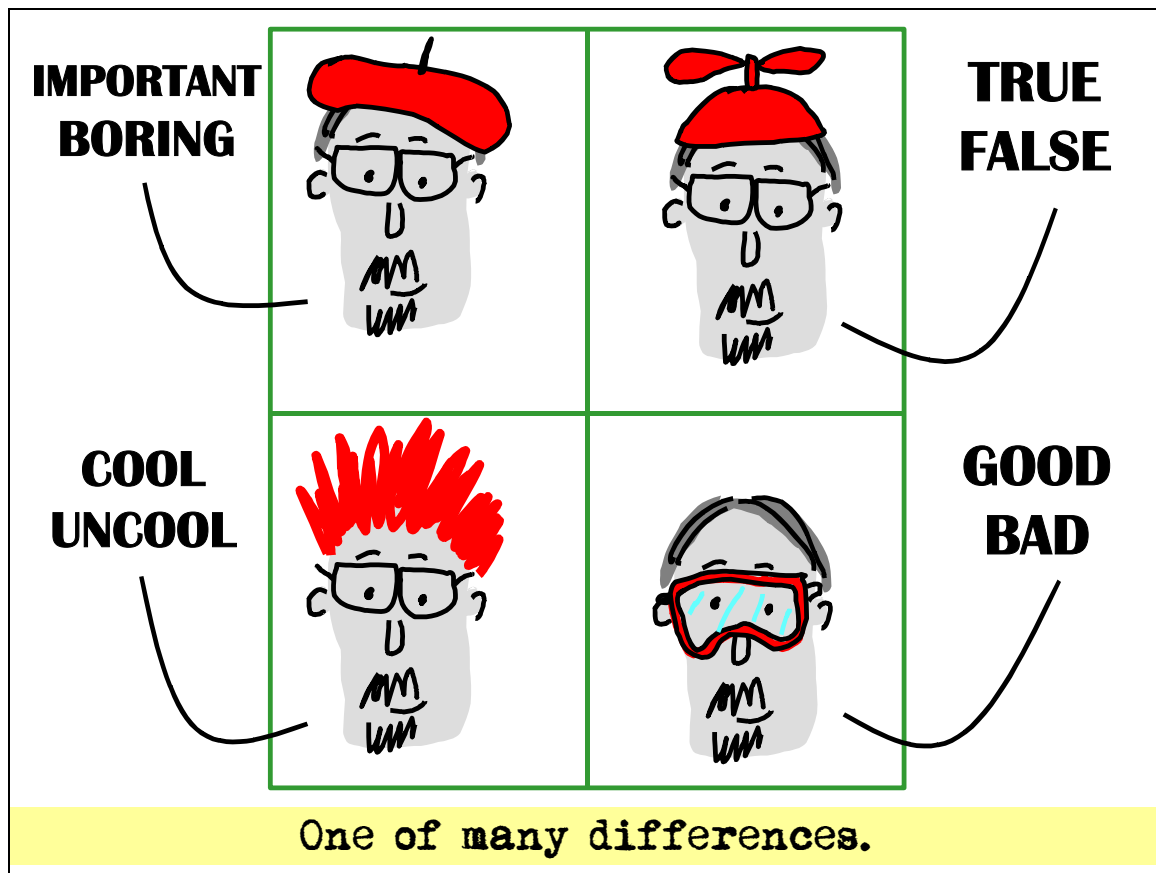
A: Wrench

I was recently at a conference on *books of the future*. I love the Plenitude: there are really conferences on such things. Many think that the Plenitude is shaped only at the cash register, but it is often consciously sculpted at conferences such as this.

I was on a panel on what tools will authors use in the future for writing.

I said, “a wrench.”

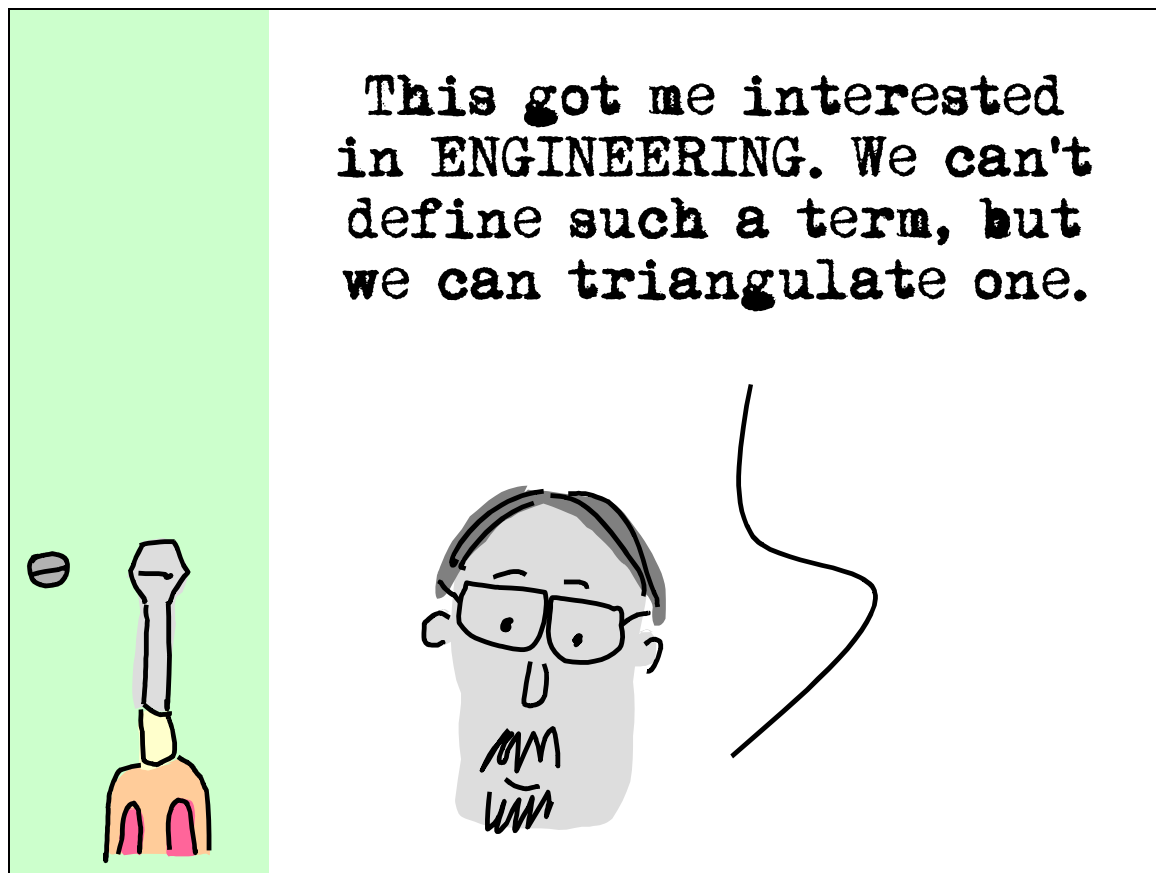




One of the differences between the Four Creative Hats of Creation are the dialectics by which they view their own output. For the person wearing the hat of Science stuff is either *True* or *False* (or for a Popperian, *False* or *Not-Proven-False*.) $E=MC^2$ is *True* or it isn't. For somebody wearing an Engineering hat, the stuff they make is either *Good* or *Bad*. The bridge is either a *Good* bridge or a *Bad* bridge. It is not a *True* bridge or *False* one.

Wearing the hat of a Designer makes one see the world in terms of *Cool* and *UnCool* (or whatever the *Cool* or *UnCool* terms are this season.) It is not a *Good* or *Bad* website, it is a *Cool* or *UnCool* one. The hat of Art, of course, is always the trickiest, but artists seem to divide art into *Important* art, which will change the course of history, enter the canon and be around a hundred years from now, and *Boring* art, which is all the rest. It is not *Cool* or *UnCool*, it is certainly not *Good* or *Bad* (god forbid) or whatever *True* and *False* art might mean. It is, to the degree that two words can capture the distinction, *Important* or not worth the trouble, *Boring*.

While the Plenitude is constructed by creative people wearing all four hats, it is the hat of Engineering that has probably touched the most stuff in our world. Almost everything from the computer to the paper clip was engineered. How interesting that they use *moral* terms to describe what they do.




While the Engineer might argue that they don't use the words *Good* and *Bad* in the *moral* sense, but rather in the *quality* sense, even this denial gives me pause. In what sense is a bridge *Good* or *Bad*? What is the yardstick that is being held up to determine the bridge's *Goodness* or its *Badness* and where did this yardstick come from? Is there, despite the metric objectiveness overlaid on the profession, a moralish system hiding just below the surface?

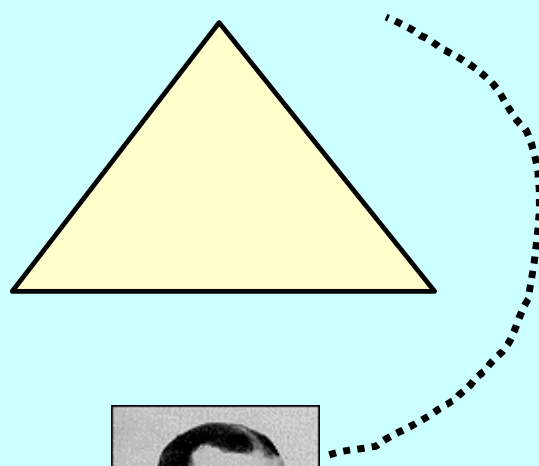

And while we are asking such questions in the great language game, what is *Engineering* to begin with? It is a big word, one that has been kicking around, in one form or another, for thousands of years. It has accumulated meanings like a magnet run through a scrap heap. It is no longer definable, if it ever was, in any kind of dictionary sense. But still, we use the word and it does have meaning.

I think we might be able to triangulate towards an understanding of what *Engineering* might be.

Let's think of
Engineering
as creating
form that
solves a
Problem.



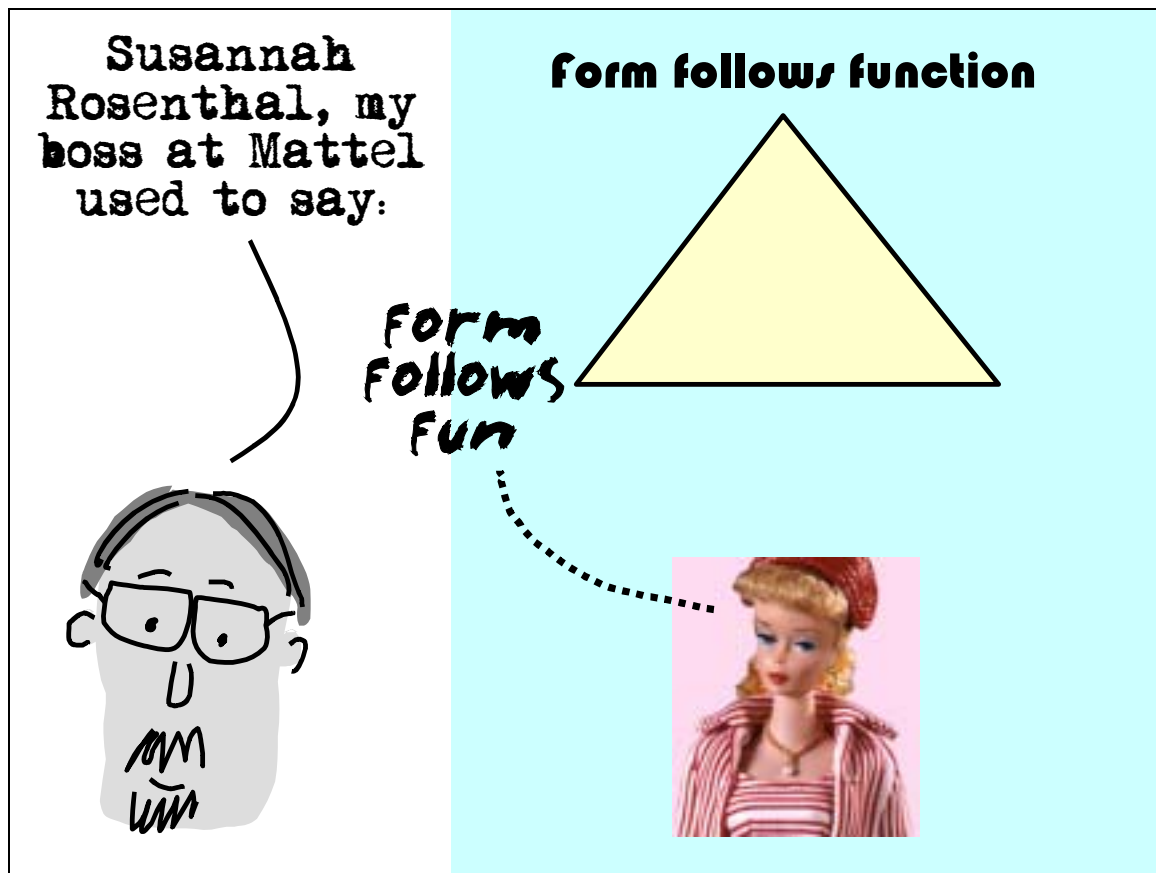
Form follows function

Louis Sullivan
architect

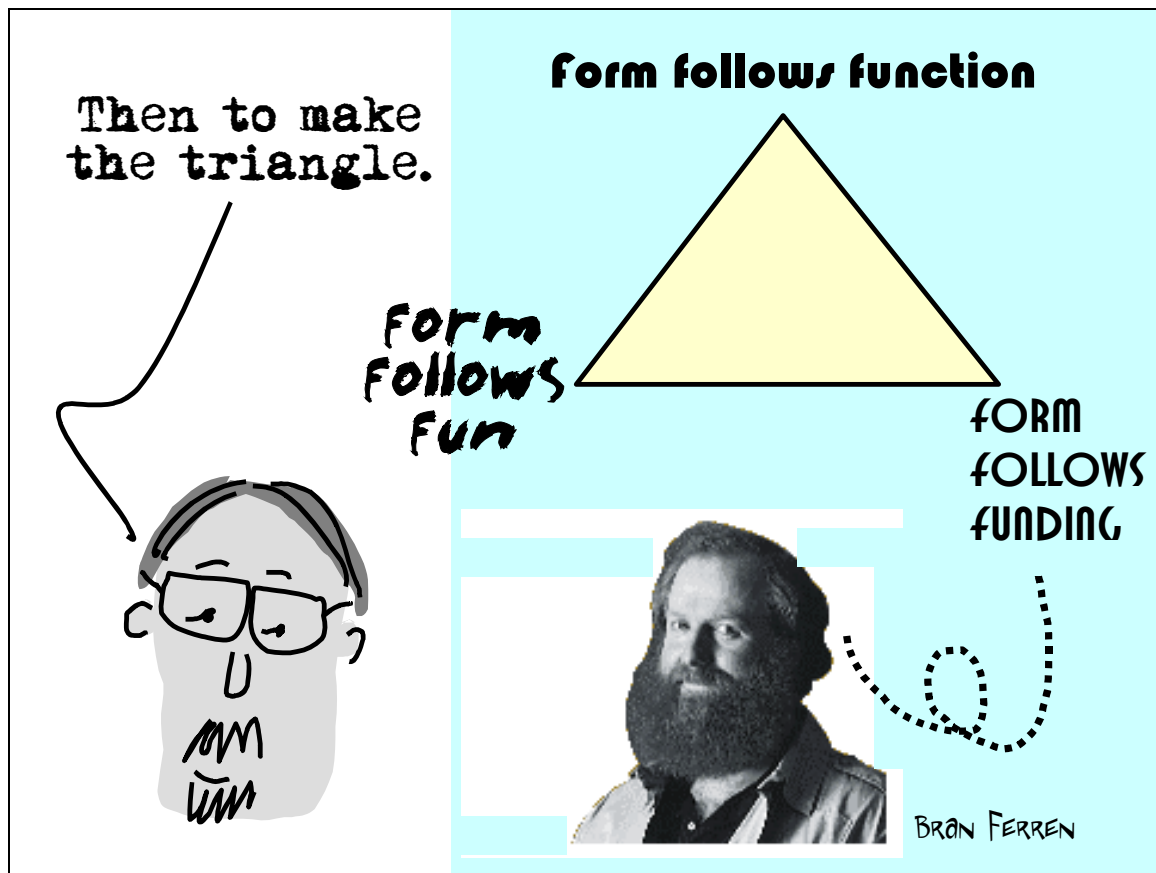
Let's start the triangulation by setting up a small sophistry. Let's say that Engineering is about *creating forms that solve problems*. That is, engineers create stuff: things, patterns, programs, items, utensils, the objects of the Plenitude. Each of these things has a form that allows it to solve a particular problem. I need to eat my food: here is a fork. I need to get to San Francisco: here is a car. I need to balance my checkbook: here is *Quicken*.

As Louis Sullivan, famous Chicagoan architect, famously stated, "Form follows function." This works in an explanatory way, and we see it in nature. The shape, the form, of a bird's wing can be perfectly reasoned from its function, flying. It is also true for stuff. The shape of a car's wheel is derivable from its function of rolling on tarmac. Of course, Sullivan really meant it proscriptively; that when we design a house or a building, it should look like the things that it does. We should *see* the heating of the heating system; we should be able to understand cooking by observing the form of the kitchen.



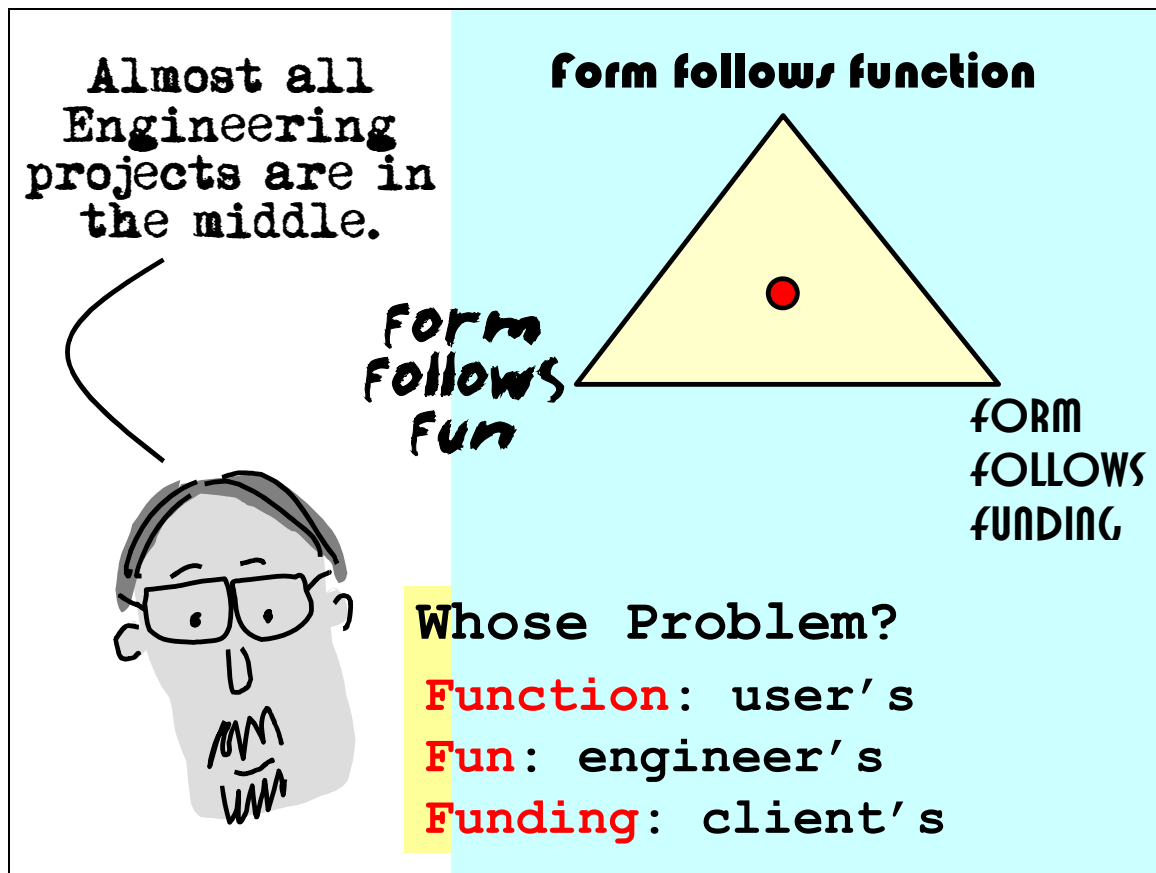
When I worked at Mattel, my boss Susannah Rosenthal, had a different formulation. She said, "Form follows Fun." By this she meant that most of the stuff around us does not look the way it does because it satisfies some deep function, but because it entertains us one way or the other. Girls do not need Barbie dolls; there is no function that they are the perfect solution for. Rather, this successful line of toys creates pleasure, or in the toy vernacular, fun. Houses don't look the way they do because of the functions they serve (well, maybe the roof,) but they look the way they do because of the pleasure we derive from them. This too can be used proscriptively: in designing a house, or a car, or a computer program, the most important thing is to make it pleasurable.

But I will actually use her proverbial statement in a different way. I will say that form is created because it is *fun for the engineer* to make it that way. Nothing else can explain the features of most computer programs other than they were enjoyable for the programmer to have written them. At its full extent, it is possible to say that the Plenitude as a whole exists not because it solves some deep function, but because we, or at least we engineers, enjoy making it. It was fun to do.



So I had two points of the triangle. One day I was walking through the halls of Xerox PARC and saw a poster for a talk being given by Bran Ferren. Bran is a designer and engineer who was once head of Disney Research. The title of his talk was "Form follows Funding." There is not an engineer in the world that doesn't know exactly what this means. To put it most crudely, engineers don't engineer things so much because they satisfy a function, or need; nor because it was fun to use (or to make); but because somebody with money was saying, "*I will pay you.*"

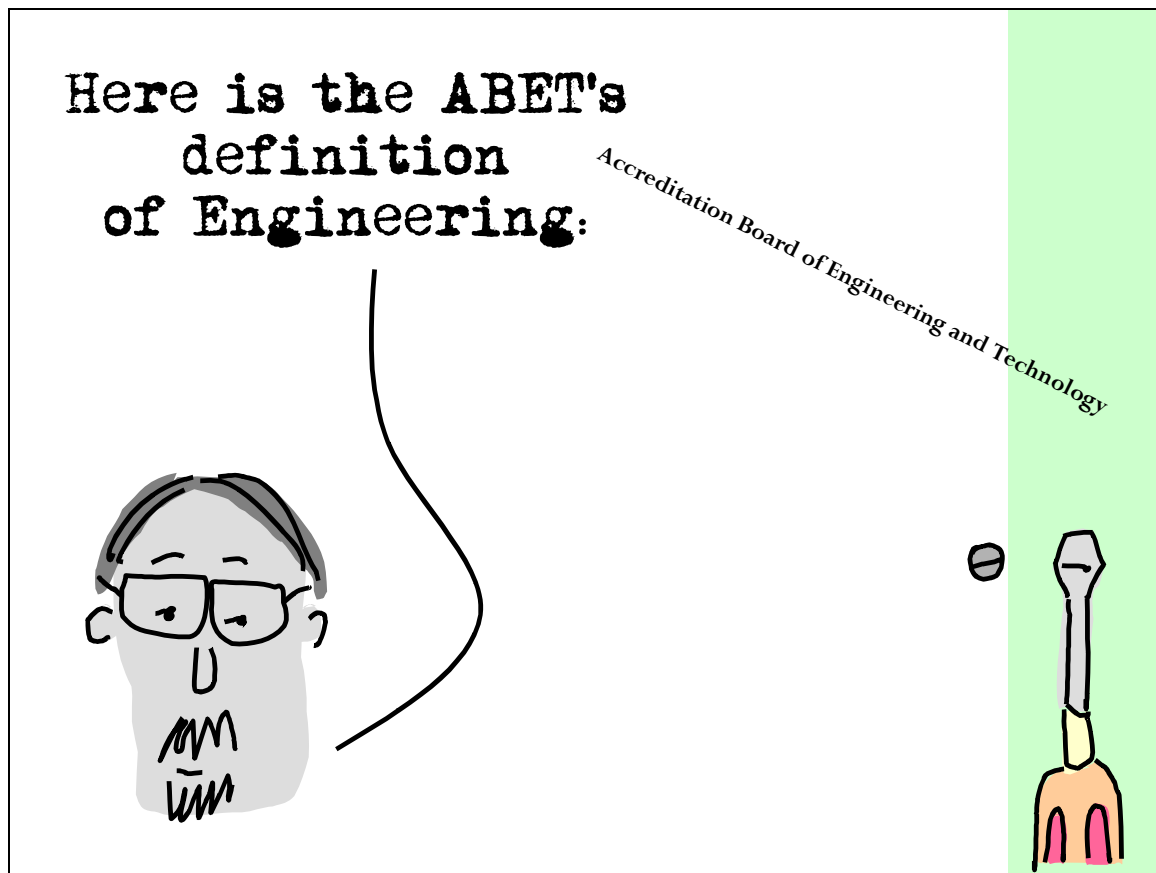
The person with the money is called *the client*. The client is the one with the *spec*, with the sheet of action items and with the check dangling out there for you to take home if you've done a good job. While one imagines that the client is trying to create something which *does* satisfy some user's needs, or possibly make some user happy, such a correspondence often seems more like a lucky coincidence than a planned event.



Almost all engineering sits in the middle of this triangle of *function*, *fun* and *funding*. Each and every project is pulled in all three directions at once. Sometimes one of the corners is stronger than another, but they all come into play.

If we think of engineering as solving problems, then each corner solves the problems for a different class of people. The *function* corner solves the problem for the user who needs something done. The *fun* corner solves the problem of the engineer who needs to enjoy their work, and whose creativity is critical to the progress of the Plenitude. The *funding* corner solves the problem of the client, who is the person paying the bills.

It should be noted that occasionally all three are the same person. A good example might be an architect who is designing and building their own house. Folk art, in general, also encompasses all three corners. But usually, as any engineer can tell you, every blueprint, specification, schematic or program is a battle of wills between the three *F* words.

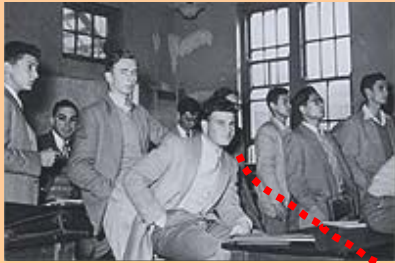


It is also useful, in this definition by triangulation, to find formal definitions of engineering. Here we are greatly assisted by Google.com, a search engine which lets us type in queries like "the definition of engineering." The result is several hundred definitions, but not, interestingly, several thousand. One of the definitions was repeated on more websites than any other.

This is the definition of engineering by ABET, the *Accreditation Board of Engineering and Technology*. ABET's definition can be found not only on its own site, but on the sites of many universities, institutions and even companies. I doubt that it is a definition that any engineer would penned by themselves, but it is probably one that they could live with.

The profession in which knowledge of the mathematical and natural sciences gained by study, experience and practice is applied with judgment to develop ways to utilize, economically, the materials and forces of nature for the benefit of mankind.

- Accreditation Board for Engineering and Technology



Wow! Solving mankind's Problems!

Here is my analysis:

Knowledge of the mathematical and natural sciences: The engineer knows the sciences but does not create them. It uses math (it comes first) and something called “the natural sciences” which I believe is distinguished from the “theoretical sciences.”

Study, experience and practice: Trial and error. Learn by doing. Everything is local.

Applied with judgment: I assume that this was something the committee threw in.

Economically: This is the entire engineer/client relationship in a nutshell.

The materials and forces of nature: There is nature again. The real world.

Benefit of mankind: Wow! You can just hear all the engineering students around the world sighing in relief and pride. Mankind’s problems! We will solve them all!

The profession in which our patent portfolio is implemented based on a lot of trial and error to increase our bottom line by satisfying the needs of our current advertising campaign.

- *The Journal of Contemporary Cynical Thought*



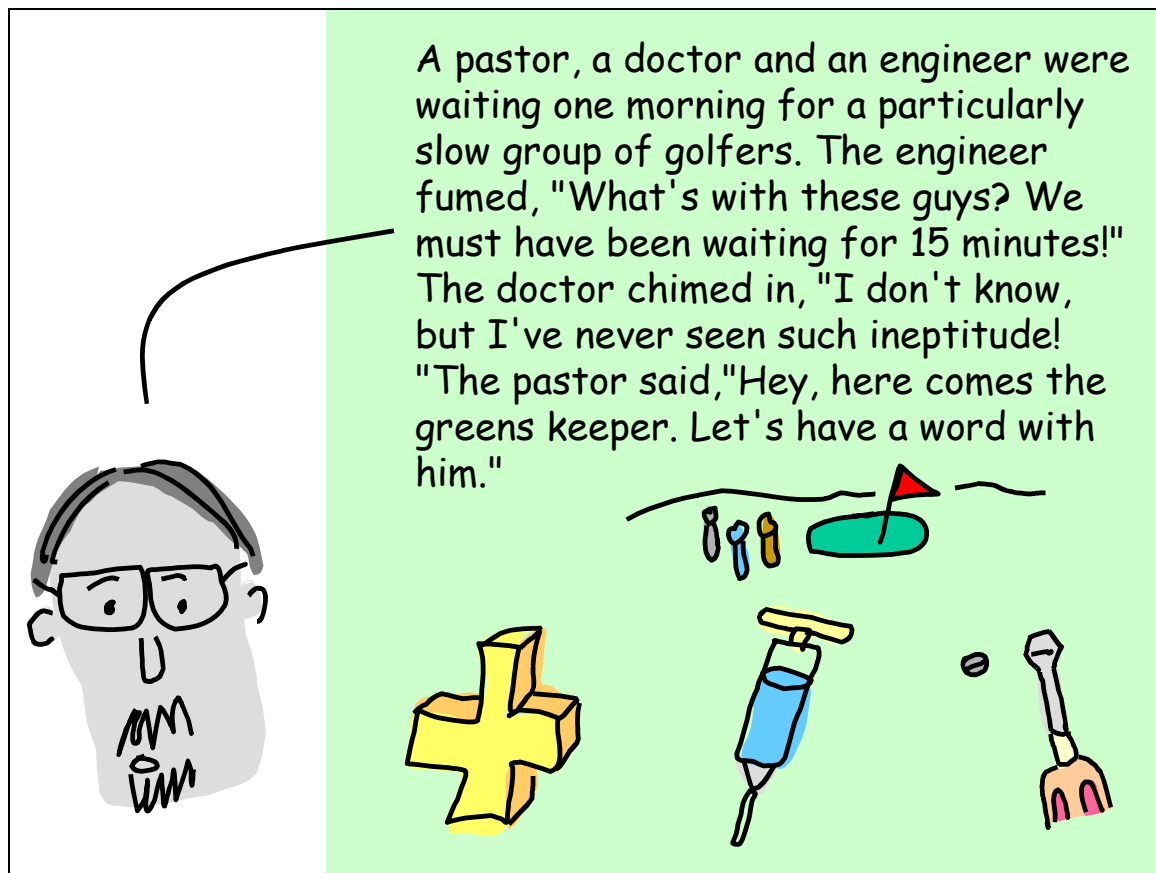
Now that's more like it!
Let's solve our Problems.

Without comment, this is what I assume most corporate boards would write as their definition of engineering. But note: it is still about solving problems.

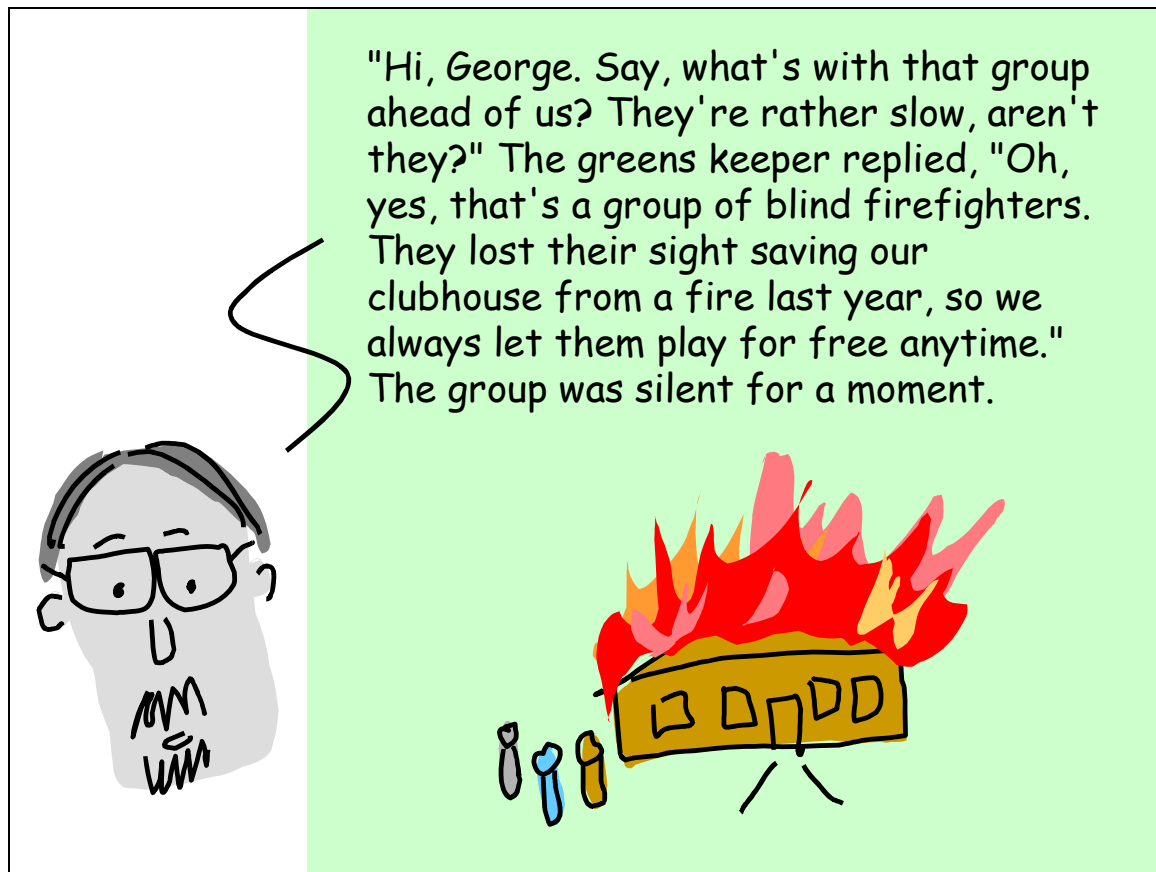


Another way to help triangulate of the definition of engineering is by studying the jokes that engineers tell about themselves. Self-deprecating jokes are a good way to define any profession. A quick Google search of “engineering jokes” turns up thousands of jokes. (Actually any profession name plus “jokes” turns up thousands of sites. Where is everybody getting the time to post all these jokes?)

The following joke is one that turned up on many different sites. I felt that it has the ring of truth:



A pastor, a doctor and an engineer. God, Science and Engineering. Where is the designer I wonder?



I love the pathos of this, as well as the improbability. While the life of a scientist is about finding the regularities in the universe, the life of the engineer is about finding the exceptions. Much of what the engineer does is create mechanisms to deal with things when they go wrong. A copy machine would be easy to build if it wasn't for the paper jams that occur every 1000th piece of paper.



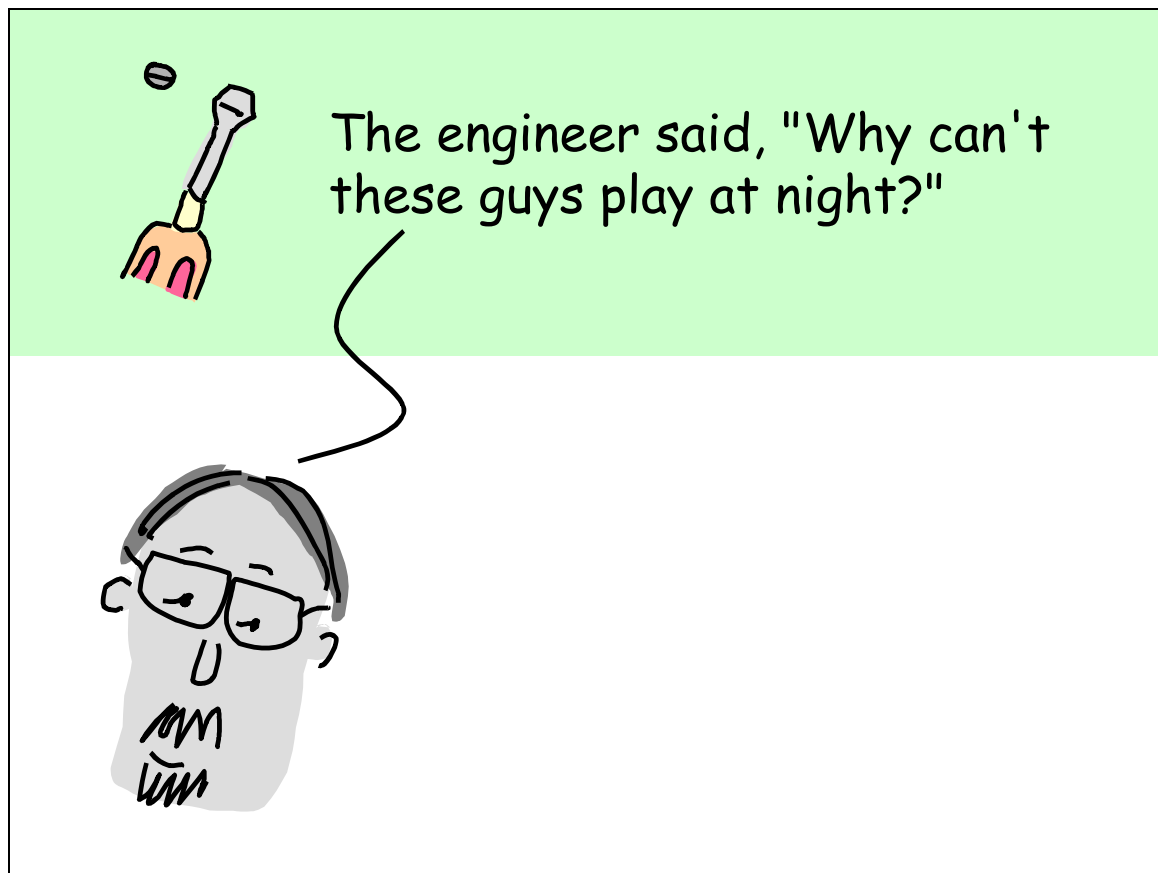
The pastor said, "That's so sad. I think I will say a special prayer for them tonight."



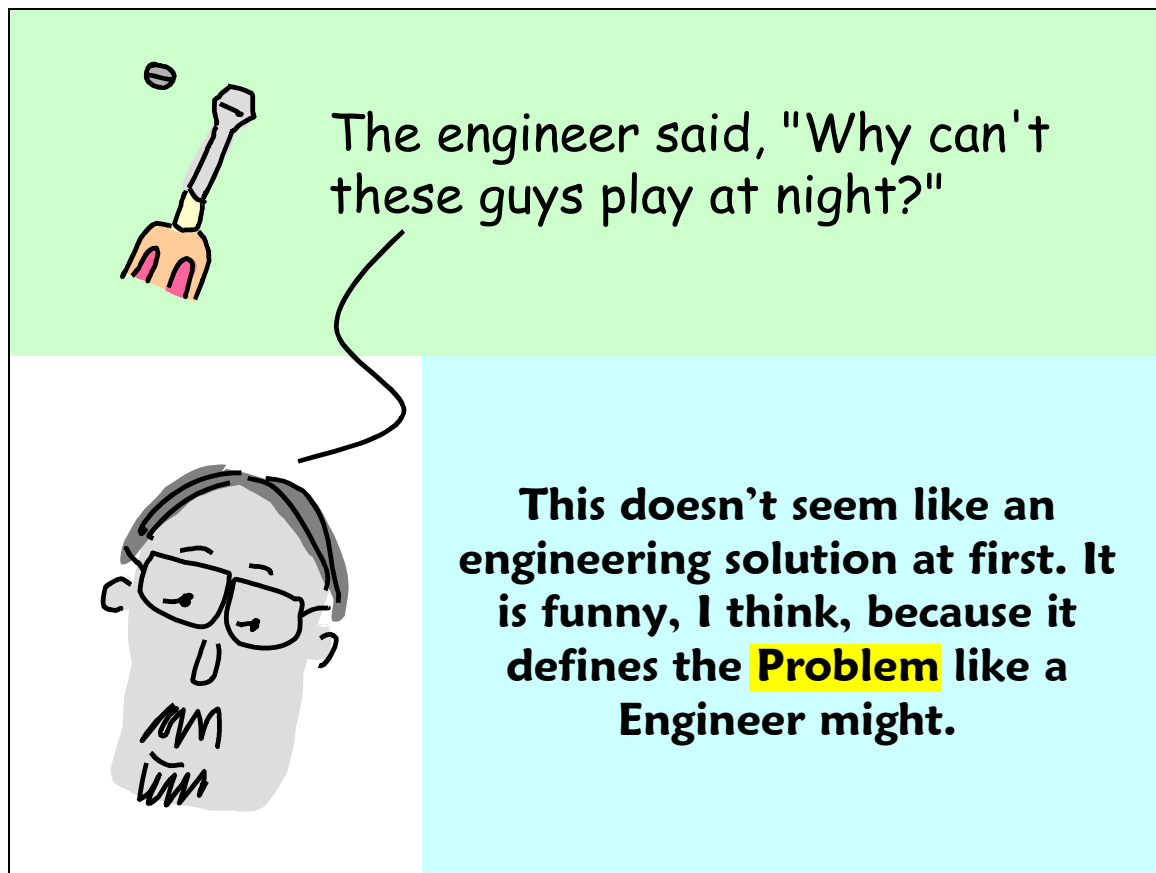
The doctor said, "Good idea. And I'm going to contact my ophthalmologist buddy and see if there's anything he can do for them."



But what, we wonder, will the engineer say?



"Why can't these guys play at night," says it all, I think.

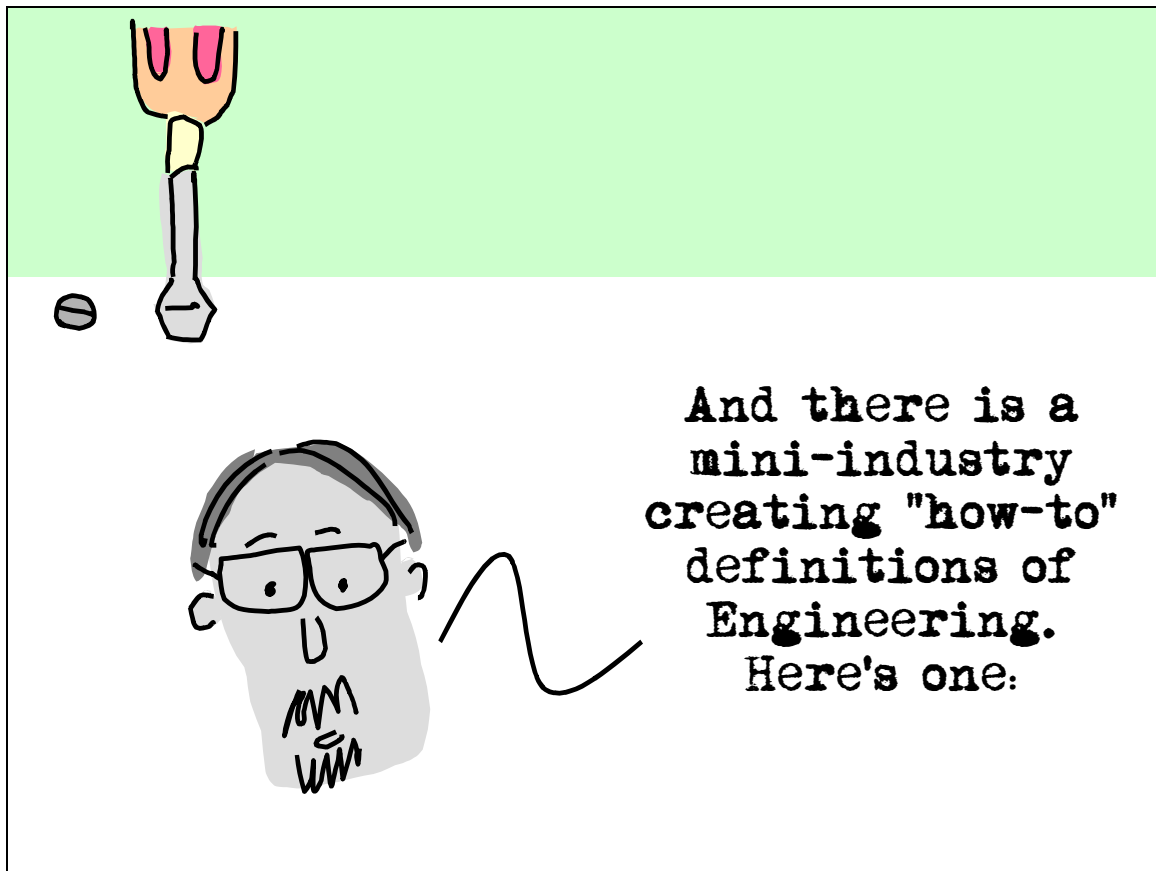


Why is this joke funny (and the engineering audiences I have presented it to laugh loudly?) At first it doesn't even seem like an engineering solution (well, social engineering maybe.) The ophthalmologist who treated eyes as a mechanical objects to be fixed seems more like an engineer than the engineer.

I think the reason it is funny is that it defines the *problem* much like an engineer might, that is, *narrowly*. The problem is, "We are playing too slowly." This solution solves that problem. But there is no thought to the lives of the blind firefighters who might have families and need to be at home at night.

It is what engineers often call a *clever solution*. By thinking narrowly, and somewhat sidewise, there is a *fix*. Here is the spec (and engineers always want tighter and tighter, narrower and narrower, specs) and here is the solution. The consequences outside the problem specification are of no concern. Needless to say this makes the problem definition (or specification) to be of extreme importance in engineering.

Where do engineering problems, and their specifications, come from?



And there is a
mini-industry
creating "how-to"
definitions of
Engineering.
Here's one:

Not surprisingly a mini-industry has emerged around problem definition and specification within the engineering context. Here is a random one that Google netted. There are many more not so dissimilar:

**Yet
Another...**

PROBLEM SOLVING CYCLE

The Dartmouth/Thayer approach



- State the **Problem:**
look at the problem carefully
- Redefine the **Problem:**
redefine it to eliminate bias
- Identify Constraints:
Set General Specifications:
refine and add specifications
- Identify Alternative **Solutions**
- Analyze the alternatives
- Select the Most Viable Alternative
- Iterate the cycle:
until you find a **solution**

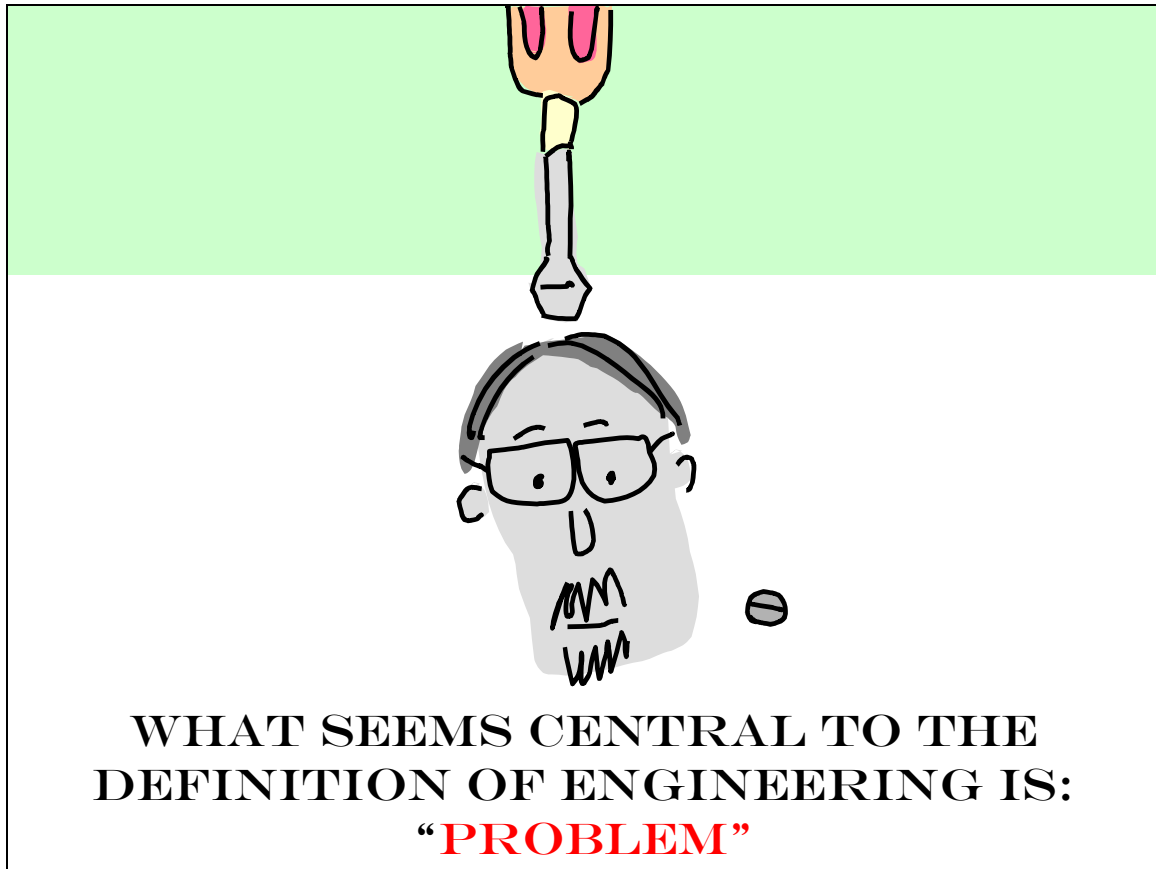
It sounds so EASY!

This is the Dartmouth/Thayer approach, one of many such methods for doing engineering. Like many of such approaches it involves an iterative cycle between re-defining the problem and finding solutions. Such engineering methodologies ask more questions than they answer, of course. Where did the original problem come from? What does it mean to re-define the problem? Who decides what the constraints are? Does environmental safety in India constitute a constraint or not?

I like the line “Identify Alternative Solutions” which takes the vast creativity and innovation of the engineer and reduces it to *identifying*.

What does it mean to iterate the cycle? What is the difference between re-defining the problem and creating a different problem? Is the idea to find *any problem* and *any solution* set that works?

Well, I could go on. Its not the point here. The point here is that engineering is defined in terms of problems and their solutions.



As noted, in trying to understand the definition of engineering, what kept appearing in many ways and guises was the concept of an *engineering problem*. What an engineer does, what is central to his or her being, is solve engineering *problems*.

If it is possible to triangulate the definition of an engineer, is it possible to also triangulate a more precise definition of *engineering problem*?

In any case, I have tried. I have created a *PowerPointish* definition of an *engineering problem* by which I don't mean that it is drawn with line and fills, which it actually is, but that it is created in broad strokes.

WHAT IS A PROBLEM?

What is a problem? An *engineering problem*.

Context

The world around us
including the environment
and our stuff.



The Golden Gate.

Here is my definition of a canonical *engineering problem*:

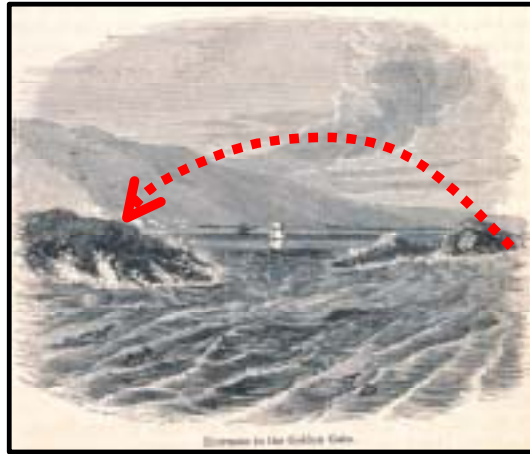
We start with a *Context*, which is everything in the world around us. It includes both the natural stuff like air, water, laws of gravity, DNA, the need to eat and the existing stuff of the Plentitude like cars, trucks, gasoline, packaged goods, sailboats and candy bars.

Almost all engineering problems start by narrowing the *Context*. This is usually one of the most important parts of the spec. In this particular example we will narrow the *Context* to the Golden Gate, a narrow break in the coast of California that separates San Francisco from Marin. At the beginning of the last Century the Golden Gate was considered one of the most beautiful natural wonders of the world and such it was almost the antithesis of the Plentitude.

Context

Desire

A human emotion to want to do something that can't be immediately or easily effected.



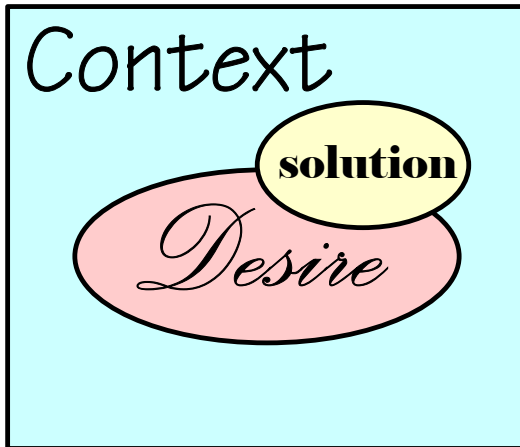
Wanting to get from San Francisco to Marin.

A *Desire* is a human emotion to want to do something within a given *Context* that isn't immediately, or easily, effected. In this example, it was the *Desire* to go from San Francisco to Marin easily, quickly and effortlessly enough that one could live in Marin and work in San Francisco.

I want to distinguish between a *Desire* and a desire. Let's say I want to type a word on the keyboard in front of me. I just reach out and type. That is a desire. It was so easy to satisfy that no deep emotion developed; *Desire* did not develop.

A *Desire* develops when one wants to do something and it is hard, or difficult, or impossible, to do it. That feeling of longing, of loss, of incompleteness, that is *Desire*.

A *Desire in a Context* is my cartoon definition of an *engineering problem*.



A solution is a change in the Context ...



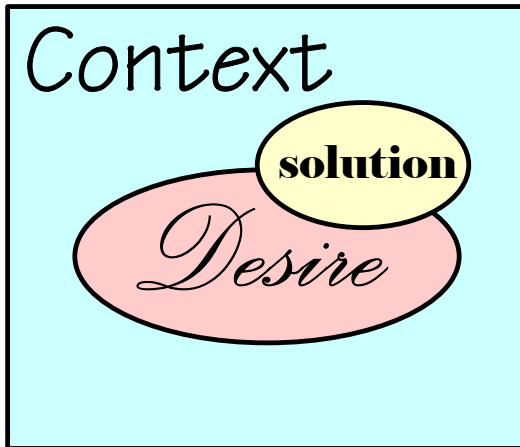
The Golden Gate Bridge.

[Asymptotes to Action]

An *engineering solution*, that to which all engineering aspires, is a change in either the *Context* or the *Desire* such that *Desire* goes away, or at least becomes no more than a desire. When a *Desire* can be acted upon, when it asymptotes to action, then the solution can be said to be effective.

In this example, The Golden Gate Bridge was built over the Golden Gate. Sure, one can no longer see the pristine, pre-Plenitude natural wonder that was known all over the world for its heart stopping beauty. On the other hand, one can get from San Francisco to Marin by simply pointing one's car in that direction and driving.

Any desire to go to Marin from San Francisco can now be quickly converted into *Action*. It would no longer be a *Desire*. The Golden Gate Bridge, in a word, is a near perfect *Engineering Solution*.



... Or in the *Desire* itself.



Commercial about
staying in SF and not
going to Marin.

[Can *create Desire* too.]

Engineering solutions to a *Desire in a Context* almost always revolve around changing the *Context*. However, it is also possible to alter the *Desire*. For instance, one could create a series of public TV commercials which show the benefits of *staying* in San Francisco and not going to Marin in the first place. Picture the *See America First* commercial series which attempted a similar thing but on a national scale. In general however, the province of changing the *Desire*, instead of the *Context*, is that of a *Designer* working in an advertising agency.

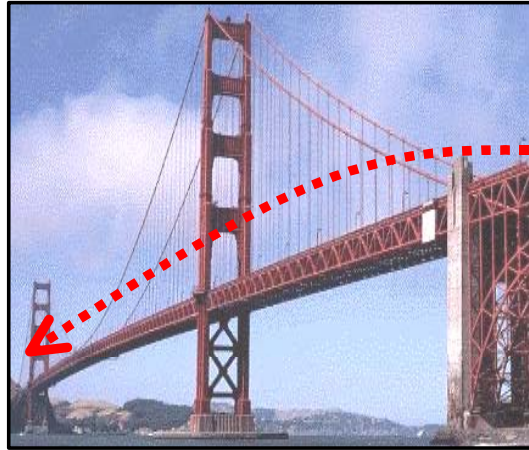
And while not part of this discussion per se, it should be noted that the role of Designers is often to create *new* Desires. Why would anyone want to create a new Desire?

Well, for instance, one creates a new Desire if one has a new *solution* to sell but no one wants to buy it. Designing Desires while simultaneously Engineering Solutions is one of the most fundamental collaborations between these two great creative professions within the Plenitude. It is more common than most imagine.

Context²

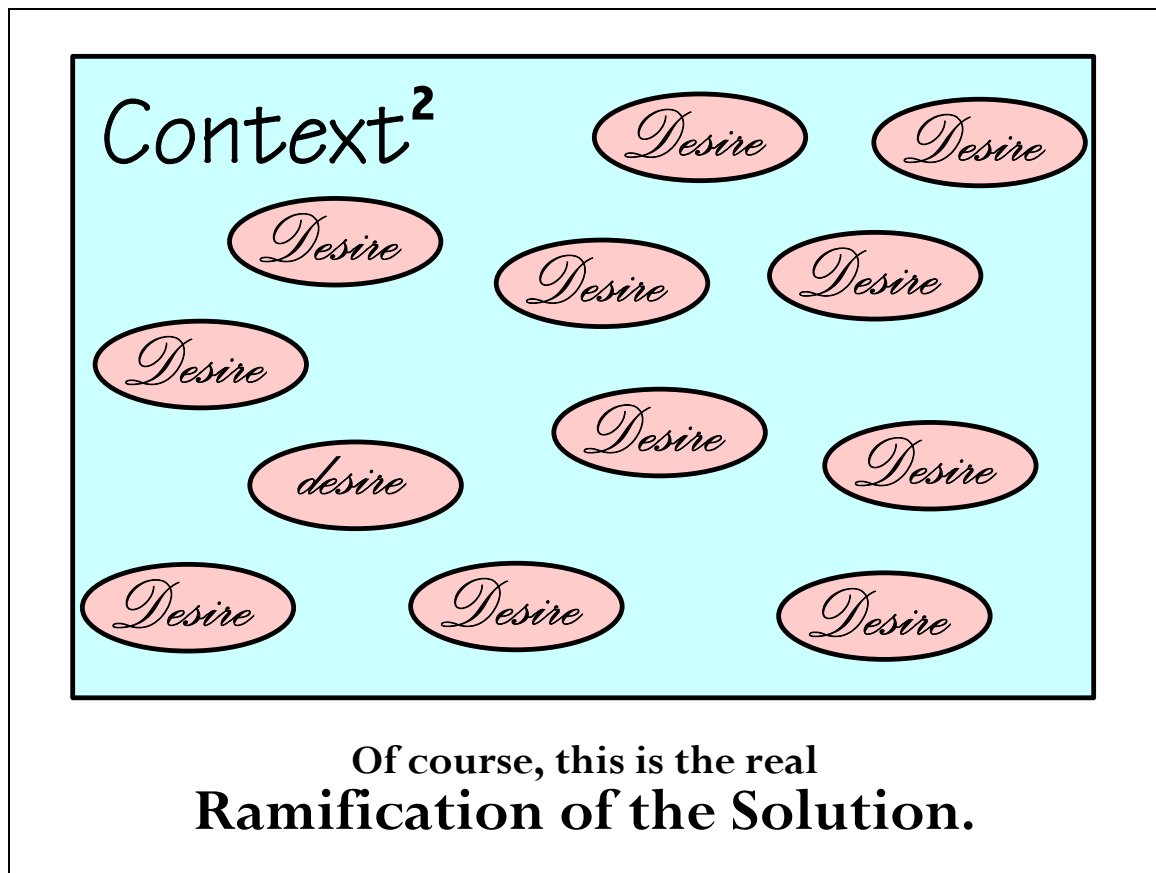
desire

...Such that the *Desire* is eliminated or reduced.



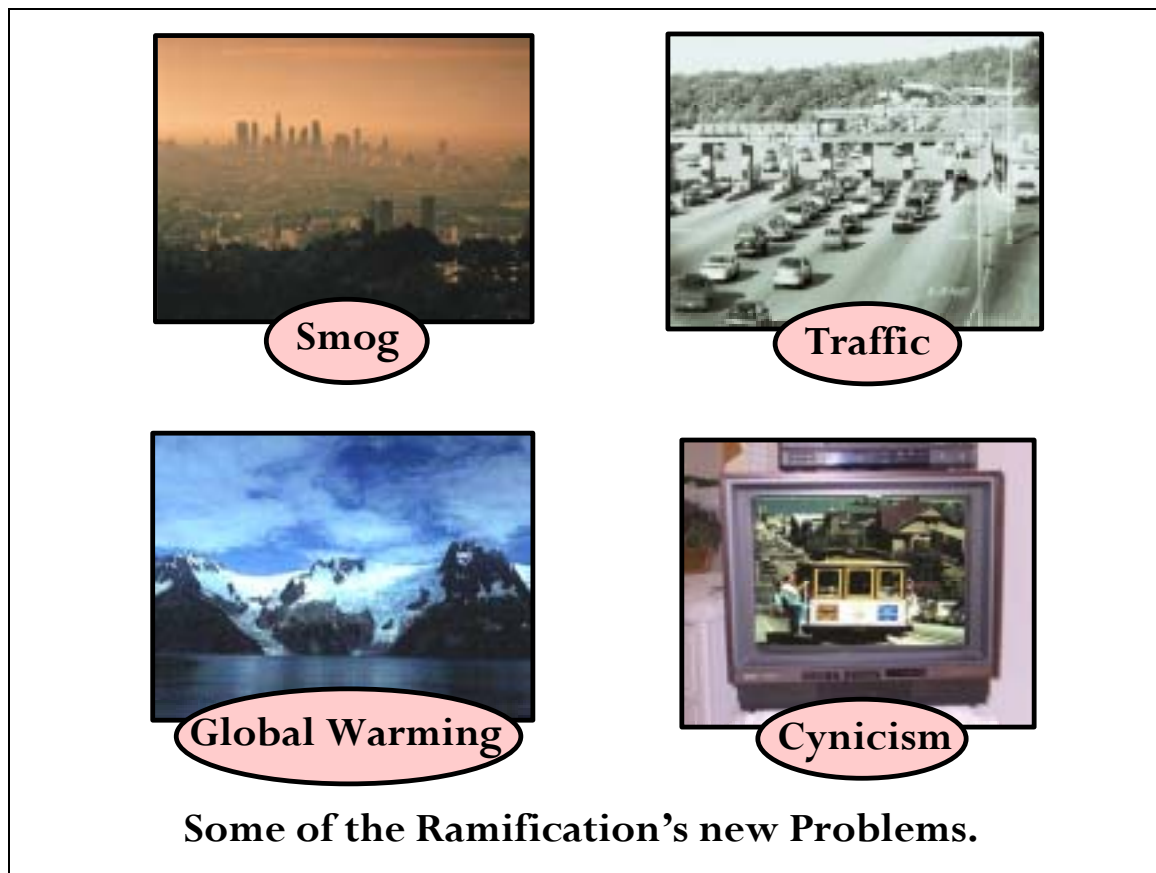
Let's just go!

Anyway, bottom line, with a good engineering solution, the new *Context* reduces *Desire* to a small desire which can be easily satisfied just by driving.



Of course, what actually happens, in almost all cases, is a vast *Ramification of Desires* based on the *solution*. I am using the word *Ramification* in its original meaning, that of *branching*. Like how a tree branches, and then those branches branch. While the original *Desire* is reduced to a *desire*, suddenly there are a vast number, an over whelming number, of new *Desires*, each of which calls out for a new *solution*.

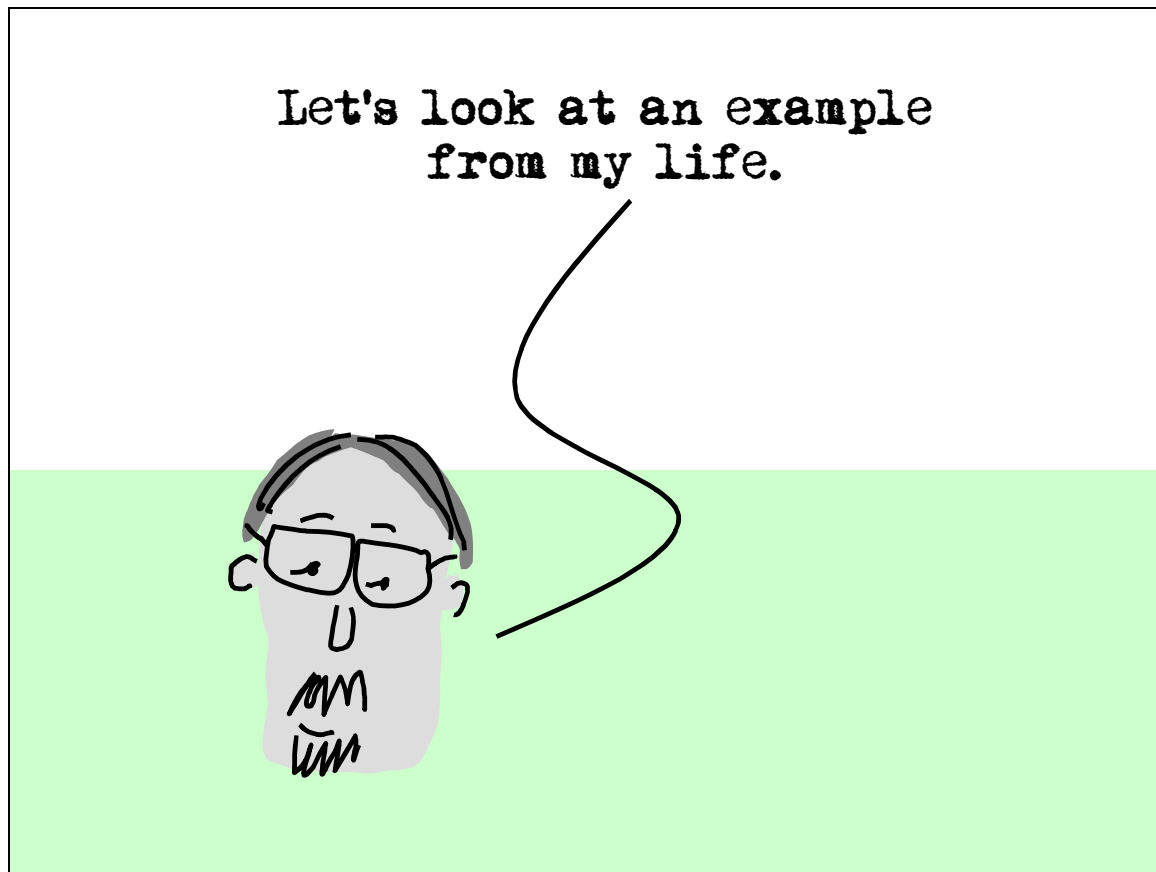
The *Ramification of Desire* is one of the prime drivers of the Plenitude and it keeps the engineers and the designers in work. The solutions to these *Ramifications*, you can bet on it, require even more stuff and it will keep the engineer in work orders.



The *Ramifications* of the *Solution* called the Golden Gate Bridge are many. For instance, there is Smog, which is caused when large numbers of cars act to satisfy the *Desires* of their owners. Large numbers of vehicles also creates Traffic Jams which, at times, can make it so slow to go over the Bridge that desire once again becomes *Desire*. Engineers all over the world are trying to find *Solutions* to Smog and Traffic.

Smog has itself Ramified causing a host of secondary problems. One is Global Warming which has the potential of bringing down the entire Plenitude. You can assume that part of the original engineering specification was *not* the constraint: “your solution cannot cause the end of Western Civilization.” But perhaps it should have been.

Design solutions that alter *Desire* are not without problems either. They certainly can cause a general numbing, or a pervasive cynicism, that spills out into other areas of life. TV Commercials attempting to instill *Desire* become part of the fabric of our consciousness and we quickly lose track of who is saying these things to us or why. Losing track of something that large can cause a general paranoia and a fear that somebody, who knows who, is trying to control one's life. And they are too.



In the early 1990s I found myself at Xerox PARC where I worked as an engineer on a research project called Ubiquitous Computing. Now, I had many other roles at PARC besides being an engineer on *Ubi-Comp* (as we called it) but engineering was what most of any given day was spent on. Never under-estimate the amount of time that engineering takes.

The Father of Ubiquitous Computing



Dr. Mark Weiser
1952 - 1999

Standard sort of "desire in context" problem definition

Most important, ubiquitous computers will help overcome the problem of information overload. There is more information available at our fingertips during a walk in the woods than in any computer system, yet people find a walk among trees relaxing and computers frustrating.

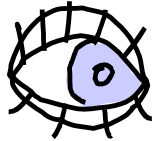
A solution based on changing the context.

... We are trying to conceive a new way of thinking about computers in the world, one that takes into account the natural human environment and allows the computers themselves to vanish into the background.

Ubiquitous Computing was the vision of Dr. Mark Weiser who sadly died before he saw that vision fully work its way into the marketplace. Above is the *Ubi-Comp* problem definition taken from his website. Though stated somewhat poetically it is a standard sort of *Desire in Context* engineering problem definition. It could be restated as: "We exist in a mental state we call *information overload*. There seems to be just too much information us to process, so we become frustrated. This is actually a mental state: there is more information in a forest than in an office. The *way* information is presented in the office, and in our homes, is what causes our great anxiety. Problem: Can we find a method of information presentation that doesn't cause these negative emotions?"

The *Solution* to this problem, Ubiquitous Computing, achieves its effect by altering the *Context*. A standard engineering methodology I would say. Simply put, the solution is to push the computers out of sight and into the background. To push them *inside* of everyday objects allowing us to deal with the world in a directly human, or I suppose, mammalian manner. This is an extremely difficult engineering problem, one that requires deep knowledge of embedded computation, interface design, sensors, human factors, product design, wireless communication, multi-processor computation, mechanics and even a fashion sense. It's still being solved.

Ubiquitous Computing is computation that is embedded invisibly though out the objects of everyday life.
It is tacit and helpful.



Sensuous



Reactive



Communicative



Embedded
Socially



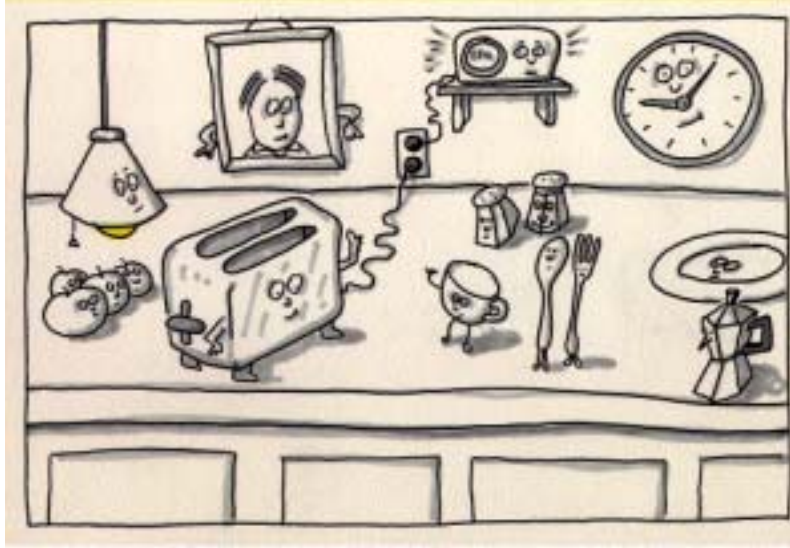
Colonizing

The five properties of *Ubiquitous Computing*.

He is my cartoon definition of what constitutes a Ubi-Object:

Ubi-Objects are *Sensuous*. They have embedded sensors, cameras, pads, keys, microphones, pressure points, tilt detectors and the like. They sense the environment and the people around them. Ubi-Objects are also *Reactive* in that they can change, and do things, based on what they sense. They have screens, motors, speakers, arms, gears and perhaps even something akin to facial expressions. To say that they are *Reactive* also implies that they are *Smart* since they have to know what to do. Most interestingly, and what distinguishes them from most of today's kitchen appliances, is that they can *Communicate* with each other, exchanging information, insight and gossip.

Ubi-Objects are *Embedded Socially* in our lives. They are simply part of the world. We don't think of them as computers. We don't stop, and then work on them. They are part of our daily interactions. Lastly, they are *Colonizing* in that they take the forms of already existing, historically-determined, objects of the Plenitude. There are Ubi-pens, Ubi-cars, Ubi-T-shirts, Ubi-walls, Ubi-notepads, Ubi-Shoes.



An Artist's Conception of a Ubiquitous Computing Kitchen


But Weiser said:

“I don’t want to argue with my car about where to go.”


Here is an artist’s conception of a Ubi-Comp kitchen. Well, it is my conception. Immediately you can see the most important and unexpected ramification. If all the objects in a Ubi-world are sensuous, reactive and communicative then they are, in many ways, *alive*. They will seem to have wills, desires, wants and needs just like other sentient beings. At least to our small brains.

Who, or what, can be held responsible in this complex ecology of stuff when the toaster burns the toast because the coffee cup told it, that the plate told him, that you like it crispy? Who, or what, caused the refrigerator to order five gallons of 2% milk and who can you sue when the kitchen self-cleans because of the smell of spoiled milk and it destroys your PDA-cellphone-ebook-notepad-camera which was helplessly screaming for its life on the counter-top?

Dr. Weiser’s original concept was that the Ubi-world was just a better world, filled with better, easy-to-use tools, and one that required little thought or knowledge to operate. To do this, programmers invented something called *independent software agents* to handle the many interacting devices. Unfortunately, they *were* independent and you have to cajole, reason, bribe and praise these agents to get them to do what you want. Like most ramifications, this wasn’t the idea at all. As Weiser famously put it, “I don’t want to argue with my car about where I want to go.”



← PARC TAB



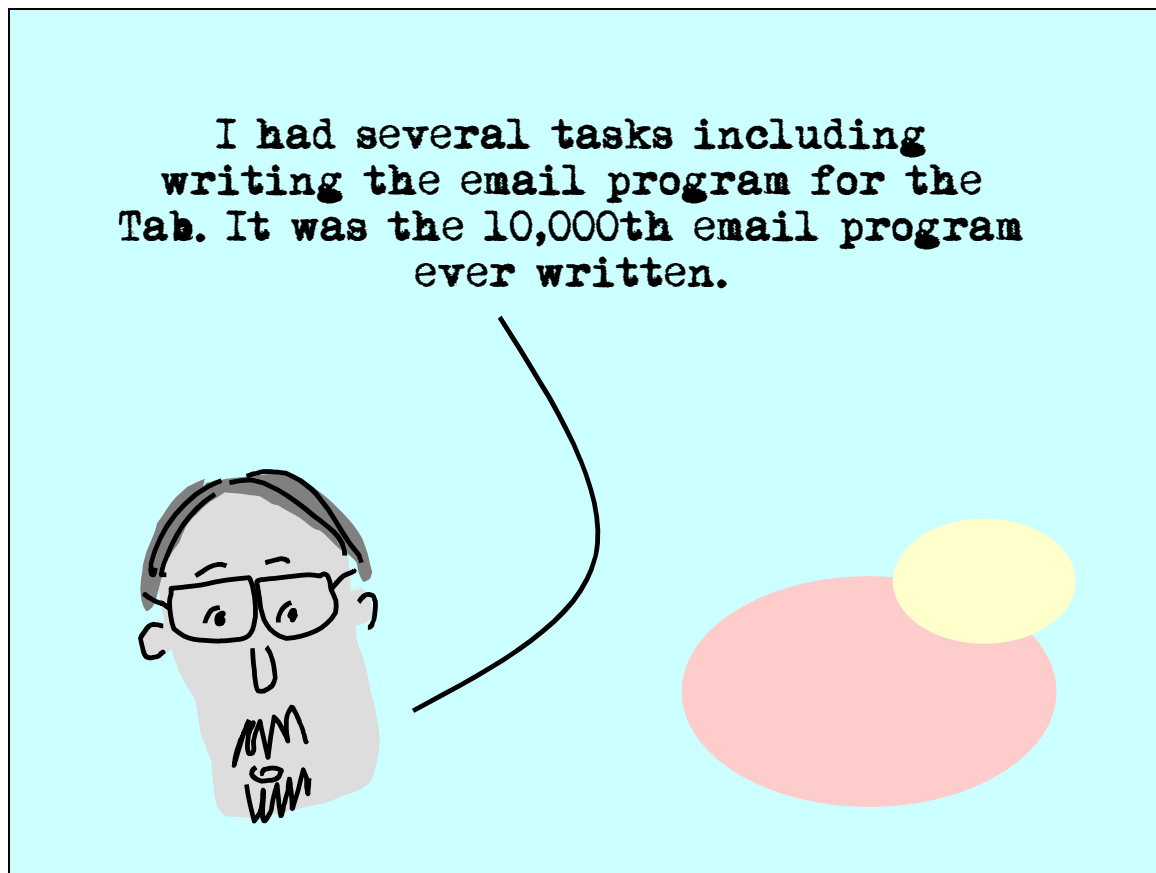
- Wireless, Touch screen, Location knowledgeable
- Small, meant to be carried at all times
- Intended to replace small notebooks, Post-it notes
- Supposed to be 50 or so per room
- Use without thinking – just like pen and paper

↑
Dr. Roy Want

Since we worked for Xerox we researched the Ubi-office, and in particular, the Ubi-documents within the Ubi-office. We looked at small, medium and large sized Ubi-documents (e.g. PostIt-Note-sized, pad-of-paper-sized and white-board-sized documents.) As part of this effort, Dr. Roy Want invented the PARC Tab (circa 1991) which, being able to be held in one hand, covered the PostIt-Note-size of the Ubi-document scale.

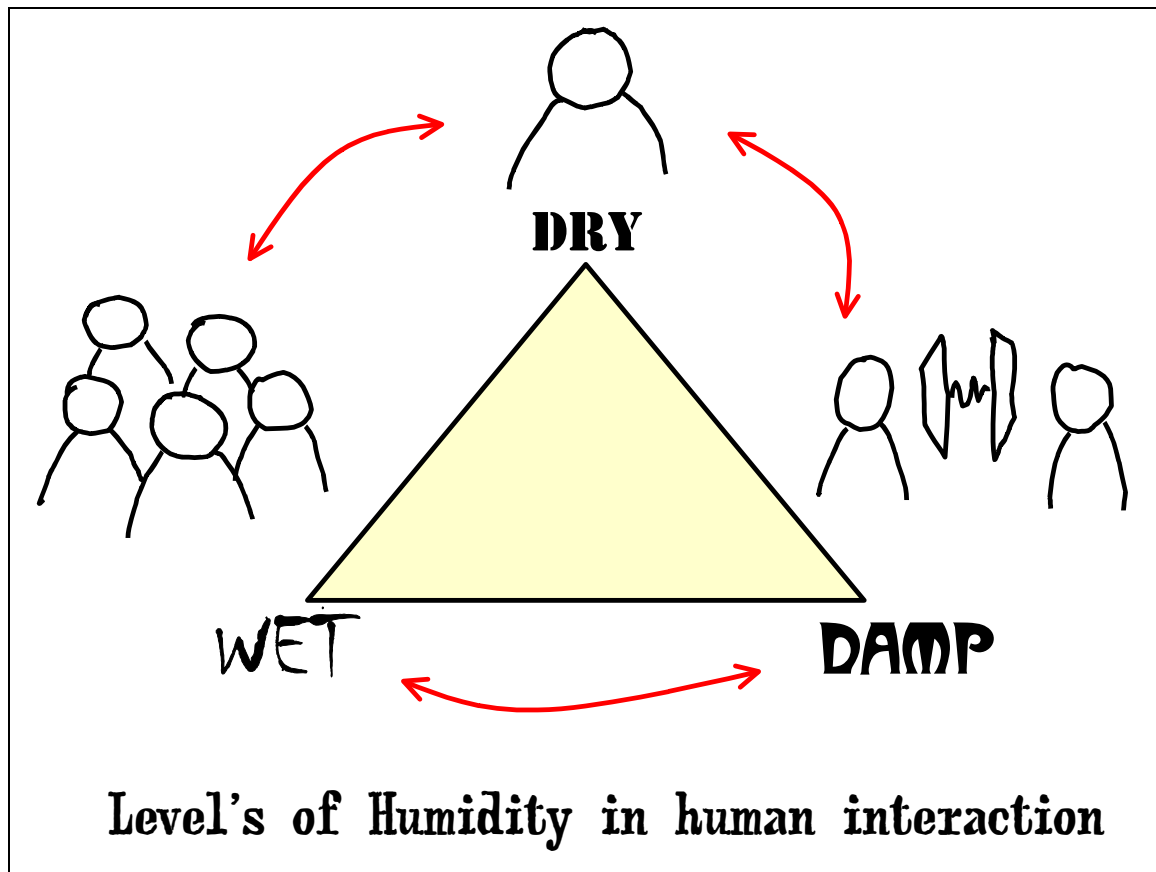
The Tab communicated with the rest of the Ubi-world via infra-red. It knew where it was in the building and could change its behavior based on that knowledge. It was small enough to be placed in your shirt pocket and it was designed to be carried at all times. It had a touch screen and it was the first device to have a simple, one-stroke alphabet for handwriting input.

Interestingly, unlike today's PDAs for which it is the clear precursor, it was envisioned that there would be fifty or more Tabs per room. They would be everywhere just like PostIt-Notes are. When you wanted to remember to turn out the lights you'd put a Tab by the light switch. If you needed to write something down you'd just grab one off of the nearest table and jotted. When writing a speech you might have twenty Tabs on the desk in front of you which you ordered and shuffle like 3x5 cards. And they all chatted away to each other all the time.



While I had many tasks while working on the Tab, one of the largest was writing the usual *productivity suite*. A little word processor, a calendar and a little email program. I believe I wrote the world's 10,000th email program. It wasn't great, but making it work on a small screen was a trick. However, it worked and it was used by the other researchers at PARC.

As any computer engineer will tell you, a program of any complexity eventually develops its own email program. Its a law of the Plenitude



To analyze what the Tab was really about I need another triangle. I call this one the *Triangle of Humidity*. Starting at the top:

When you are alone in your room, door shut, email off, phone off the hook, just you, alone, I call that a *Dry* space. Dry spaces are needed for creating long works, for thinking and for reading books and other bibliographic material. I wrote and drew the PowerPoint slides for this book in a Dry space.

A *Wet* space is a room filled with people, from two to a hundred thousand. You can smell each other, touch each other, feel each other. Pheromones fill the air. You can see every nuance of their face. All our mammalian herd instincts arise to our skins. It is my belief that no project of any complexity can be built without some Wet space. When I give talks, it is in a Wet space.

Recently, perhaps we can date it from 1840 and the invention of the telegraph, a new form of space has arisen. The *Damp* space. In the Damp space you are physically alone, just like in a Dry space, but you are in *contact* with other people, just like you are in a Wet space.

The telephone is a common Damp space. I am in California when I talk with my father, who is on a telephone in Buffalo. We are both alone, and yet we together. We are both in a Dry space and in a Wet space. We are in a Damp space.

In an office, information and documents move between Dry, Wet and Damp spaces fluidly. You write a report in a Dry space. You bring it to a meeting, a very Wet space, where it is passed around and critiqued. After the meeting people call each other (a wettish Damp space) and exchange email (a dryish Damp space) about what happened at the meeting. On-line, a new report is put together (a Damp space.) You work hard at night on a special section of it (a Dry space.) At another meeting (Wet) you hammer out the final draft. You send it to the boss who reads it alone in his office (Dry) and so on, around and around.

Certain people believe, as an article of faith, that all Damp spaces should become as Wet as possible. That, for instance, teleconferencing should develop to the point where it is indistinguishable from a live, very Wet meeting. It is important to point out, when people suggest this, that the prophylactic aspects of Damp spaces are very useful and remarkably valuable. For instance, it turns out, that I can have a better half hour conversation with my father, once a week on the phone, than I can have in person. Email can strip out the confusing information often presented in a meeting and come right to the point, saving time and effort. Using symbolic tools, such as language, one can often mediate emotion and add rationality that are hard to achieve when facial expressions and uncontrolled body postures are sending other messages. The best working environments are not exclusively any one of the three points of the triangle, but a complex soup of them all.

I have tried to find the first Damp space, but no matter how far back I look there always seems to be a precursor. OK, there is the telegraph, but isn't the *postal letter* just a very slow Damp space? Well, yes I guess so. And, as somebody pointed out to me, aren't Japanese paper walls, where you can say things in one room meant to be heard in another, also a form of Damp space? Or aren't our clothes, which we wear on a city street, a way of making a Wet space considerably Drier (and adding a symbolic layer?)

I have come to believe that interactions of Wet, Damp and Dry spaces are as old as humanity.



How can we think of email on the Tab in terms of my proposition that engineering is *Desire in Context*?

Here is the *Context*: The highly Wet environment of the day-to-day office where people talk in the corridors, point over each other's shoulders, have meetings, eat lunch together, sit at tightly packed desks and in general, engage in the highly social, herd-animal behavior that humans were born to engage in.

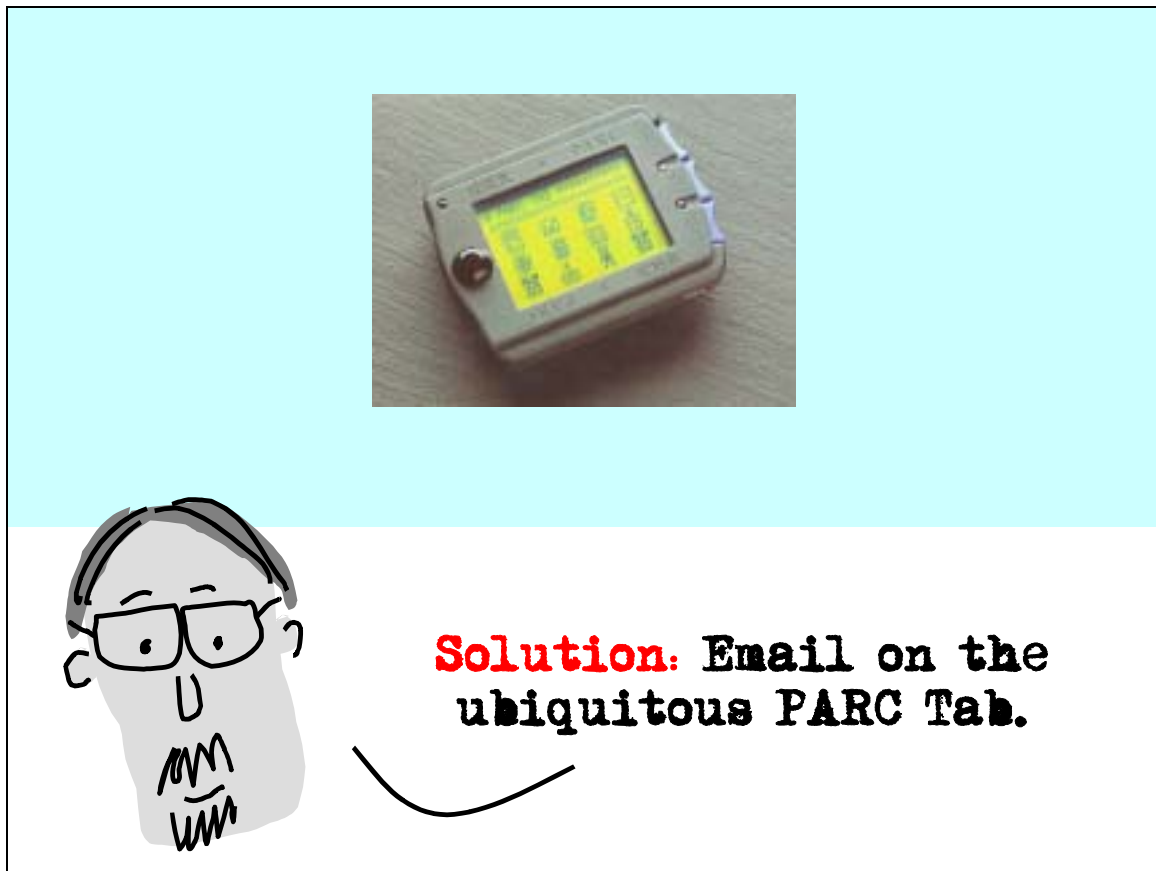
There is a good argument that we created corporations not because they were good vehicles for creating wealth, but because we liked to get together in very Wet tribal rituals. How else can you explain corporate T-shirts?



Desire: To make the world damp. To turn the world into a giant text chat room.

The *Desire* of Ubiquitous Computing was to overlay on top of this Wet environment a Damp one. In the middle of a Wet meeting you would be able to email a colleague in another room, another building or around the world. In the middle of eating lunch at the company cafeteria with your office mates, one would be able to tap out an email message and send it off to your wife, or husband, or to your boss, or to your rival.

The Wet would become augmented with the Damp. At any moment you could chat with any one else in possession of an email device.

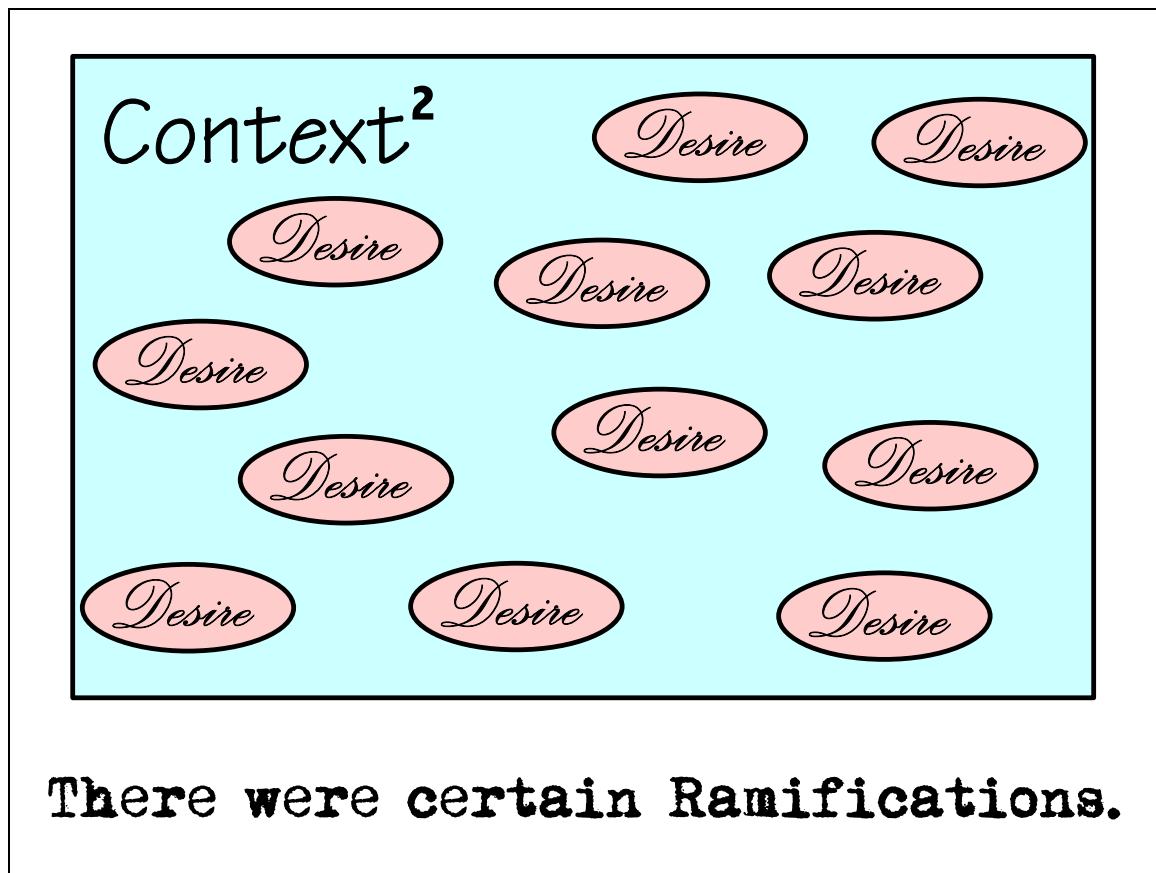


The Solution to this *Desire in Context* was the PARC Tab and the little email program I wrote for it.

Like most engineering solutions it primarily changed the Context.

Of course, this solution would work best if everybody had a Tab with the email program on it. Part of the practice of this kind of research was to build and distribute enough Tabs so that people saw them in action and then *Desired* to have one themselves.

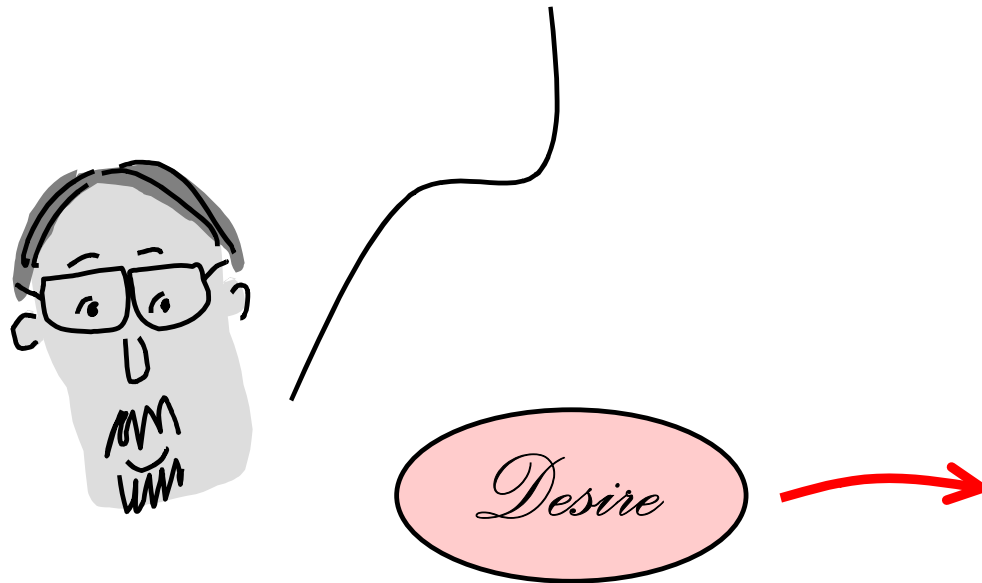
Like a firestorm, or a nuclear chain reaction, the Plenitude is self-sustaining. And can be just as dangerous.



The email program on the PARC Tab was a Solution to the Desire to have a Damp space in the middle of the very Wet space of the office. It would reduce Desire to desire, allowing you to send an email to a remote colleague while interacting with people who were co-located.

However, like most such engineering Solutions, it branched out and intersected many other aspects of office life, and frankly, life in general. It severely *Ramified* as it created the new Context producing many new Desires, some of which weren't so pleasant.

I gave names, and assigned causes,
to some of the the Ramification.
Here they are...



I gave names to some of these Ramifications, these new Desires.

Here they are, in no particular order:

1. Big Brother



To make the Tab work, and to make its features powerful, the system had to know where it was, who was using it and who was near by.

People Desired not to be watched.

During the Ubi-Comp project we got more than our share of press coverage. Most of the articles stated something like: “Big Brother Comes to the Office.” What they meant was, that for the system to work the system had to know whose Tab was where. The system needed to know this so that it could deliver the email and so the Tabs could change their behaviors depending on what room they were in or who or what was near by. This is called *situational high-tech*.

What makes this problematic is that if the system can know where you are, so can your boss. He or she would know if you are at your desk, or at a meeting, or in the bathroom, or by the water cooler. This sort of surveillance seems some what un-American and it can be argued that ubi-Comp could create an environment of fear even as it delivered the mail, which it may have read. This divided PARC over the wisdom of Ubi-Comp as a whole and the Tab in particular. There were many who simply refused to carry one.

So, one of the ramifications of the Desire to deliver email right to a person where ever they were, was the even stronger Desire *not* to be watched.

It was hard to imagine that ten years later there would be TV shows in houses with cameras everywhere, including the bathroom, and it would be called entertainment.

2. Road Warrior



To make the Tab useful it had to be stuck in a shirt pocket (if you had one), hung from your belt or off your purse (if you had one).

People Desired not to change their social status just to read email.

Where did you put the Tab if you did decide to carry one? At least part of the Tab needed to be exposed so that it could communicate with the rest of the system via infra-red. The shirt pocket was the ideal place, but the Tab was actually just a little too big to fit there comfortably. Dr. Want had tried to make it as small as possible, but at the time, he was at the limits of miniaturization. One could hang it from one's belt with the clip that was on the back of the Tab (which we thoughtfully provided) but one began to look like the Road Warrior. Remember, in 1993 almost nobody had a cell phone, particularly one that was small enough to wear (and nobody could even imagine that executives would wear headsets just to speak on the phone.)

And women often had neither shirt pockets or belts.

Wearing a Tab visually changed you from a middle-class worker into a *techie-nerd*. That had very deep social ramifications since we often judge people on who they are based on what they are wearing and what equipment they are carrying. At the time, to wear a Tab was to slide down the social ladder a notch or two and most people desired to stay at the rung they had struggled to. People Desired to look cool.

3. Humidity Matters



Because we wanted the Tab to be maximally useful,
we made it work everywhere.

People **Desired** to have their wet meetings
undiluted with dampness.

It seemed to us that the Tab would be most useful if it could work everywhere. In fact, unless it worked *everywhere* it was unlikely that people would come to rely on it as a primary means of communication (which was our desire.) Hence we wired up the meeting rooms along with the offices, corridors and lunch rooms.

This immediately caused a problem within group meetings. Instead of listening to the other people around the table, folks with Tabs were clicking away, sending and receiving messages with people elsewhere in the building, or around the world. Wetness is easily destroyed by distraction. If even a few people in a meeting were doing something else, the humidity of the room, as a whole, dropped precipitously .

While we wanted the Tab to work everywhere (or else we felt it might not work at all) others wanted them *not* to work in group settings. Given the widely held belief at PARC that meetings were a waste of time, it was hard to argue the point.

While it was never settled with the Tab we see ten years later that where one is allowed to use cell phones (another Damp device) is being argued out even in Congress. The Desire for undiluted Wetness is a deeply political issue.

4. Devices Desire Complexity



The idea of the Tab as a simple notepad quickly grew to encompass email, video, phones, remote terminals, etc. It took a PhD to run it.

People Desire the simple.

The Tab started out as a simple idea: let's replace small pieces of paper like PostIt-Notes with Ubi-PostIt-Notes. It would be just like a regular PostIt in that you could quickly pick one up and jot things down, but it would be better. It could move what you jotted to another Ubi-PostIt or to your main computer. It would be just an enhancement. What could go wrong?

But almost immediately email and word processing became *applications* and in not much time there were other applications, including an application to manage the applications. Somebody figured out how to do voice and photos and video on the Tab and wrote applications to do those things. And multi-player games. Soon you couldn't just pick The Tab up and jot things down. You had open a program and to learn how to use it. Pretty soon only the PhDs could run it.

We started out desiring a simple, the clean idea. Tab = PostIt. But Ubi-objects have their own Desires: they wish to be complex. When engineers looked at the Tab they could hear it calling to them, asking for more functions, more programs, more I/O. "Give me a paint program, give me GPS, give me a phone *please!*" the Tabs called.

Which would be OK, except that even within the Plenitude, people still Desire the simple.

5. It's a Jungle Out There



By itself the Tab was simplifying but it joined an ecology of 1000s of other devices all fighting for their own survival.

People Desire calmness.

This is a photograph of my kitchen. Its hard to know (or define) precisely but there are clearly thousands of individually designed objects in it. The manufacturer of each item wants to sell more of the same, or related objects, next year. Given that there is a limited amount of space in the kitchen, and a limited amount of money in my wallet, there is competition for existence between all of these many objects.

If the Tab was to survive, it had to survive in a world with many other increasingly smart objects. Cell phones, regular phones, remote controls, video cameras, PDAs, laptops, desk tops, digital watches, smart stoves, smart refrigerators, smart coffee pots, ebooks, pagers and on and on. Any one of which was quite amazing and brilliant, but which, all combined, created a jungle of electronics that was nerve wracking to live in. And for each object to survive, it had to become more complex, do more things, become more valuable. The Tab was no different.

As Mark Weiser said, “people Desire calmness,” and yet the world we engineers were creating was anything but. There were several reasons. First, while each device *Solved a Desire in a Context*, the combination ramified into a new set of problems. Second, each device competed for its own survival making it more complex and attention grabbing. The Plenitude is, in many ways, a ruthless jungle.

6. McLuhan Was Right



The Tab was used primarily to communicate but because it was placeless, and because there were no design tools for it, the nuances of story were lost.

People Desire understanding.

Meaning is carried by the medium, the genre, the context and what is often called the content. It is not just one, but all four together. Meaning itself is remarkably hard to define and I won't attempt it here, but one can see that even a simple phrase like "Pass the salt" changes its meaning if it is said through the air or over a phone (medium); said in a conversation or in a song (genre); said over dinner or while fighting (context); or if it is *pass the bomb* instead of pass the salt (content.) Meaning is dense and goes all the way down. And us humans are meaning mavens and *look* for the meaning all the way down.

The Tab was a new medium and all of its meanings were not fully understood (was it a small computer or an active piece of paper?) The genres for it were also not clear. Email was somewhat understood (though it was still early, before its emergence into the general population.) And the context kept changing. You didn't know where the sender was and you didn't know where your receiver would be. Meaning came unraveled and fell back to fundamentals.

So while a message could be delivered to somebody anywhere, which was a strong Desire, the meaning wasn't always clearly understandable, and which was an even stronger Desire. People deeply Desire to understand what the heck is going on.

Because Engineering is local, and often based on trial and error, it has developed a vast symphony of Rules of Thumb.*

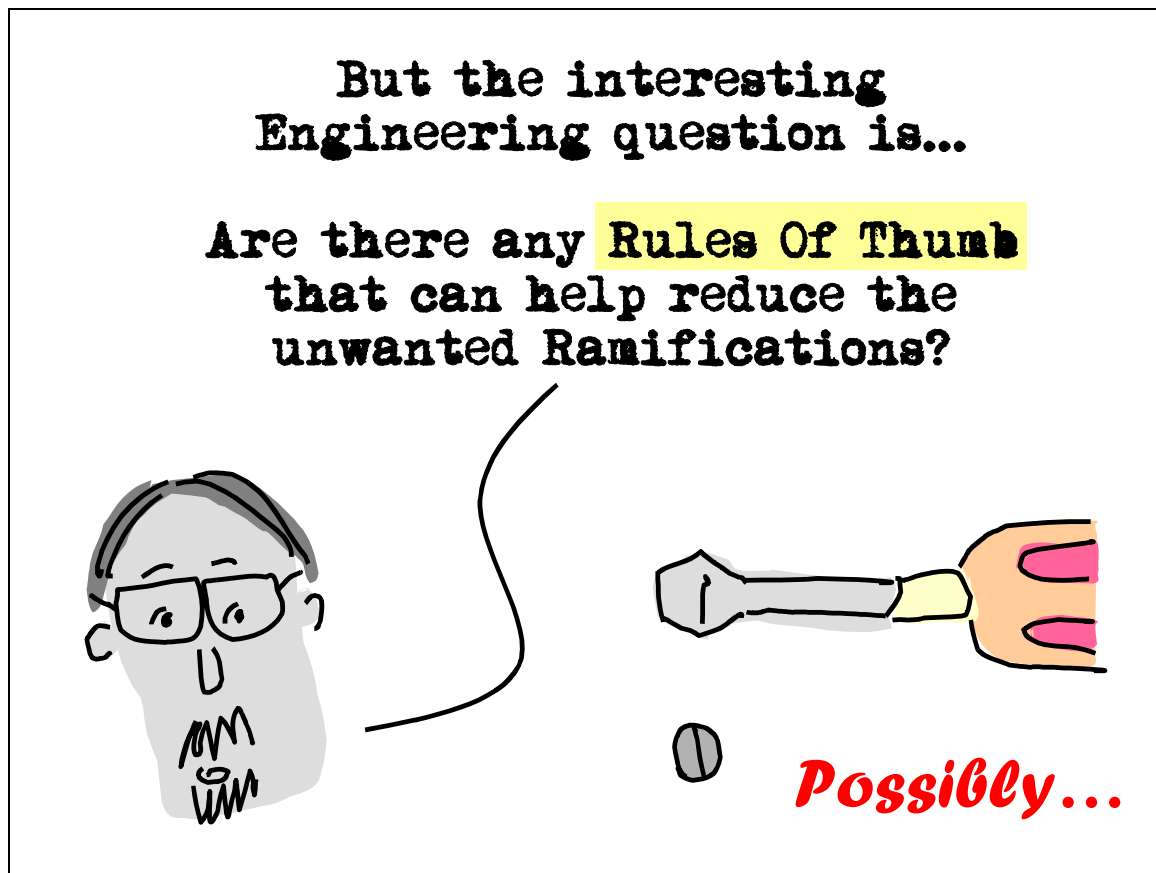


*Heuristics
Pragmas
Good ideas
Patterns

Unlike scientists, who attempt to find universal laws that work everywhere, engineers often find themselves collecting *Rules of Thumb* which can be extremely local.

Scientists fantasize that they will find a single equation at the center of the universe from which, by rote expansion, *everything* can be explained. The science library of the future will be one small sheet of paper. Engineers have no such fantasy. Their hope is that they will be able to find a technology that will allow them to carry hundreds of volumes of Rules of Thumb to every job and be able to search it fast.

Where did these Rules of Thumb come from? In the past hundred years many *were* derived from scientific principles, but the vast majority came from trying things out and seeing what worked and what didn't.



Most of the objects around us were engineered to find Solutions to very specific Desires within the Plenitude. Many of them succeeded in reducing the targeted Desire to a desire. But almost all objects Ramified and created far many more Desires than they solved. It is unclear, as we enter into the Twenty-First century, living as we do on a remarkably small planet, if this can work any more.

What if we start with the Desire: We wish to create new objects, even Ubi-objects, that don't Ramify, or at least produce a highly reduced set of Ramifications.

Is that possible?

I don't know.

But here are some Rules of Thumb that might help based on the Ramified Desires of the Tab. I have given them the structure of little Pattern-ettes after Alexander's *Pattern Language* though clearly without the depth of that great work.

Problems are narrow but
solutions are wide.



Therefore treat antithetical desires as
your friends and not as your enemies.

Making a Wet space Damp by inserting email into the Context is not all that difficult. As an engineer, I found the specification well written. It was easy to determine if I succeeded or not. With a bunch of C code on the Tab and Unix server the job was done. The Problem was narrow.

But the Solution, like all solutions, was wide. It impacted the very social fabric of the Lab causing a political rift down its middle based on the political consequences of inserting Big Brother into its collegial environment. It disrupted meetings. It caused otherwise normal looking people to look like nerds, and worse, it made it clear that us male engineers didn't have a clue about women's fashions (or their lives in a scientific laboratory.)

To mitigate the Ramifications we would have needed to embrace as deeply as Dampness itself, the consequences of Big Brother. It is true that we considered *security* to be a high priority, but it is also true that outside the confines of the Lab there would be little protection. What is the engineering solution then? Engineering is bounded on one side by Design, but on the other by Politics, and I suspect along with the C code we needed to lobby for a new Bill of Rights in the US Congress.

The TV shows would follow with or without us.

Small things make a
big difference.



Therefore assume that fashion and
design are critical components.

We knew from the beginning that the Tab was too thick, but given the technology of the day (and our budget) it was the best that could be done. But those fractions of an inch changed everything, as they dictated how the Tab could be carried and held, how it looked, and how you looked while carrying it. It set up a series of constraints on its use, and because of its thickness, the Tab's metaphorical referent was that of a small computer rather than the PostIt-Note we wanted.

Certain aspects of the Tab were brilliantly designed. It could be operated with a single hand using the three buttons on the side. It could be flipped over, and due to its symmetry, be used by lefties as easily as righties. But when the PalmPilot and its relatives arrived in the marketplace the biggest change was the physical design which spoke loudly: *Fashion Accessory*.

To say that something is a fashion accessory is to say an object (or its creators) care about, and are concerned about, the entire social infrastructure of the society. That they care about how people visually judge each other, the accoutrements that they wear and the social hierarchies that they represent. Fashion is *tribal*, it is part of our mammalian, simian brains that developed when we hunted in packs, needed to defend out territory and chose our alpha member to lead us. Engineering Ramifies into the issues of fashion and design immediately, so *put it into the spec*.

**There are always multiple
competing **Desires**.**



**Therefore don't assume that every
solution is universal.**

The Plenitude is designed to be unstable. Next year it will look different than this year. Next year there will be different Desires than this year. At no point will all Desires be satisfied; if they were the whole economy would grind to a halt. And at no point is there a single, non-contradictory set of Desires. Within the Plenitude there are always multiple Desires heading off in different directions. There is no Solution that can work all the time. An engineer is always choosing which Desire to satisfy. Usually, of course, it is their employer who is choosing.

But if we start with the proposition that as engineers we wish to reduce the amount of Ramification in the world then the following Rule of Thumb might help: *Don't Assume That Every Solution is Universal*. Most things work, or work best, when they are limited to certain places, certain times, certain social situations. And it all works best if the possibility of limitation is built into the device itself.

It would have been extremely helpful if the Tab simply didn't, couldn't, work during meetings, either through technical or political means.

Ten years later meeting-goers demand not just power cords, but T-10 lines for their laptops. The Plenitude is unstable. But today I don't want my son's GameBoy at the dinner table where it destroys family life even as it helps the family on long trips.

Stuff always **Desires** to be more complex.



Therefore try to say “no” when it calls to you for another button.

Almost all engineering occurs in a context of previous engineering. One doesn't design a car from scratch, one starts with last year's model. One rarely designs a computer program (or computer) from scratch either. There is always a version 1.0 for every version 2.0. And version 2.0 is almost always more complex, with more features, than version 1.0.

Stuff calls out, it Desires to be more complex. Clients always want another feature. The corporate processes of how to add a feature are clear; how to remove them are not. Particularly, how to remove them and still sell the object, are not.

Yet, to avoid Ramification the *simpler the better*. It is more useful, more understandable, more workable, more flexible to have 10 simple things which can be combined as needed, than one complex thing with all functions embedded in to it.

Saying *NO* to a new button is usually saying no to one's boss, to the user study firm, to the *obviousness* of the button. Complexity is simple to add and yet its consequences are exactly opposite of Weiser's original goal of making the computer disappear and reducing anxiety. The complex object argues with you all the time, and is why as the Tab became a general purpose computer, it ceased to be the simple, useful, intelligent, PostIt note.

The world is already a **mess**
of unmanageable stuff.



Therefore to whatever degree your
client will allow you, simplify.

The key to this *Rule of Thumb* is the client, the person usually paying the engineer's bill. Basically, there is usually little money coming in from a client asking to make something simpler. It is almost impossible to get paid for taking things away. I have tried thinking of a way around this truism, but the best I can do is an appeal to morality and planet-wide survival.

We will destroy ourselves, physically, and I suspect mentally, if we don't start thinking of simplicity *as complexity* that needs to be paid for.

But at the moment, the money is not there.

Probably it is back to politics. The government, and the laws it creates, are part of the engineering solution and are not extraneous to it. The Digital Millennium Copyright Act is exactly as important as the frequency of a radio, or the speed of a sub-routine, both of which do count as a solution. As the world continues to grow in complexity, and as the number of objects per room approaches tens of thousands, lobbying will become as important an engineering skill as coding. Probably not what most engineers want to hear. Just think of the costs of properly clothing them all.

The medium and the content are just two ends of a **continuum**.



Therefore figure out how people should best tell their stories.

Most Ubi-objects are *media* in the sense that they can be *modulated* by different content. Even your microwave oven can be used to send the message “Have a Good Day” which is a rather complex thing for an oven to say. And as McLuhan pointed out, having a microwave saying “Have a Good Day” is considerably different than having your spouse say it.

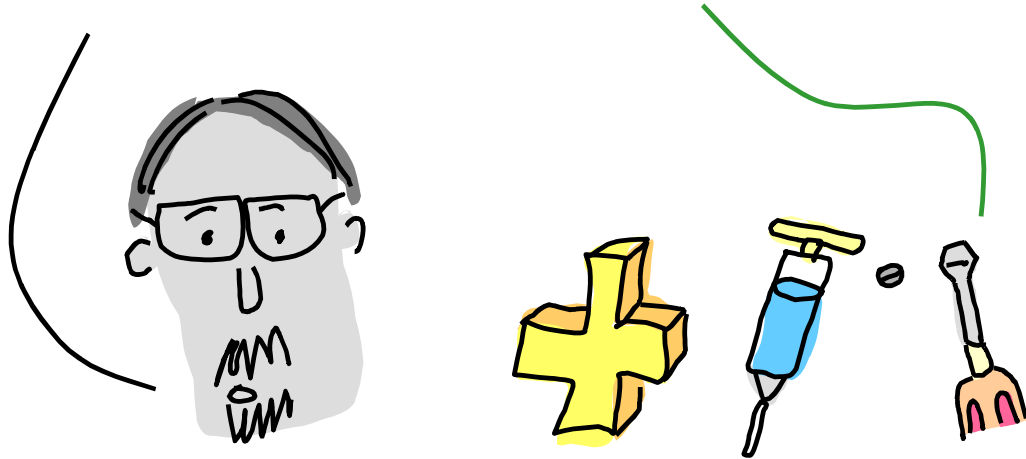
Meaning is carried at every level of the Plenitude. The Tab has a meaning and the email on the Tab has a meaning and the two meanings interact in non-trivial ways. Meaning is not additive; it is a field effect.

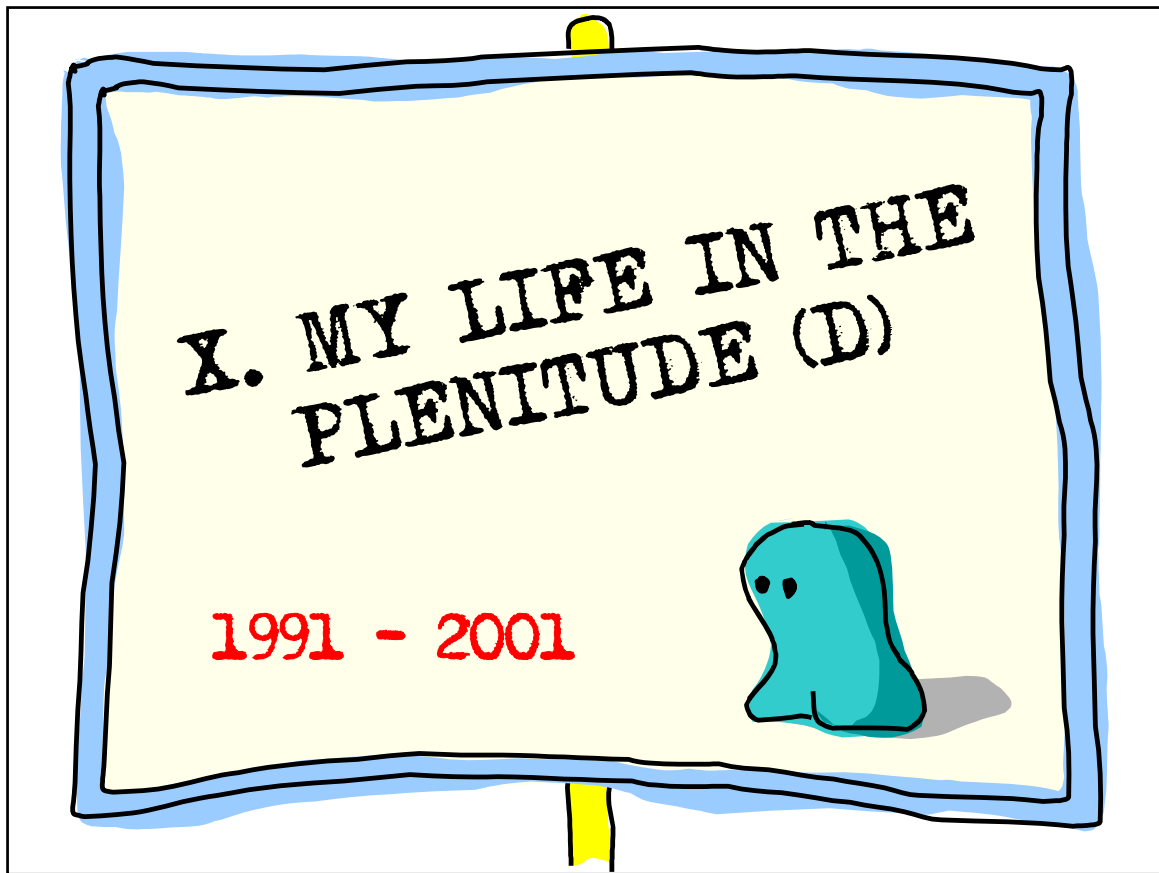
The primary reason why media exists at all is so that people can tell stories to each other. Our vocal cords and ears, combined with the air, constitutes the proto-media that envelopes us. Culture is the collected tales we transmit through this proto-media and the newly added Plenitude-based media.

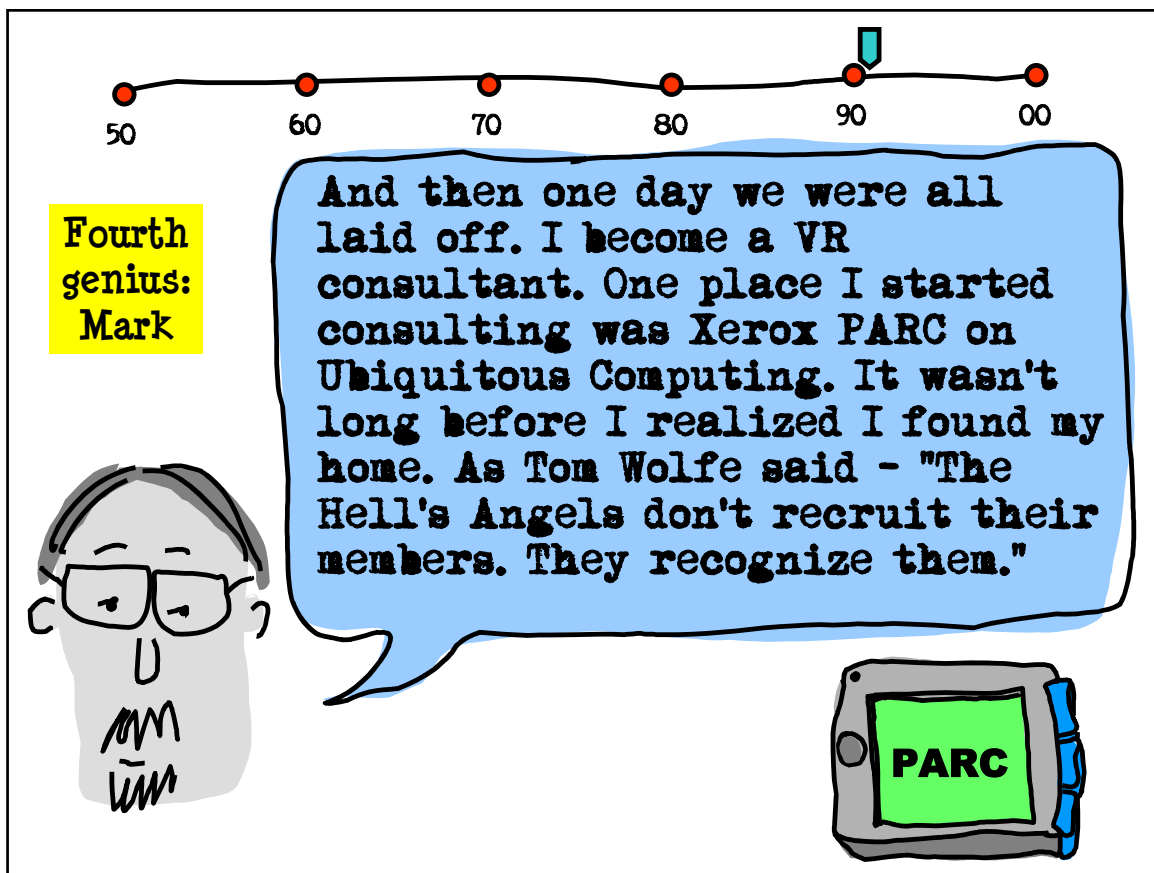
Start not with the medium, but with the stories that need to be told and engineer the ways to best tell them.

There are probably 10,000 things
in this room, each one partly
formed by an Engineer.

I don't think we can afford anymore
to say, "Let them play at night."

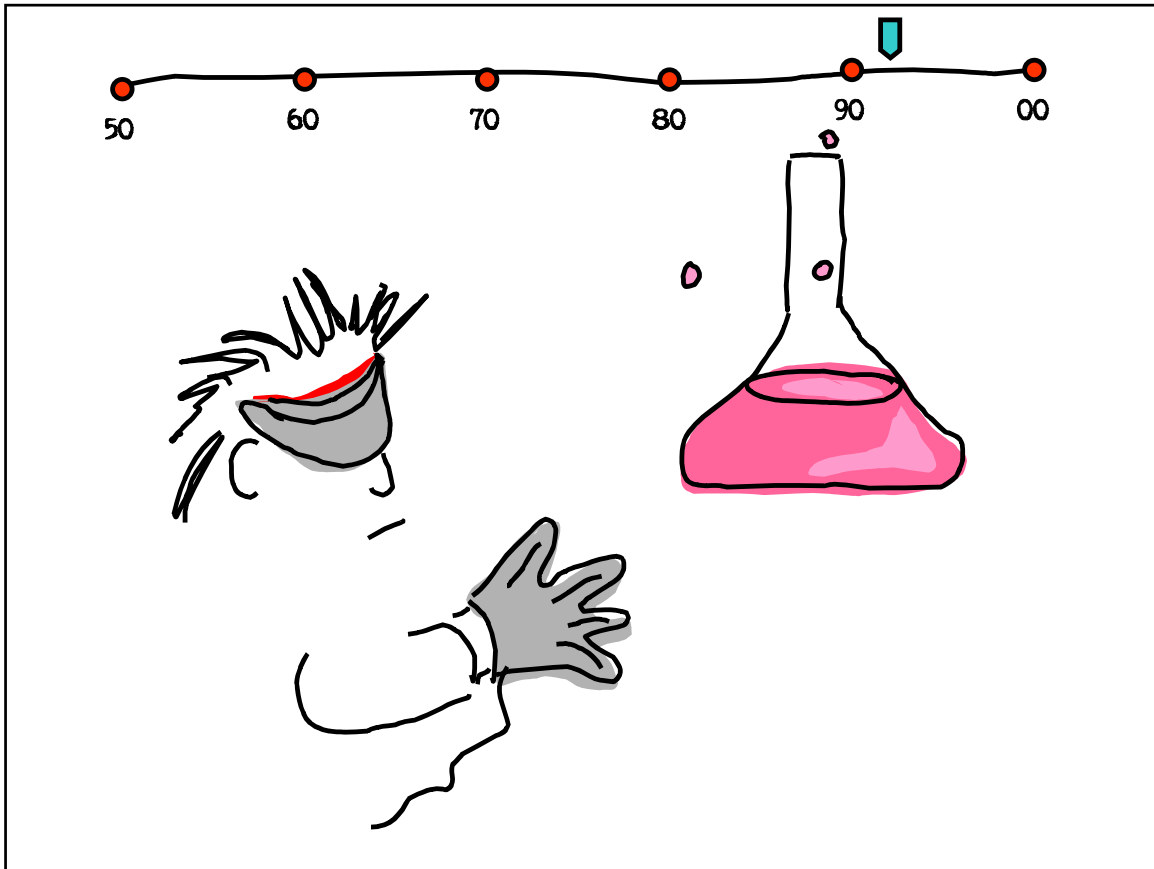






I had known about Xerox PARC for pretty much my entire adult life, PARC having been founded in 1970 just about the same time I discovered computers. It was featured in a famous 1972 Rolling Stone article which I devoured. Hippie friends of mine, during the Seventies and Eighties, worked there as media experts. The ideas that flowed from PARC penetrated the computer art-tech world I inhabited in a myriad of ways, from interfaces to networks. PARC was the mythical computer-Valhalla to the South of San Francisco. In 1990 I splashed down.

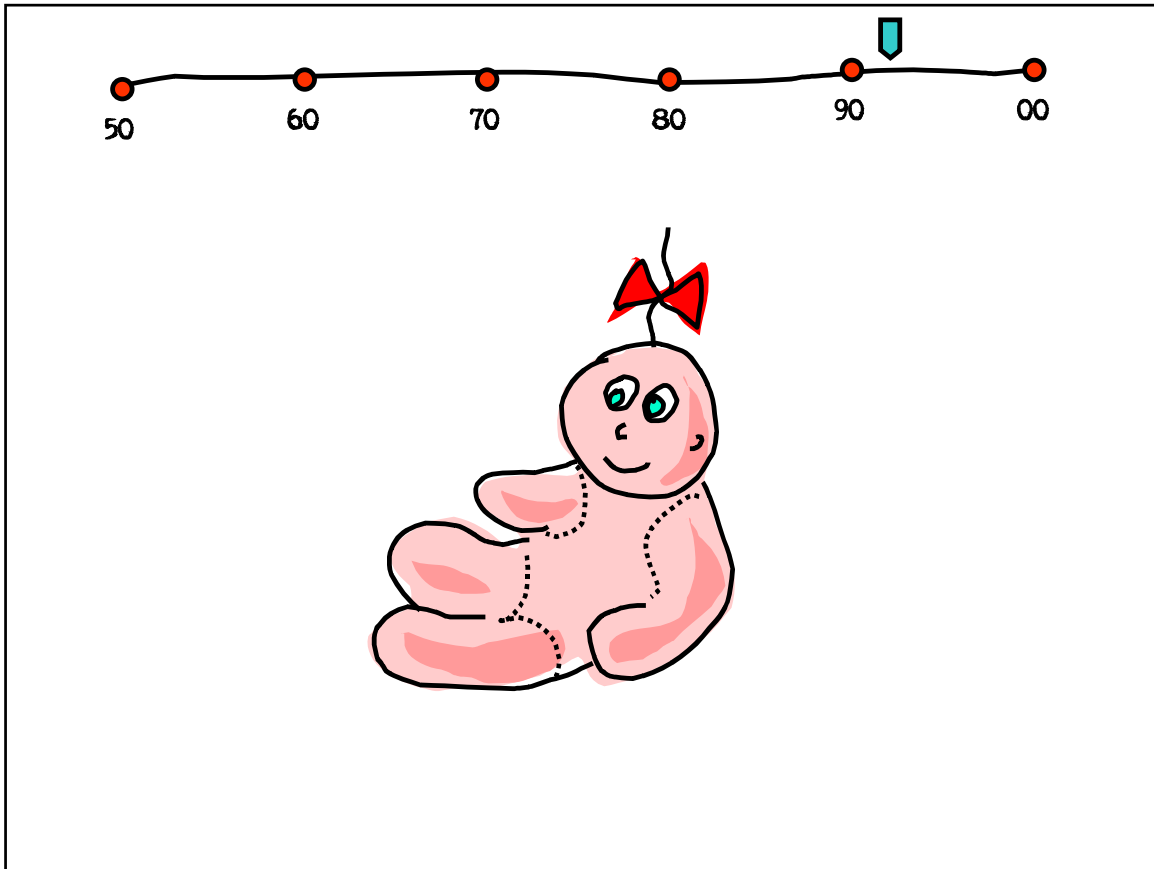
In 1989, my last year at Mattel, I had several close encounters with PARC which at the time seemed coincidental, but in retrospect, were clearly backward moving time waves. The first had to do with the Director of PARC, John Seely Brown, who happened to also be on the advisory board of the financial company that owned a good deal of Mattel. He came down one day to look around and was surprised to discover a research group at a toy company. He invited a bunch of us up to PARC, and as I recall, four of us went. We got a tour of PARC and saw the toys that they had. We also got a short lecture from a bouncing Dr. Mark Weiser on something he called *Ubiquitous Computing*. I would eventually work for Mark. He was the fourth genius I worked for in my lifetime.



At around the same time several of us at Mattel decided to take the *PowerGlove* to a conference on Computer Human Interfaces usually referred to as the *CHI*. The average person is perhaps unaware that there are these gatherings, where academics and scientists come together to exchange ideas about what constitutes *true* and *false* product in very scientific terms. But they do exist. That the Plenitude works in anything but a scientific, predictable way, is of little consequence to the people who attend. So there I was at the CHI conference in a little booth showing off the *PowerGlove*, an OK toy product, but to the people of CHI the *PowerGlove* was a revelation. They had thought of VR as something still in the expensive research phase and here was a god-damn toy company selling an \$80.00 VR glove.

To me CHI was a dream. I had never heard people give scientific lectures about the future of the Plenitude before. These talks resembled nothing so much, to my ears, as my performance pieces a decade earlier. Of course, as it turned out few of the people holding forth on the future of stuff had ever actually designed real product. It was a *utopic* vision of how to make things; one that didn't include user tests with irate moms or cigar smoking toy agents.

I liked it.

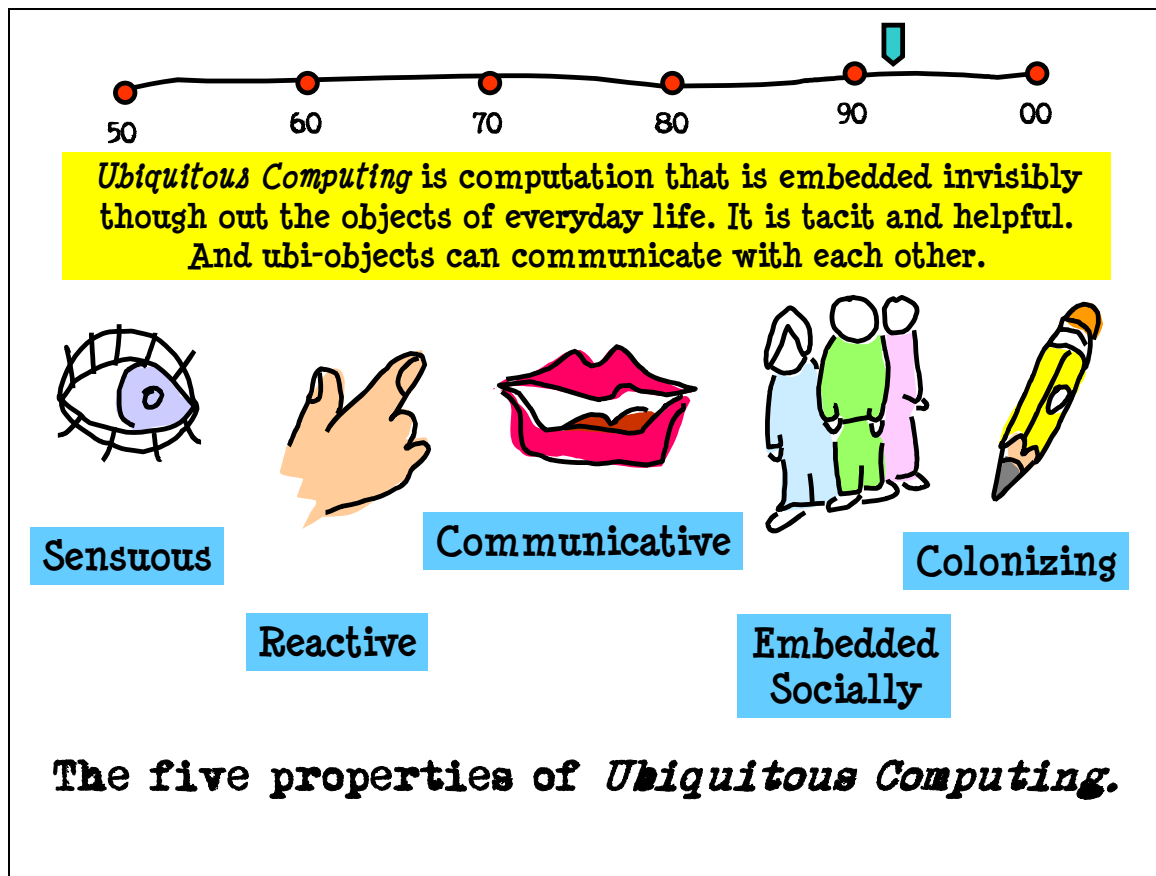


Two researchers from PARC stopped by the booth to talk at some length. Despite our vast differences in background we recognized each other right away like members of same species but developing on two different continents. They invited me up to speak at one of their famous Thursday Afternoon Forums, which with some nervousness, I accepted.

My talk was on *toy interfaces* and its central thesis was this: if a little girl ever got the idea that her talking baby doll was a user interface to a computer then it was a terrible toy. The computer needed to disappear into the objects of everyday life, like dolls. I did not know at the time that *ubiquitous computing* started from almost the same premise.

After this second trip to PARC I knew that I wanted to work there and wrote a letter to John Seely Brown expressing my belief that I simply, naturally, fit. Of course, I wasn't a scientist, but I had been a faux one. Close enough. I was first hired as a consultant and then six months later I was hired as Scientific Researcher, Level II.

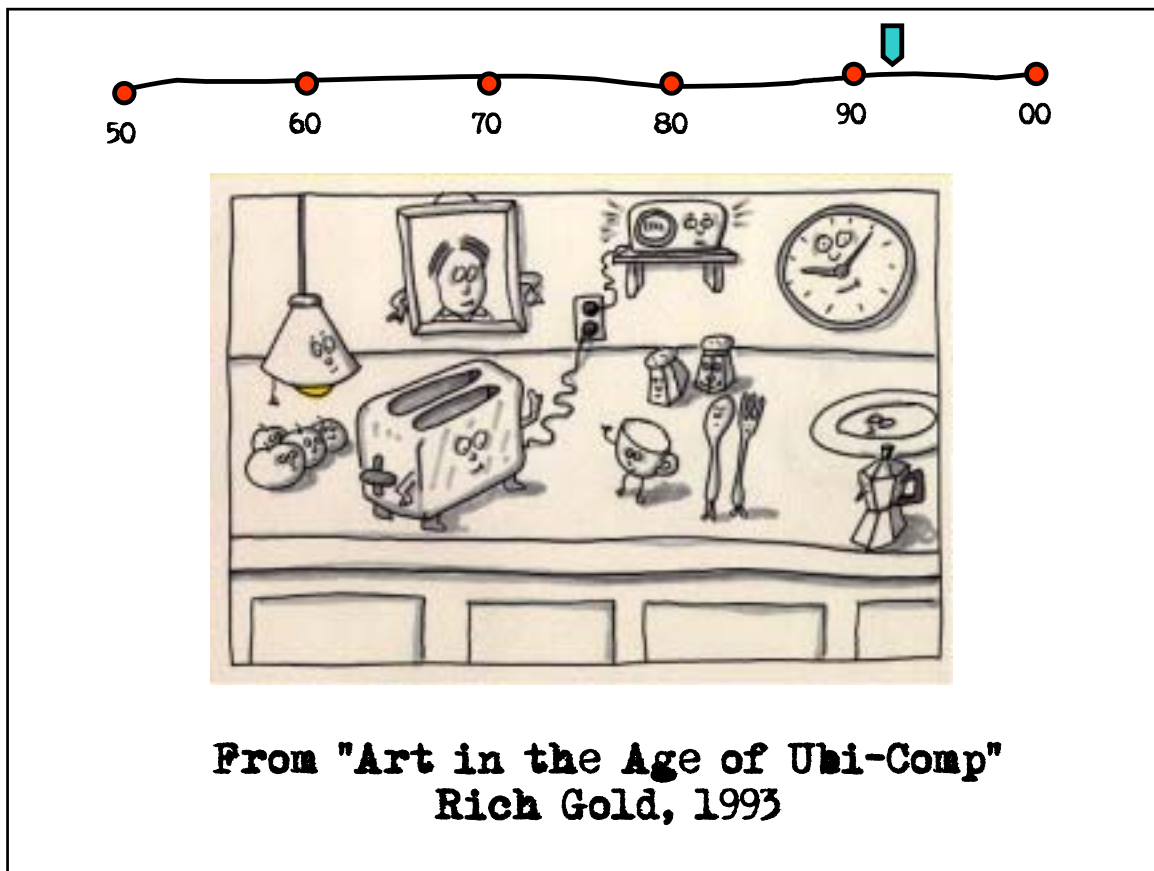
I was faux no more.



I had two different tasks within the heady world of *Ubiquitous Computing*. The first was to program and to build the prototypes. But the other task was to construct a philosophy. A Ubi-Comp *Cult*.

My ubi-philosophy was based on Weiser's formulations, but also divergent from it (he was enough of a genius to know that sub-cults were a good thing.) My formulation of Ubi-Comp started with Ubi-Comp *product genres*, a carry over from my toy days. Each product category genre had its own history, metaphor, shelf space, use in the world, sales method, manufacturing technique, aesthetics, dependencies and other products dependent on it.

I started to give talks about *ubiquitous computing*. Performance pieces really. It was as if I finally found my artistic subject matter, only twenty years too late.

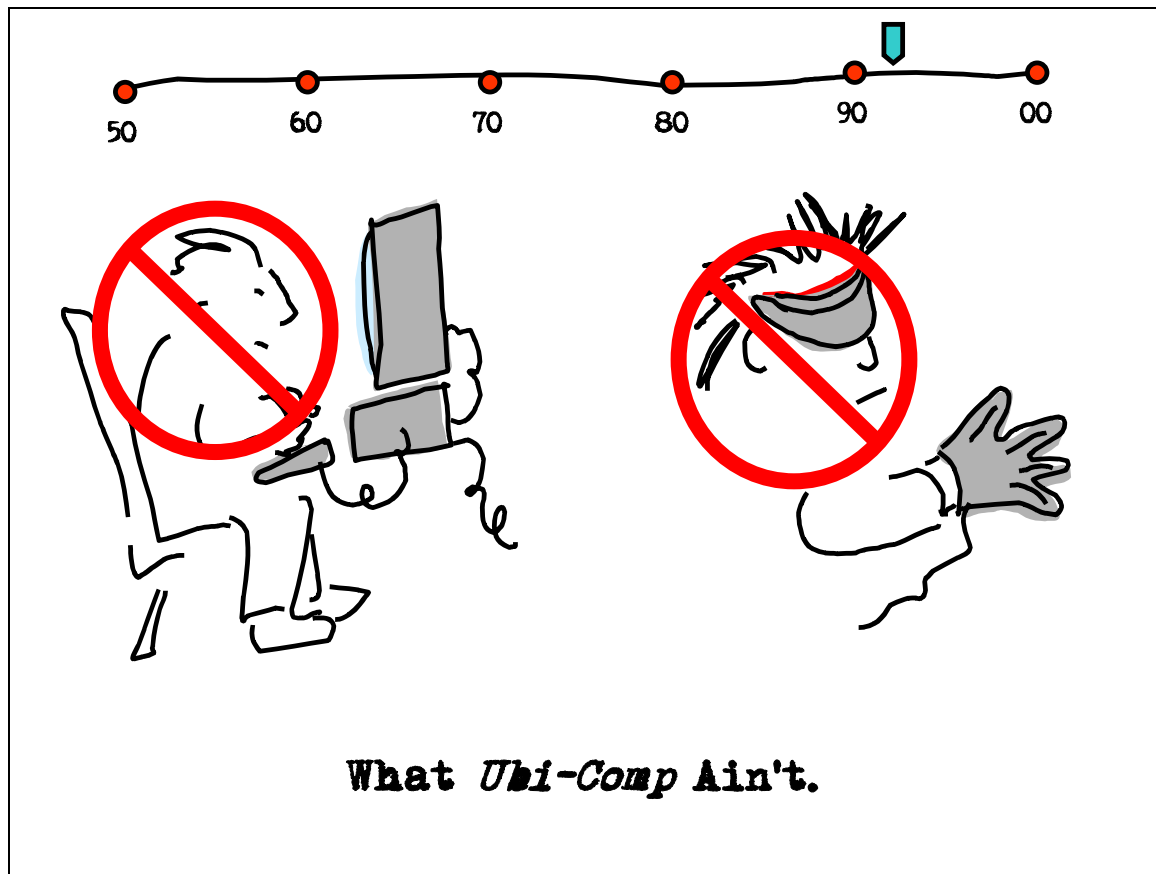


Ubiquitous Computing set up three problems which have become the center of my research and art:

First, if the Ubi-toaster can also play the internet radio, and display your email, and check on the pot-roast, and adjust the temperature of the house, and jot down little hurried notes, then, in what *sense* is it still a toaster? What aspects of its *toasterish* are being carried forward into the Ubi-world?

Second: if all of these Ubi-products are chatting away in the background, looking around and doing things, how do we know who is in control? How do we know the knife won't jump up and stab us? How do we know that the Ubi-car isn't broken when it won't take us where we want to go? And exactly what is the fork telling the spoon? And who will the spoon tell that piece of gossip to?

Thirdly, does the art on a Ubi-TV look and *mean* the same as when it is displayed on a Ubi-toaster or on a Ubi-T-shirt? What happens to the distinction between *media* and *content* in a Ubi-world?

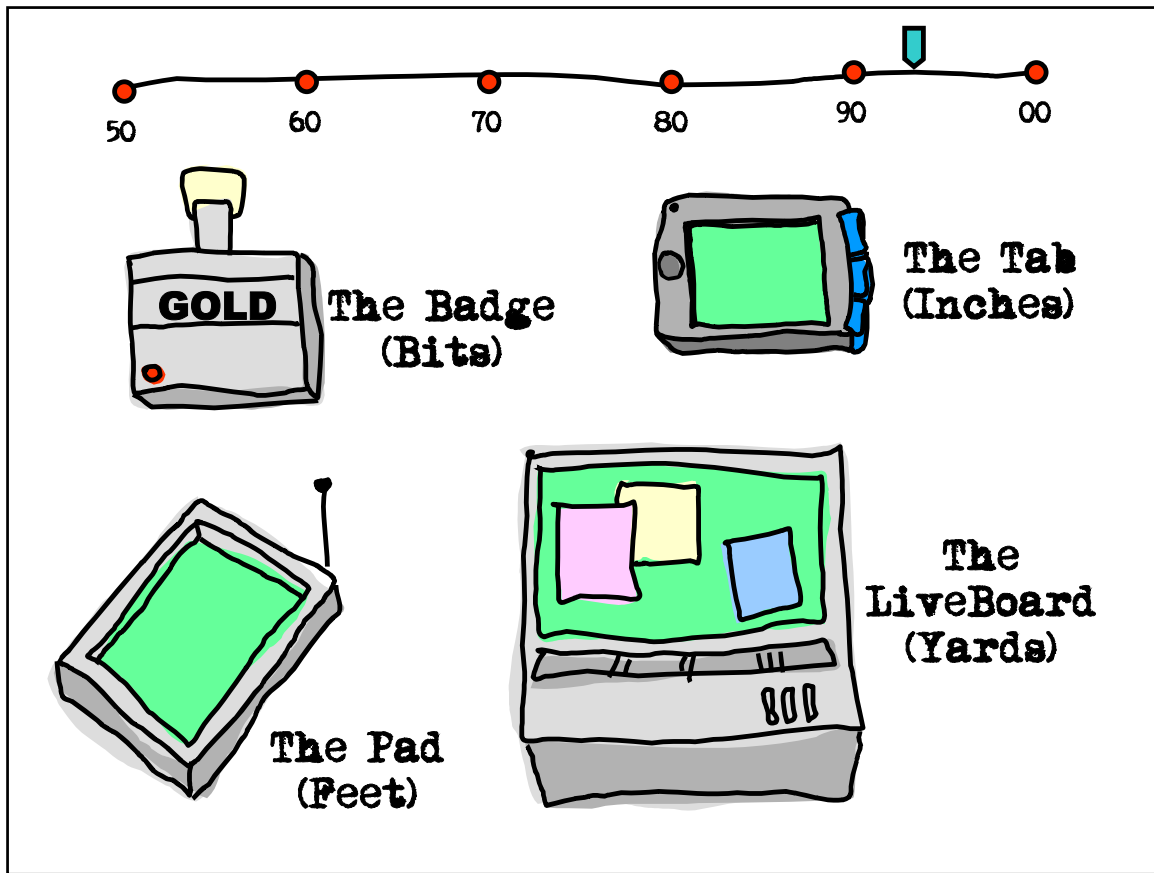


It is hard now to see what the big deal was as these ideas have today become almost givens. But at the time they were radical propositions. If you went to computer science college you would be shown a box with a monitor, a keyboard and a mouse. This was a computer, you would be told. Your job was to program it. The computer itself was nothing: it was simply a *medium*. It disappeared. You faced the screen and put your fingers on the keyboard. All the world's content, in fact the whole world, could be mediated through this single, dull white, appliance. That was the computer science cult of the time.

It was not, however, what the *Ubiquitous Computing* cult was about. Not at all.

Nor was Ubi-comp related to the only other major computational model around at the time, *Virtual Reality*. In *VR* you sealed yourself off from the world. You covered your senses in such a way that nothing from the molecular world penetrated. You strapped over your eyes and ears, light and sound makers that created a computationally generated world. A *complete* world if you could believe that there were no wires dangling, no computers under the desk, no goggles/gloves strapped to your head and hand, no little program drawing brightly colored cartoons.

Ubiquitous Computing, to the contrary, *accepted* the world, it just burrowed beneath its surface.



The actual experimental *Ubiquitous Computing* we built was considerably more prosaic than the visions that had spun out of Mark's (or my) head. Never underestimate the power of corporate identity, even a badly formed one, on the employees of a company. Did I mention that Xerox decided to call itself The Document Company? We made a world where every *document* was replaced with a *Ubi-document*. It was not nearly as neat as a dancing kitchen could have been.

We looked at Ubi-documents at every scale. There were the “Badges” (designed by the Roy Want) which were pinned to your shirt and which did nothing but let other Ubi-objects know who and where you were. Badges were documents of one bit. And that bit meant something like: “RICH GOLD IS HERE NOW.” Things could happen based on that information depending on what other Ubi-products did with that information. For instance the room might adjust itself to your favorite temperature, a nearby computer might post your current schedule, phone calls could be directed to the room you were in, or a map displaying everyone's whereabouts could be updated at the admin's desk. Oh, and your boss could know if you were taking a coffee break.

Next up in scale were the “Tabs” (also designed by Roy) which are now instantly recognizable as the first networked PDA. Each Tab was connected to the full network infrastructure via infra-red, which meant that we had to put receivers in the ceiling of *every* room at PARC. A Tab was always connected, as long as it was

near one of these boxes. It was in instant contact with its file system, email, other Tabs and all the other Ubi-devices. We were of the first to learn what it meant to bring fully connected computation to a meeting.

But the real interesting idea behind the Tabs was something we never got to test out. You were not supposed to have just one Tab, as you now just have one PalmPilot; you were supposed to have 50 or a 100 Tabs scattered everywhere on your desk, in your office, on your person, in your car, in your bed. They would be everywhere and as easy to pick up and use as a scrap of paper.

Larger still were the *Pads* which were about the size of notebook computers, but without the keyboards. They had a touch screen and were connected via wireless radio to the system. In the schema they were intended to replace books and notebooks.

And at the largest scale, yards, were the *LiveBoards* which were meant to replace whiteboards, which themselves were ubiquitous at PARC. You could draw on a *LiveBoard* just like you could draw on to a whiteboard, except that it was all electronic and once drawn it was changeable, storable and retrievable. If there was a problem with the *LiveBoard* (besides their cost) it was the same old Ubi-comp problem: we wanted them to be simple and metaphorically just like a whiteboard. But, they could do so many other things and no designer, no engineer could say “no”, and eventually they became so complex with new features nobody but a researcher could get them to work.

As a cult, Ubi-Comp was overly successful. There are now university departments devoted to it. There are corporate research labs delving into its mysteries and product potentials. There are Ubi-devices on every desk top, in many purses, and hanging off of way too many belts. There are young graduates who can’t imagine that this wasn’t always the way of computer science. It has gone from an interesting, challenging, philosophical debate about the nature of reality, to corporate advertising in the front of WiReD.

It has traveled the long road from research to becoming a pillar of the Plentiude.

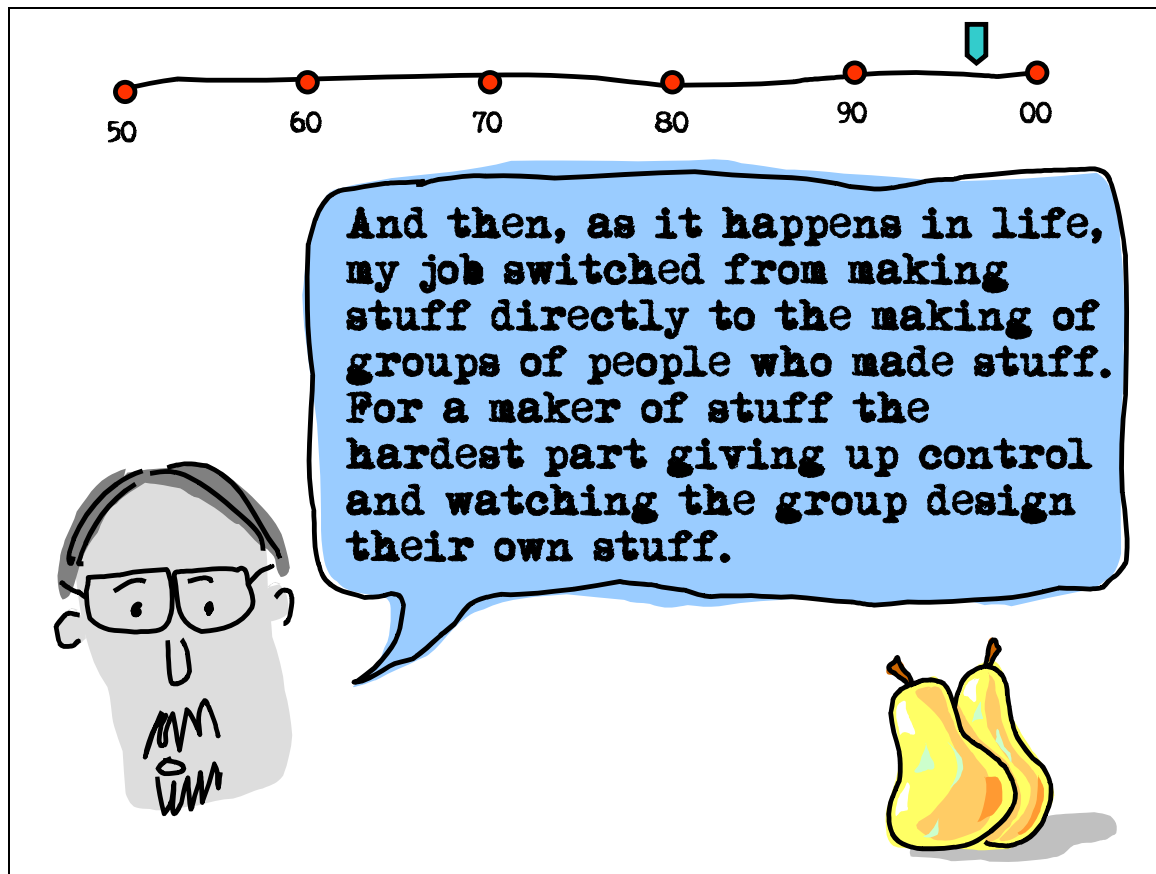


In the background of my engineering work I was becoming a *corporate performance artist*. This took on different forms. At one end of the continuum were my *PointPoint* presentations with their cartoon drawing style (yes, this one) and an overly enthusiastic presentational style with me bouncing about the stage. It had me touring the world.

An example at the other end of the spectrum, in 1995 I got tagged to produce the four hour PARC 25th Anniversary extravaganza to celebrate a myth – the myth of PARC. Dense with theatrics, PARC technology and PARC scientists, it altered the tone of PARC for many years.

Pictured here is a short, twenty minute, scene from that work which encompassed: two scientists drawing in a shared-drawing space using LiveBoards; a video of a pink document in a black-and-white world moving through all its analog and digital forms; Pamela Z, an performance artist, singing about PARC's past glories; and another scientist mixing records in the background.

It was, frankly, more PARC than PARC.

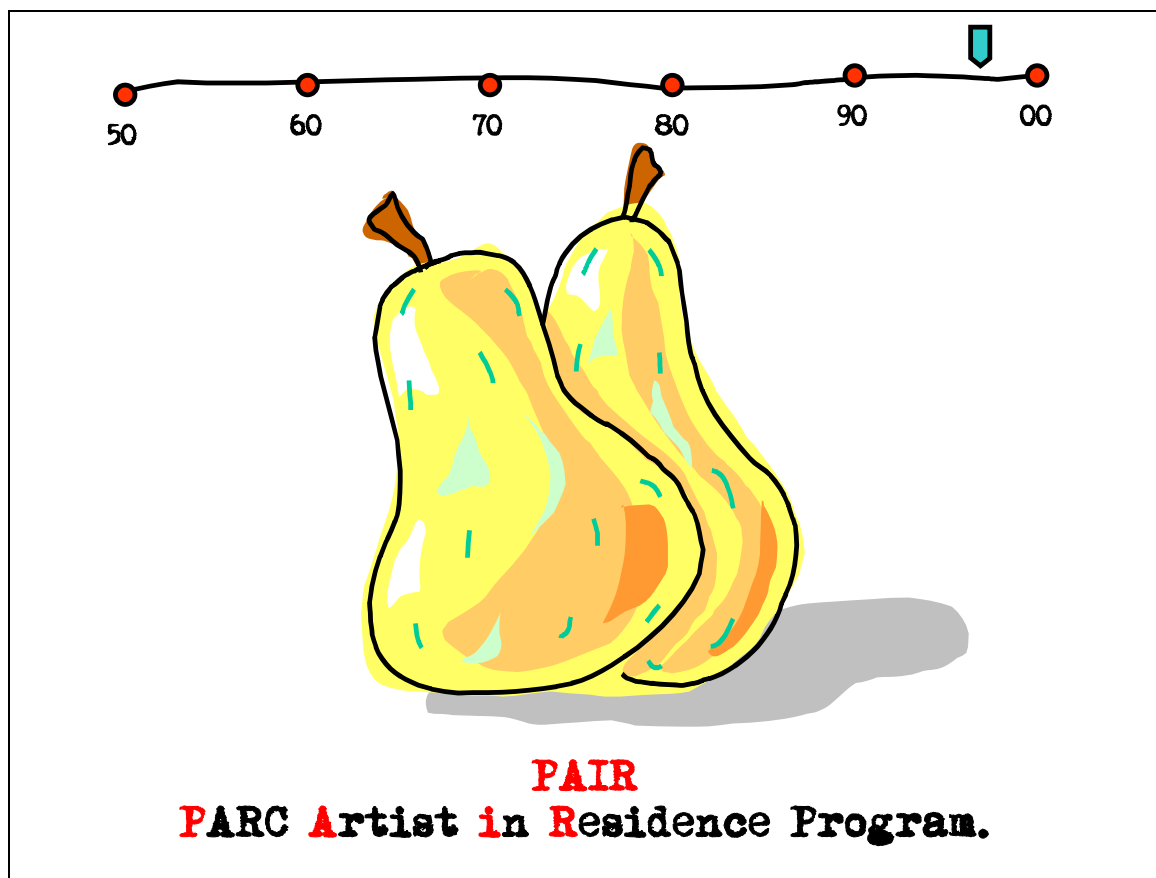


Perhaps it was these theatrical presentations of myth that got me thinking about my own life in mythic terms. Or perhaps, if you create cults as a child, you always think that way. In any case, I became fascinated at how people in different professions made different stuff in different ways. I became fascinated with questions like: How does stuff get made? Who makes it? How do they decided what to make? How do they design it? What the heck do they think they are doing when they make it? Which methods produce better stuff? Are there collections of people who can make stuff better than the current collections? Are other organizations of stuff makers possible? Would such organizations make different kinds of stuff? Could I put together organizations that produce better stuff?

And that's the true reason I went into management.

The hardest part of management is the stepping back and letting others design, create, make, invent. The manager's job is simply (*Hah!*) to create the structures, the umbrellas, the cosmic lies in which their folks can work and do their best work. The hardest part at PARC was the "herding cats" problem. Scientists came to PARC to do their own work - to be free to follow their own visions. You think they are going to listen to a manager?

Hah! Hah!



PARC, when I got there, was constituted around a broad swath of scientific activities, “From Atoms to Culture”, as we liked to say. There were scientists who worked with the molecules and there were anthropologists, linguistics and epistemological philosophers who worked at human, less predictable, scales. And there were certainly lots of computer scientists, from systems administrators to user interface designers. There were cognitive scientists and perceptual scientists. Artificial intelligence experts and social scientists. It was almost like a university with all the students sucked out.

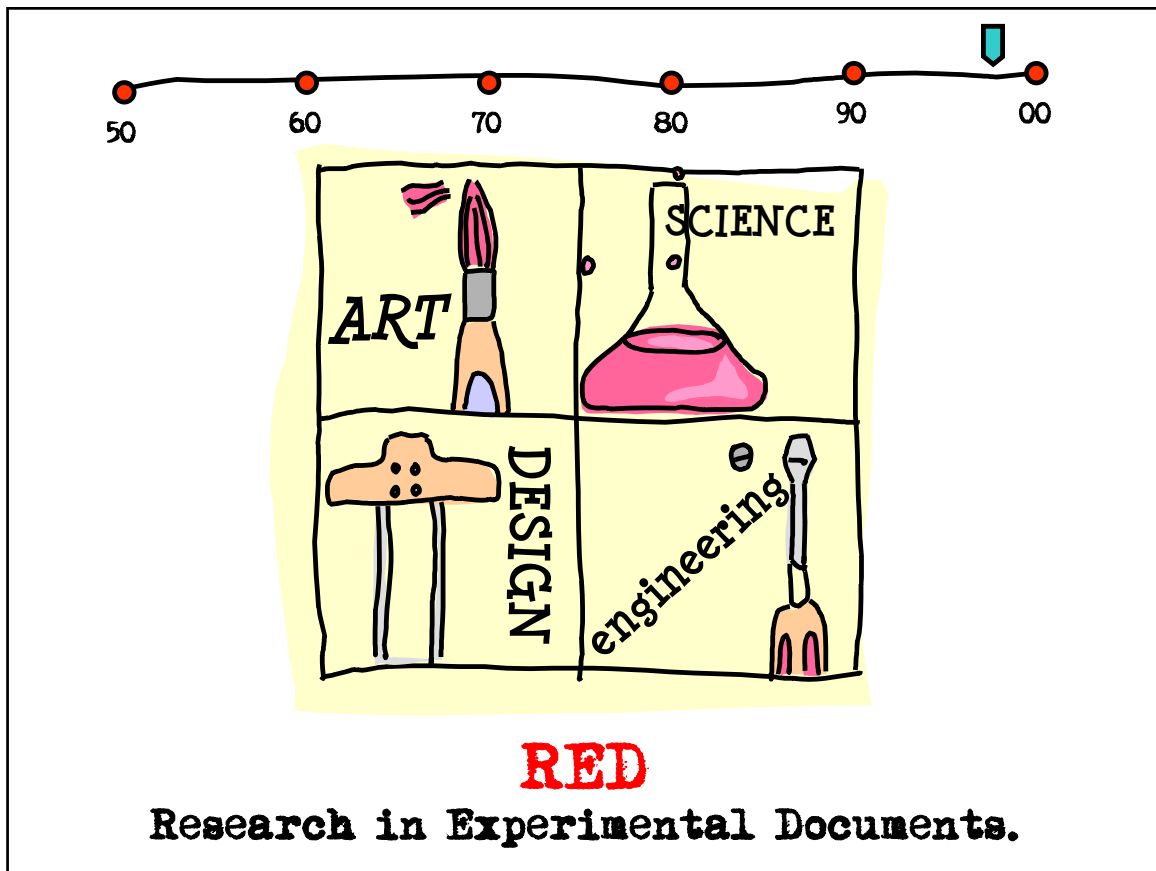
But there were no artists. At various times in PARC’s past artists had come through, and some researchers were artists themselves, but art was not part of the fabric of the place. Yet, in my mind, modern artists came from an intellectual tradition and it was grounded in almost the same moments of history as science. They were separated twins.

With the help of many others I set-up the PAIR Program at PARC (PAIR standing for PARC Artist in Residence.) There are many ways to create an artist in residence program, many models, this just being the one. An interesting question I am often asked by other institutions is, how replicable it is? The answer is, about as replicable as PARC. Here are some of proverbs of genesis for PAIR’s creation:

1. One artist should be paired with one scientist (in practice there turned out to be several occasions where there were small groups of each.) The PAIRing have to be agreed to by both parties. Set up elaborate mating rituals to make sure that the pairings are right and will work.
2. Use technology as *a common language* between the pairings. The artists should already be working with these technologies as this was not a training workshop. (Of course, in the Bay Area, it turned out to be easy to find such savvy artists.)
3. Once these little “marriages” (I was a Yenta really) were set up, let them be free to do what they want. The last thing we wanted was a proposal *in advance*. As I have been often quoted as saying: “They could drink beer together for a year for all I care. The important thing was that it was together.” Both artist and scientist should be expected to act like adults. If you have picked well, you don’t have to tell them to make stuff. They are people who instinctively want to add to the Plenitude.
4. PAIR didn’t want the artists to become *designers* for science projects and we didn’t want the scientists to become the *engineers* for the artists. We wanted what they did to arise from mutual interest. In the end, some did act as designers or engineers. But that was OK. That was their choice as adults.
5. On the financial plane, the artists owned all their own art work. The scientists (*read Xerox*) ended up with any patents that arose (though the artists were granted full rights of usage to these patents in perpetuity, but only in their art works.) The artists were also provided with a small stipend.
6. While good art and good science were created, the real job was to create better artists and better scientists.
7. Lastly, what I was interested in was the effect not on the science world, or the art scene, but on the micro-world of PARC itself. This was *local* art, almost *folk* art. It was meant to enhance the specific place called PARC.

Over the years we had about twenty artists and I believe that it succeeded in most of these goals. It also had one unexpected result, almost every PARC scientist involved eventually either left or was fired. So try replicating this experiment at your own risk. The Plenitude has laws deeper than even marketing departments know about.

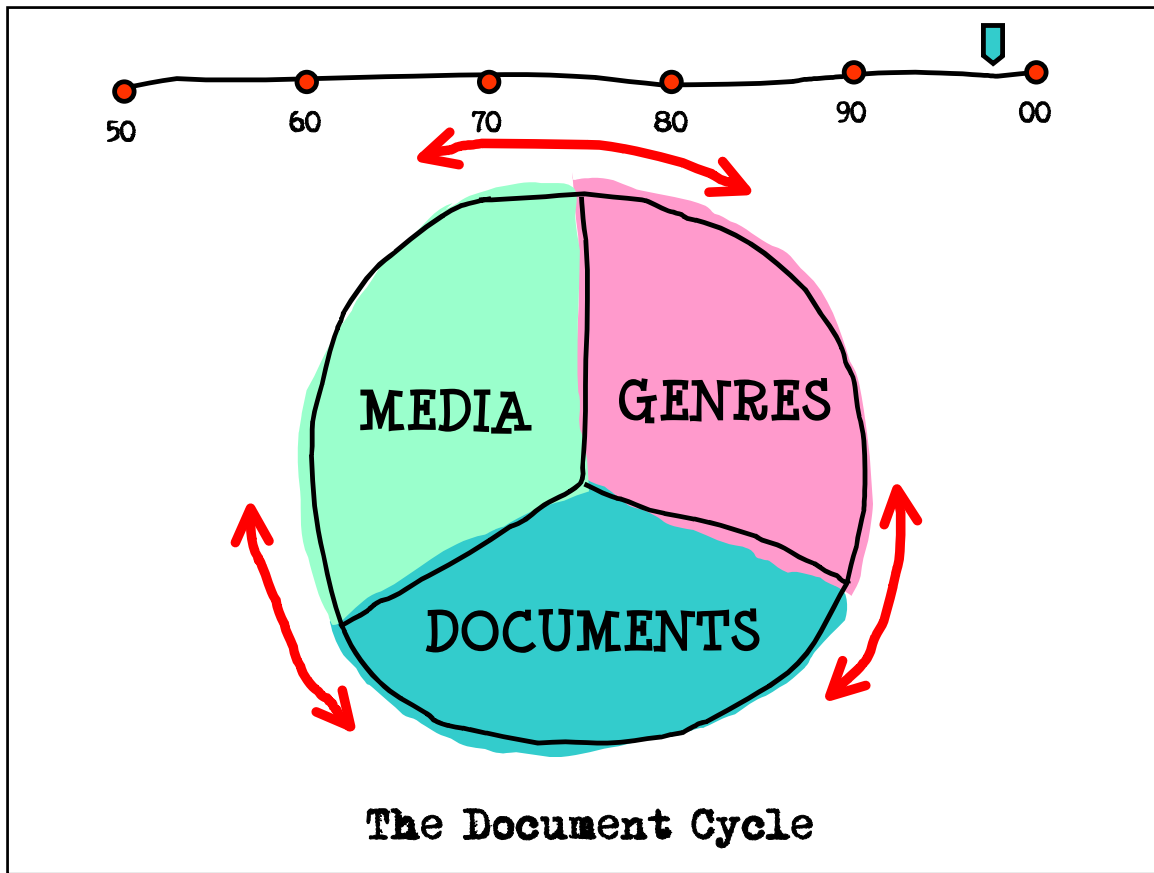
The objects of the Plenitude are not arbitrary things, they come from specific creative species. Cross breeding, is well, tricky.



RED, or *Research in Experimental Documents*, was such an experiment in cross breeding. It occurred to me that I had been over my life time an artist, a designer, an engineer and a faux scientist and that these four professions together constituted the core of Western innovation. They were not the same, not just in what they produced, but in how they produced it, how they saw the world, and even why they made stuff in the first place. But it also seemed that if one could combine these practitioners in space, as I had combined them in time, then one could create things that otherwise would never come to pass. And have a damn good time too.

I recruited the REDsters from the other labs of PARC and from scattered Universities about the country. We developed numerous techniques to bridge the interdisciplinary languages and methods, to jump over the lines, but not erase them. Mostly I found people who had a foot in at least two squares of the Creative Matrix. And we made lots of stuff, and we thought a lot about the stuff we made.

We became a little PARC inside of PARC. Or as somebody put it, if PARC was Xerox's ponytail, we were PARC's.

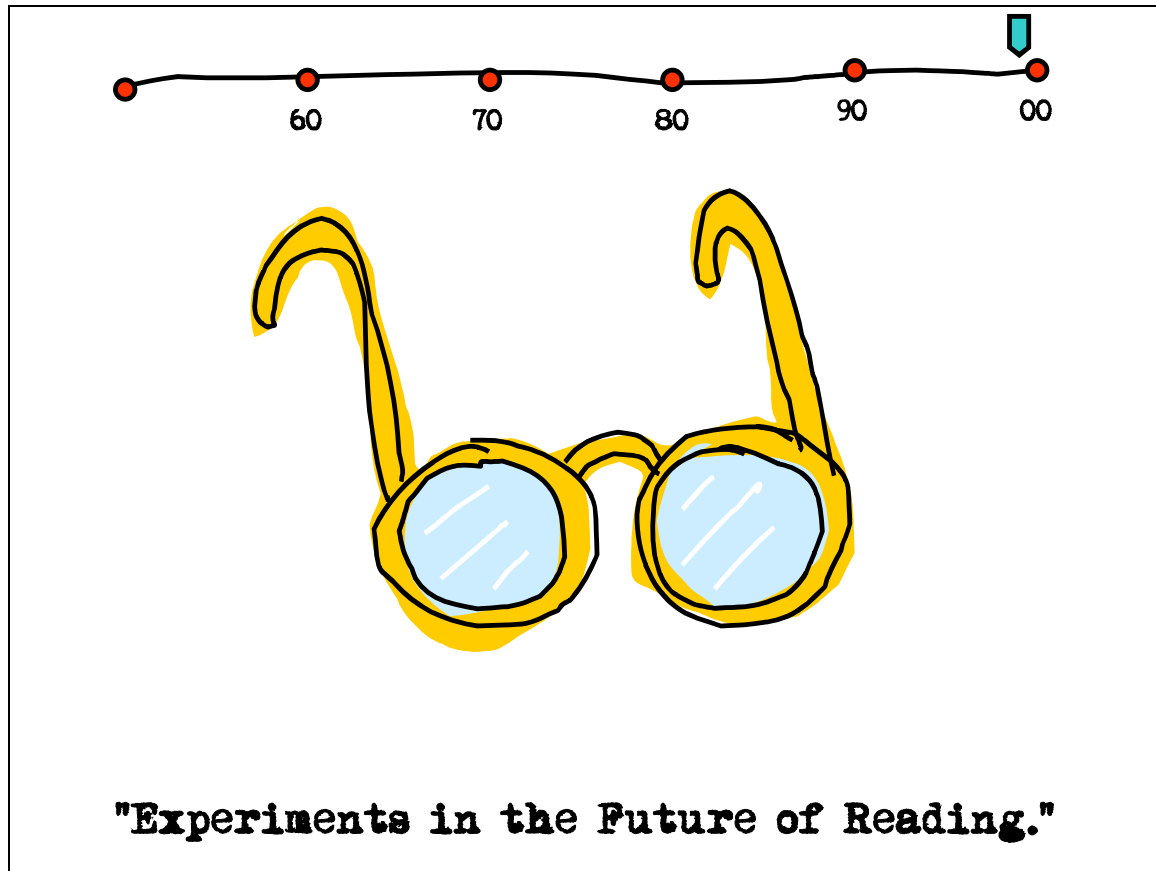


RED's charter, which was somewhat like a cult's manifesto, was *to study, research and then invent New Document Genres of the Future by making exemplars of those genres.*

We know that there are genres (rock and roll is different from country western); we know that new genres arise (punk rock, reality TV, the homepage, didn't always exist); we know both from observation, and from McLuhan, that new media gives rise to new genres; we know that while there is a difference between *media* and *content*, that the two merge or bleed together in a given genre; we know that one media can support multiple genres and that a single genre can cross multiple media; we know that new forms of content puts pressure on and changes the medium; and we know that this is happening faster and faster.

If you are a printer company and it takes five years to make, design and build a new printer, you might want to jump forward on the document cycle and ask what the new printed genres of the future might be? But how do you create a new genre? You can't do it abstractly. You can't just write an academic paper about it. To put it another way, you can't create rock and roll without recording a rock and roll song.

And that's why we needed scientists, engineers, designers and artists all working together for a genre is the resultant vector of these creative forces.



Starting with the observation that *"Xerox makes things (printers) that make things (documents) that people read"* RED decided to look into the question: "what are the genres of reading of the future?" Here is some stuff we knew:

Reading is one of the two primary ways for humans to communicate and exchange information and knowledge (the other being speaking.) Unlike speaking, reading works over time, as well as space. And while people often think of reading and writing as symmetrical, we estimated that the average person reads about 1000 times more than he or she writes.

Reading has changed over time, place and technology and there is little doubt that it will change in the future. Five hundred years ago people (mostly men, mostly monks) read standing up, out loud, and in groups. Today most people read silently, alone, and if you ask them, mostly while lying in bed. While people think that they read mostly books, actually they mostly read newspapers (unless they have a computer, and then they read mostly screens.) In any case, there is reading everywhere. By law, every object can be read (at least a brief comment about what country it is from.) Even our fruit has readable stickers on their skins.

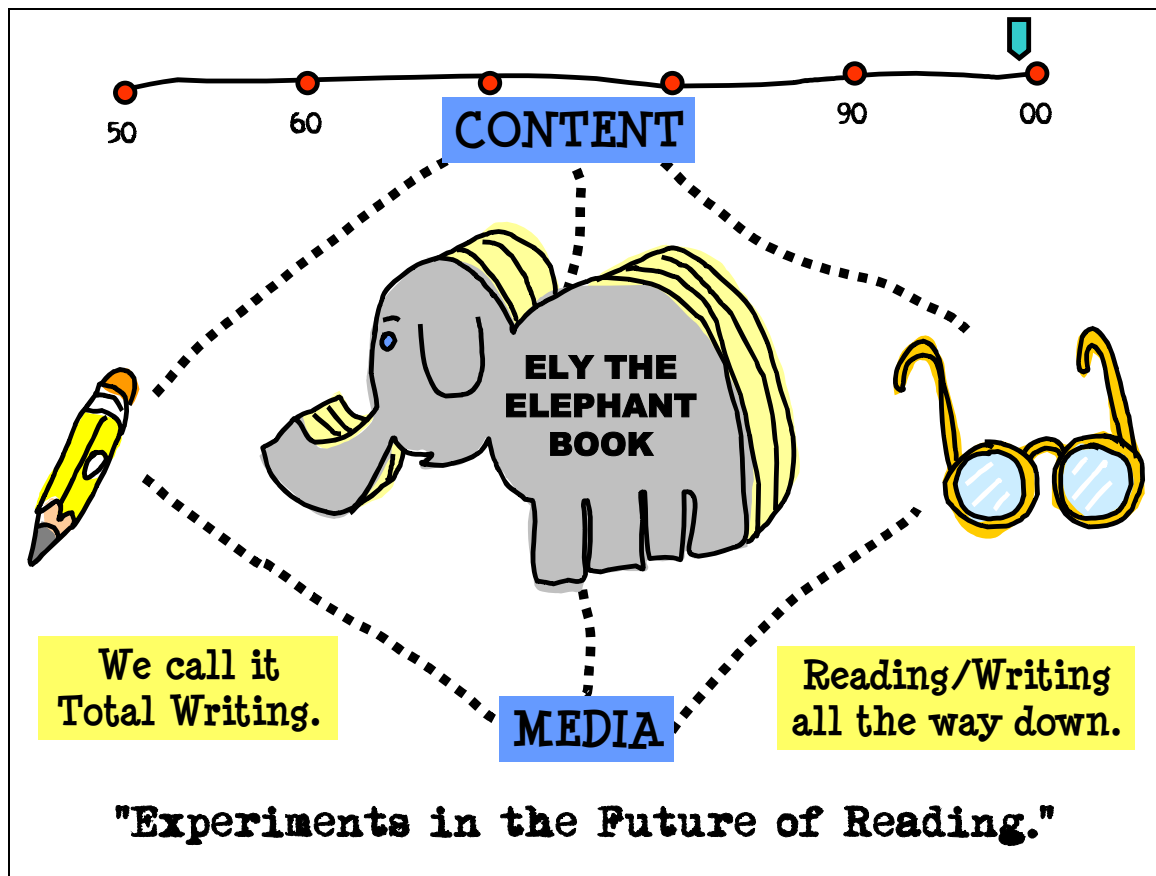
Civilizations are often divided into *Epigraphic* or *Bibliographic* reading cultures. Epigraphic cultures read off walls. It is vertical reading and it tends to be more social, more communal and more illustrated. Bibliographic cultures read off of paper on tables, or in books. It tends to be private, highly literate and less illustrated. Most cultures have both but skew one way or the other, for instance, the Japanese towards epigraphic; Renaissance Europe towards bibliographic. Ten years ago most Western businesses were highly bibliographic, internally communicating via memos. Today, most businesses communicate through PowerPoint which is a very epigraphic form.

Reading in our culture is unbelievably diverse. It is a Plenitude of words. In a car, for instance, not only is the entire dashboard filled with words and numbers, but you will find many parts readable, from the mirror to the gas tank. The instruction manual is read, as were the ads and magazines which helped you purchase the specific car. The streets on which you drive your car are an epigraphic wonderland with street signs, signs on the tarmac, store signage, billboards, and bumper stickers.

Probably your first experience of reading was your mom and dad reading *to* you. Movies and audio-books pick up this *audiographic* form of reading with actors reading scripts to you just like mom and dad did. Even television, that supposed harbinger of the non-literate future, consists primarily of actors and newscasters reading from teleprompters.

Reading has been redefined yet again by the forces unleashed by Ubiquitous Computing. Every surface is becoming a dynamic display. Every surface is becoming readable. Text is suddenly flying about, moving, changing, updating. Reading is becoming time-based, crashing up against its traditional antithesis: speaking.

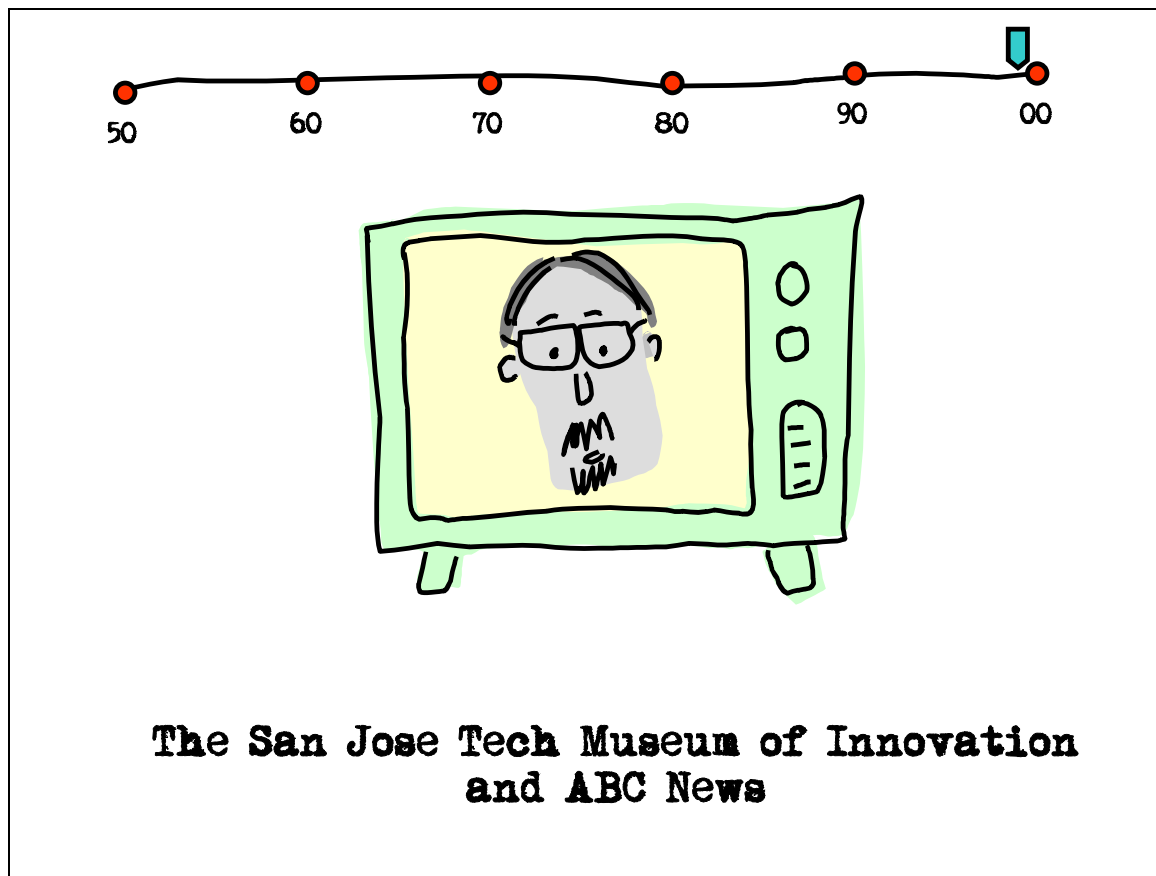
RED, through research and study, knew all this. But knowing it and creating new genres is not the same. So we put on our artist and designer hats, and made some rock and roll.



In Silicon Valley, where PARC is located, there is a religion of sorts called “convergence.” It is a belief that holds that all media including TV viewing, movies, web surfing, telephoning, photos and reading will all collapse on to a small device that one can hold in one’s hand and even go to bed with. That device would constitute all the media you would need and there would only be one media. Well, OK, maybe it comes in different sizes. The stuff on media would be the content and the content would be very diverse. If you are an artist your only choice would be to make content for this one, converged media.

I believe that this is a false religion. It is false in the sense that this isn’t what is actually happening. Quite to the contrary, the world is filling up with more and more different forms media, even of forms of reading. You can read a wristwatch, you can read massive dynamic billboards off freeways, you can read the scrolling under CNN. Soon you will be able to read dynamic T-shirts. The Plenitude is recreating itself in a plethora of reading media. And each media has a different meaning.

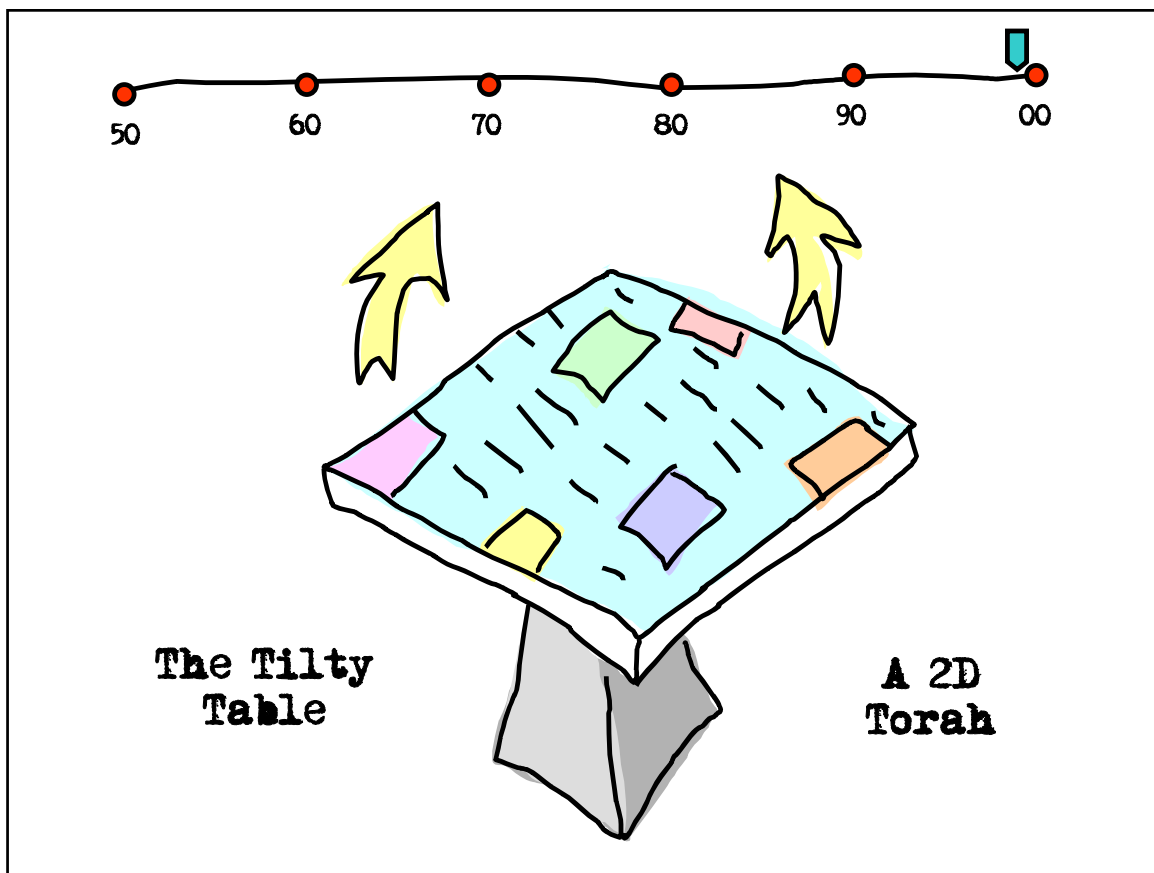
But it is also false in the sense that it is not the future I *want*. I want a future high in the diversity of media, in the competition between media and dense with interactions between modes of knowledge, information and data presentation.



RED was given the opportunity (and the money) to fill a 4000 square foot exhibit space at one of the world's premier science museums, *The San Jose Tech Museum of Innovation*, with fifteen exhibits of different, possible, reading genres of the future. These were highly interactive, human-sized, book-like things. RED wrote both the content and the medium for each piece in such a way that there was no distinction between the two. The show was called *Experiments in the Future of Reading*, or XFR for short.

The exhibit was up for six months and had approximately a half a million people visiting. It was featured in over a hundred newspapers and magazines. When it was on *ABC Nightly News* my mother could have fainted.

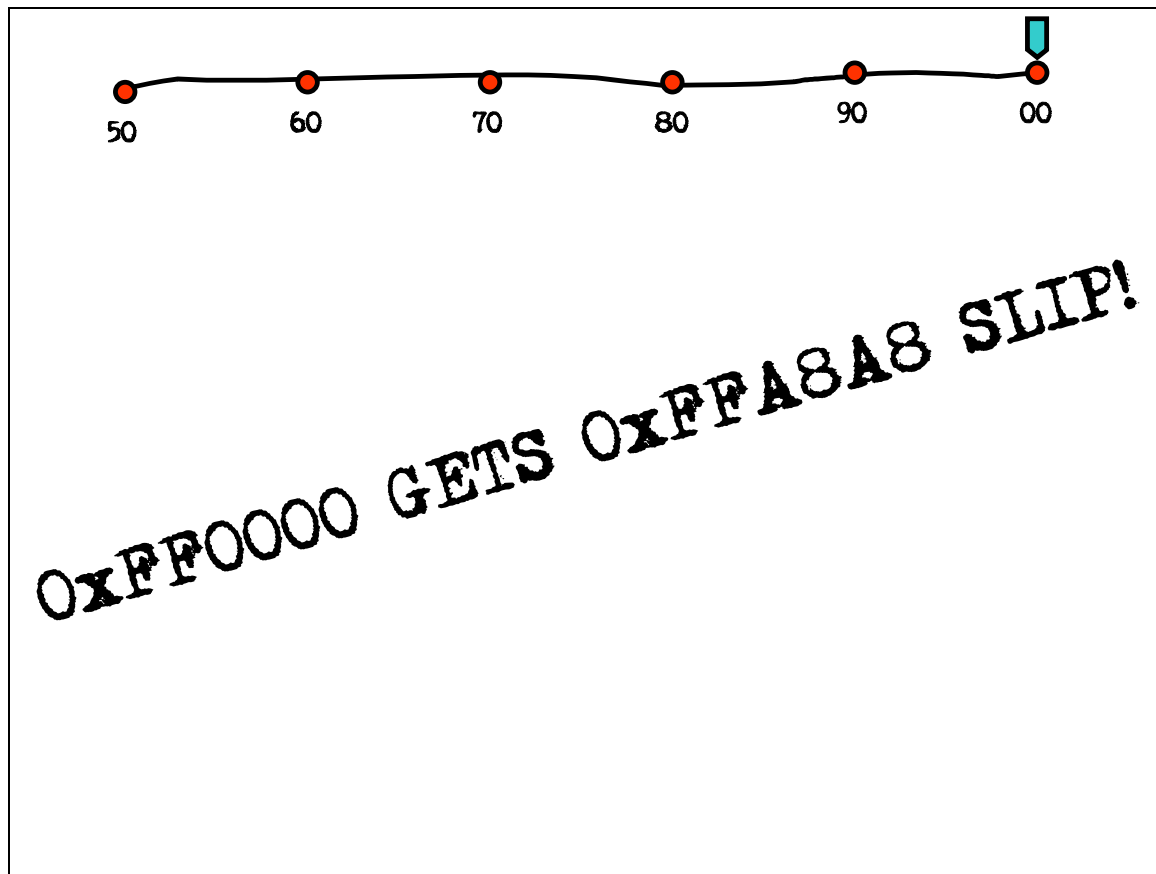
Did we create any document genres of the future, which after all was RED's charter? I don't know. Once the invention part is over, genre creation becomes a social act quite out of anyone's control. I do know that to the amazement of the museum, kids actually *read* the pieces and did not just look at them as one does a typical exhibit of say, a dinosaur.



Let me describe one of the XFR book-like things that I had a lot to do with, just want to give you a flavor of what we were thinking.

We designed a device called *The Tilty Table* and built three of them. A Tilty Table is a 3 foot by 3 foot white table gimbaled so that it can be tilted in any direction. Projected on to the Tilty Table (from a projector hidden in the ceiling) was a graphic image that reacted to the tilting. To the “reader” the images appeared to come from the table itself, as if the table were a giant, glowing document.

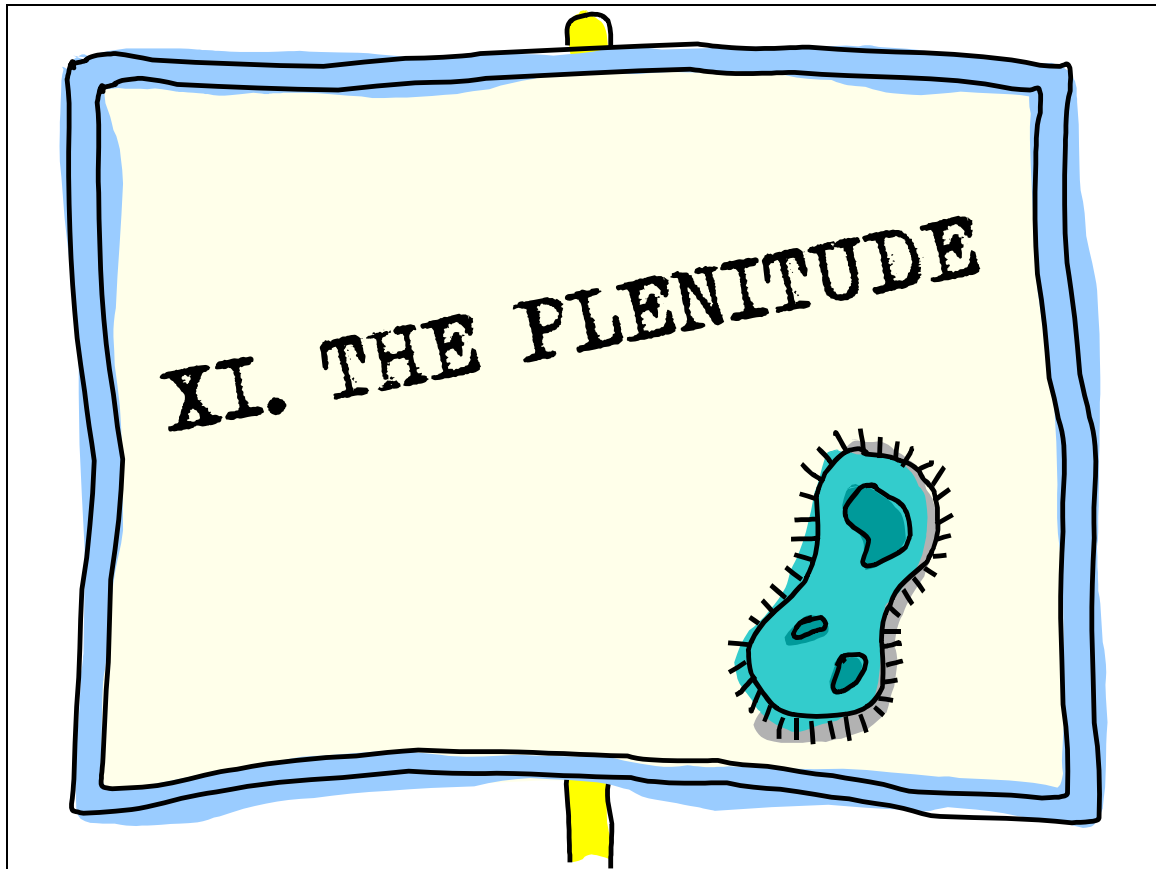
Tilty Table #1 presented a small portion of a giant, virtual, napkin drawing filled with hundreds of small drawings all about reading. At scale, the full drawing was over thirty feet by thirty feet. When one tilted the table, the napkin image *slid* as if pulled by gravity. By tilting the table in various directions one could surf through the large illustrated napkin-manuscript. I have likened the effect to the reading a 2D Torah.

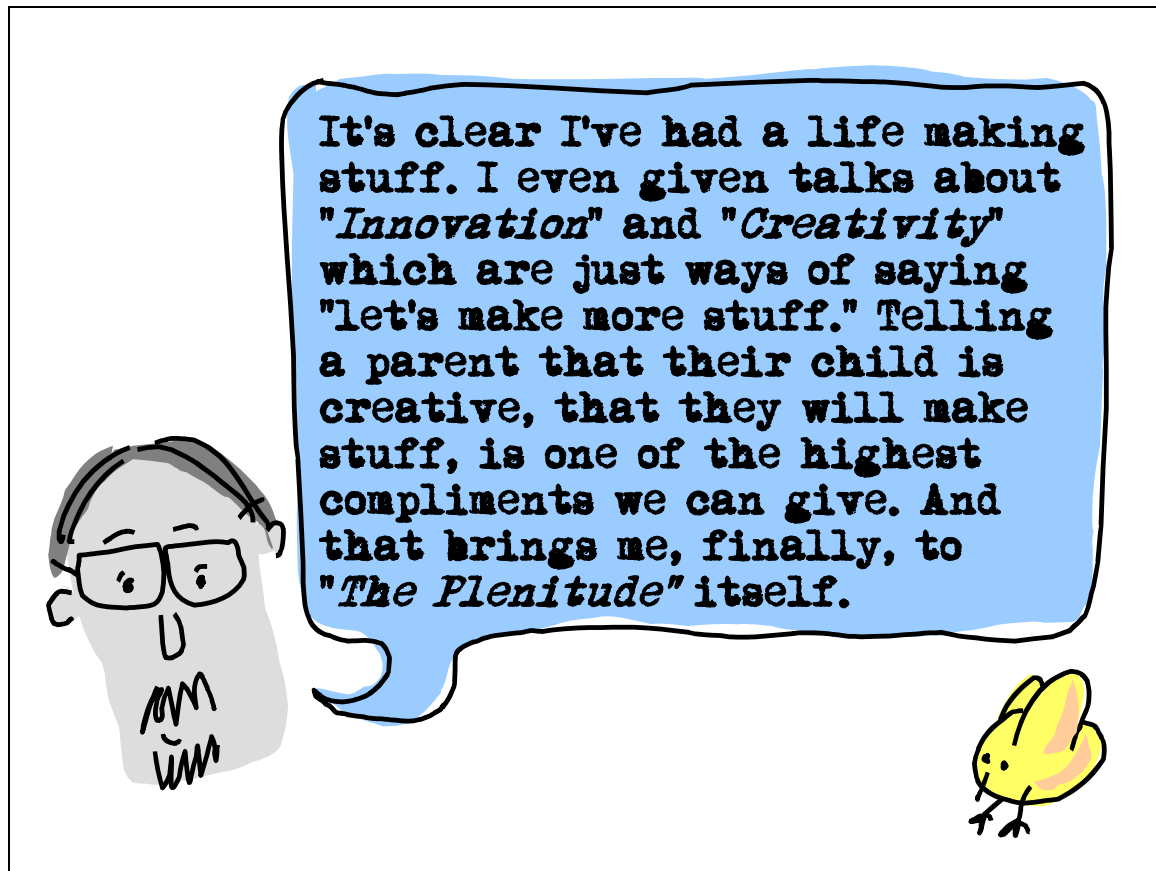


And then RED, as a group, was laid off from PARC. The simple reason was that as Xerox collapsed it could no longer support such an institution. On a deeper level PARC has decided to go in a different direction. It was pretty clear that our kind of innovative work wouldn't fit in, and in fact might be a little awkward to have around, and so we were let go.

After twenty years it is interesting to be not working for a corporation. One feels scales falling from one's eyes. One feels oneself *reverting*.

I found myself writing a book.





It is clear that I have had a life making stuff. Lots of different kinds of stuff. Some successful, some not. Some really cool, some, well, lets just say, prosaic. Its been interesting, a good life. A life I'm not allowed to complain about.

And far from complaining about it, I have begun to speak about it. I go to companies and to conferences, and give talks on "innovation" and on "creativity". These are not words that I would have chosen myself to describe my life, but the culture has settled in on them. For most people they have what's known in the marketing trade as "high positive valance." Creativity and innovation seem like good things. Things fundamental to the running of the culture and to the success of the planet.

If you want to compliment a mom or a dad the best thing to do is say something like: "My, your son is SO creative!" or "You have such a creative little girl!" Creativity is seen as a kind of personality trait. Some are gifted with the creative trait. For others it has to be developed or nurtured. Unfortunately, still others are "not creative" (I don't have a creative bone in my body, they will say) and we will

take pity on them. Hopefully, they will learn to appreciate the creativity of others, and become, say, art collectors.

But what is this thing called *creativity*? What does it mean? At its core, I maintain, it simply means *making new stuff*. Not copies of old stuff, but new stuff. Stuff that has never been made before. Stuff that nobody has ever thought of before. Stuff that comes fresh and is not just a warmed over replica of some already made stuff.

Now clearly I don't mean that the stuff has to be physical. It could be an idea, or a concept, or a string of words. But a lot of stuff *is* physical stuff, particularly in our world. Physical objects in our culture are like words in other cultures.

And just as clearly there are hierarchies of creativity, both personally and culturally. We often say something is *more creative* than something else, or that this thing is *more innovative* than that thing. That is, it is farther away from something that already exists - it is less of a copy. To be not creative is to "think inside the box" - to think of stuff which has already exists. In our culture of creativity we want the new, the different, the revolutionary. *NEW NEW NEW* the boxes on the supermarket shelves visually squeal at you.

But there is another meaning of the word creative that also has a qualitative connotation: it's not just something which has never been before, but it is something good, or useful, or communicative, or impressive, or beautiful, or that lots of people would like to buy for small amounts of money, or that a small number of people would like to buy for a large amounts of money.

Yes, a child is creative when he or she draws mommy and daddy with purple crayon, but there is a different (though related) sense of creative: as when a scientist creates an unexpected equation or when an artist produces a new and wondrous painting. The child's drawing to the painter's canvas forms a continuum from the simply different, through the unexpected, to finally, to the so different that it allows entirely new forms, new genres, of stuff to come into existence.

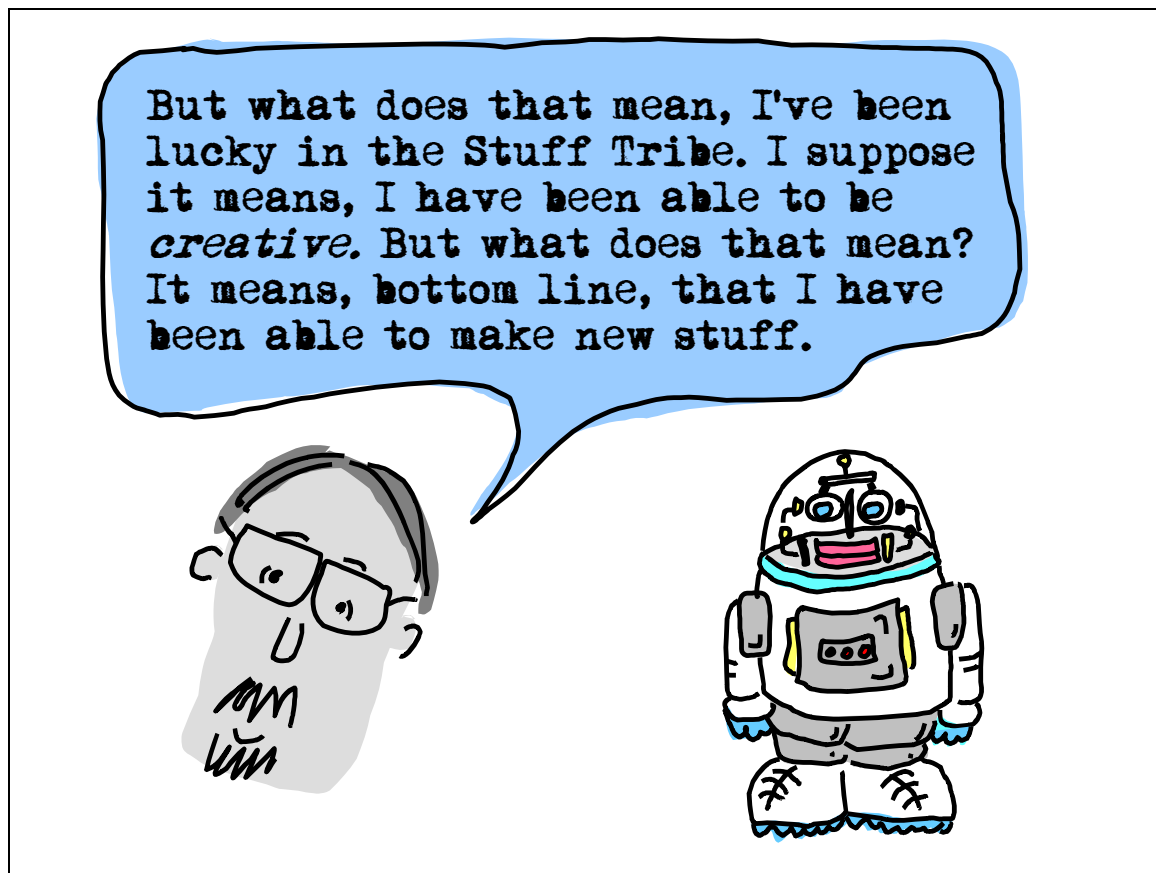
Here's a tale: There are cultures where telling stories means re-telling the same story that your parents told you. The power of the story, in fact, comes from the retelling of it over and over again. In its consistency, its sameness, it provides the eternal. In our culture, this is illegal. It is called copyright infringement and you can be fined or even sent to jail. Each story must be new and different. In some cases it cannot even reference an existing story (just try using *The Lion King* in a movie you are making and see how unbroken the circle of life can be.) The eternalness in *our* culture comes from everything being *ever new*.

This concept of creativity is the core of our culture. Here, where we live, we must make new things to get money to buy other things, including food and shelter. And since we can't make what others are making - by law and by the laws of the market place - it is only through creativity and innovation that we survive.



I realize that as I speak this, that some might be thinking, “My God, what a terrible fate - that I am condemned to make stuff in the, well let’s give it a name, *The Stuff Tribe* or in my more cynical moments, *The Junk Tribe*, for the rest of my life!”

But its not like that at all. I, for instance, love making stuff. I enjoy what other have called *the creative act* - when suddenly there is something where there was nothing a minute before. It gives me great and deep pleasure. In that sense I am a perfect member of *The Stuff Tribe*. Either I was born this way and I was lucky to have found myself living in North America in the late 20th and early 21st Century, and not say, in medieval France. Or, possibly, the Tribe is just extremely good at forming perfect members for itself from the babies born in to it. That’s why we spend so much of our money on teaching our children to be creative: to make happy members of the Tribe. The third possibility - that this is the *perfect* Tribe and that all other means of organizing humans are immoral (and not just inefficient) is, of course, also interesting to contemplate. Many, I think, believe this. My father used to express it this way: if the people of Russia just saw all the wonderful, creative stuff in our country they would immediately overthrow Communism become just like us. Turned out to be a little more difficult than that, but he wasn’t completely wrong either.



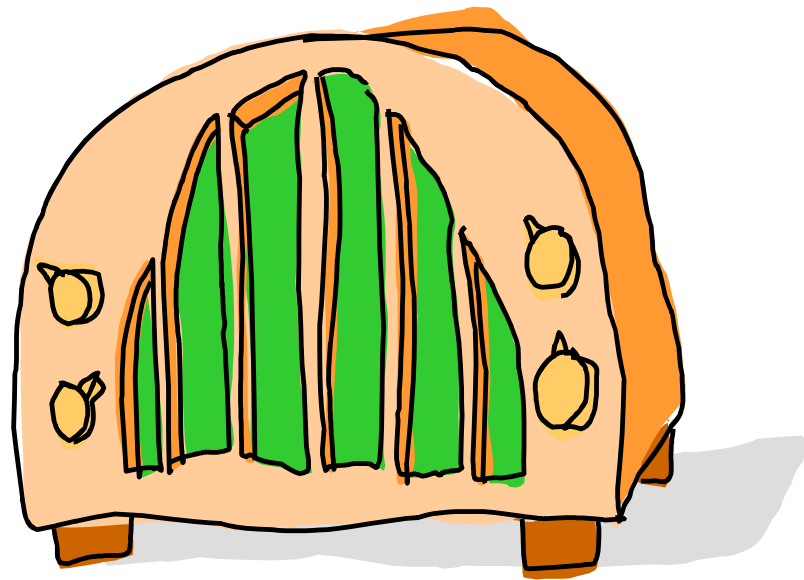
I have been able to make my living inventing new stuff and getting paid for it, and really, bottom line, liking it. Does that mean, if I had been born into a culture that didn't value rapid and continuous change, I would have been unhappy? Or am I just an adaptable guy and would have made it work out no matter what culture I landed in?

Hard to say from this position, but at the moment I'll stick with believing that I was lucky. It is mostly incomprehensible to us what a small percentage of humans, dead or alive, have ever lived in the kind of heaven we can find for sale at even the smallest mall.

And I would ask you to remember that this *is* heaven. It is a kind of hubris to forget that fact, despite all its other troubles.



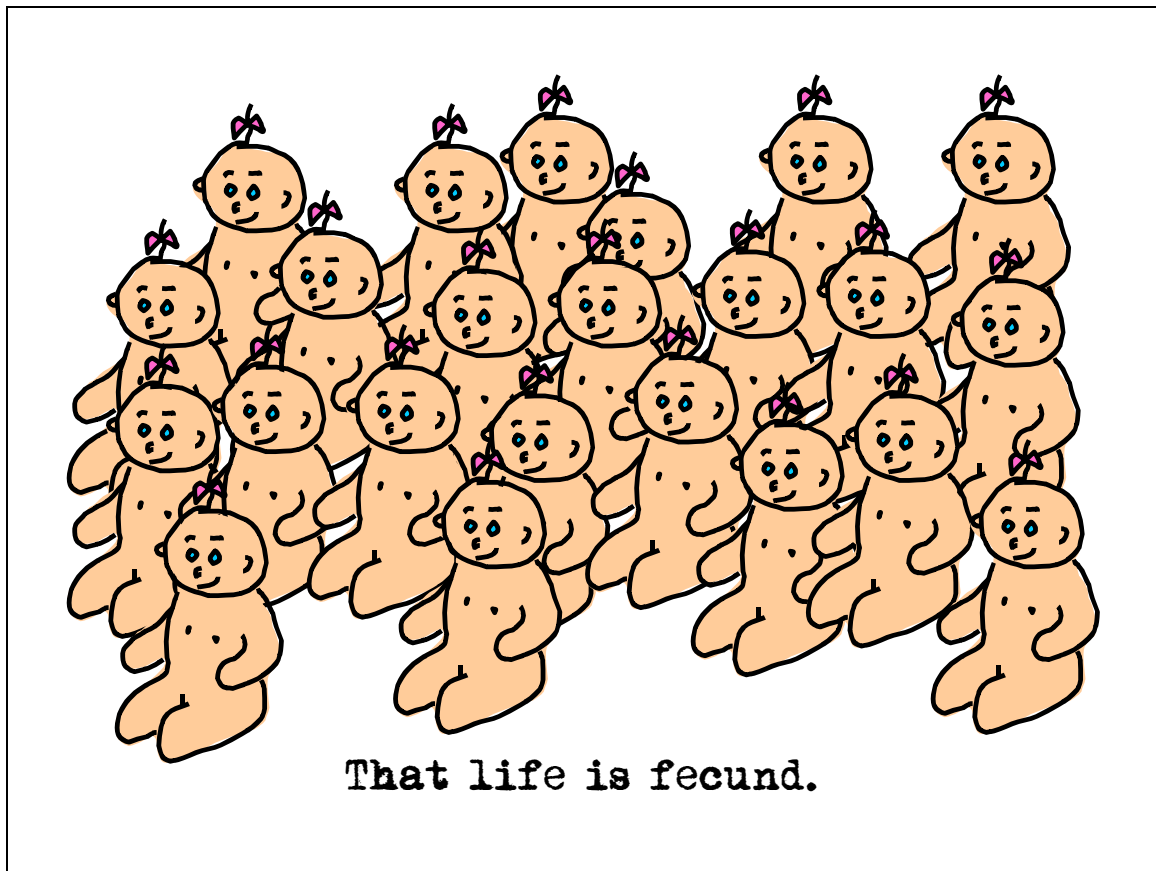
So one day I was listening to the radio and...



The Wiccan on the Radio

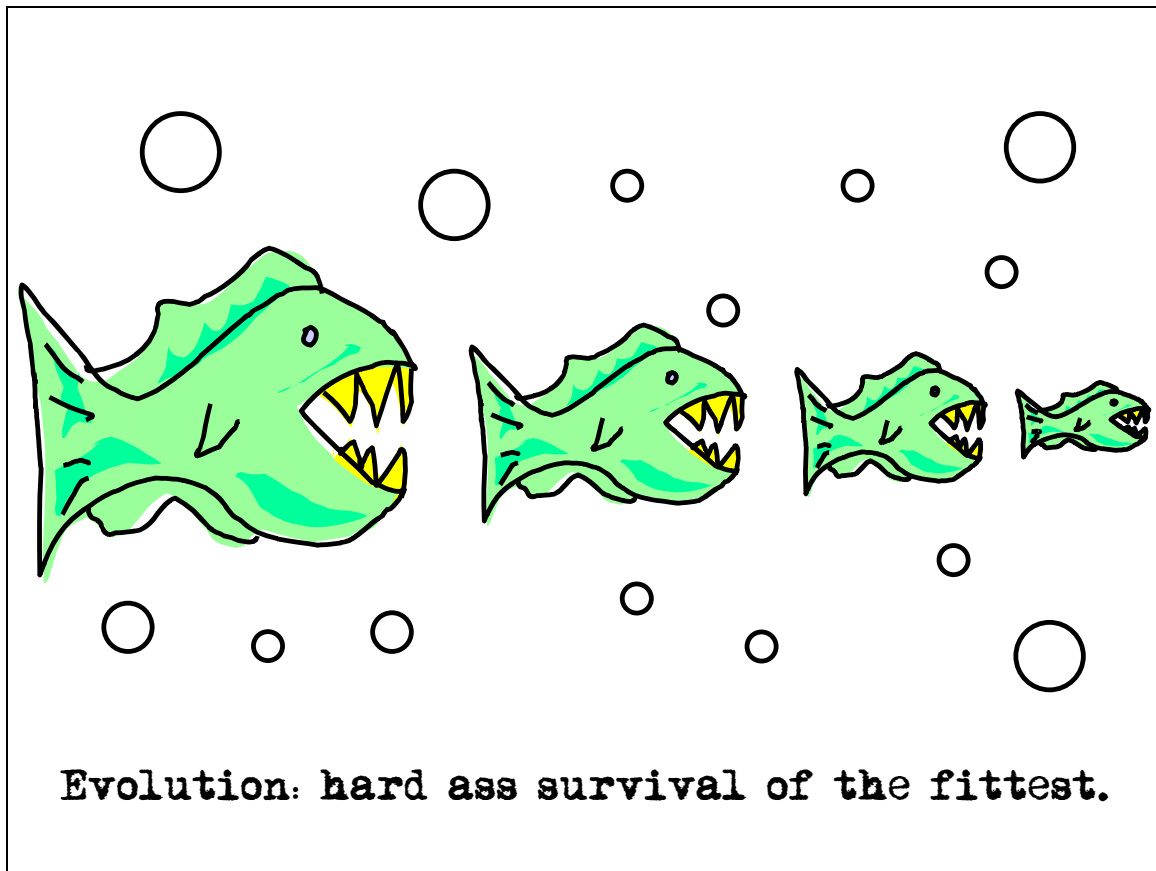
... and I heard a Wiccan on the radio. Wiccans are *Good Witches*. Wiccan's believe, to way over simplify it, that *nature* and not *god* is the ultimate authority, or being. Wiccans pray to the spirits of the bio-mass. What this Wiccan said was that abortion was not a crime against nature because, "nature is Plenitude."

Nature produces, re-produces and creates the new at prodigious rates. It replicates and procreates. It fills the space with innovations though evolution and with copies through sex. Fishes don't just lay one egg, they lay millions. Given ten thousand years, nothing in evolutionary time, even the comparatively infertile humans can pack a planet. Nature is thick and dense. It is *also* filled with death. Everything dies. Everything alive eats other things that are or were alive. Pruning is how you make a garden grow even bigger. Nature is fertile and fecund. She grows and grows and grows. She is almost impossible to hurt. Nature moves and grooves between plants and animals and virus and retro-viruses. - they are always dying, always being born, always in transition, always innovating, always exploding. Nature makes the atmosphere and Nature makes the soil. Nature makes so many species that even humans, the natural counters, can't count 'em. Nature is, in a word, Plenitude, and it is the Plenitude, and not the individual, which is precious.



Life is fecund. It grows and grows. It replicates and expands. Any individual's death is the beginning of life for a thousand other parts of the Plenitude. Each new individual is just an experiment in even more life. Each new life is like a design exercise. Billions of times a second.

Eat away. It doesn't matter. Life is Plenitude! Just as every cell in your body will be replaced hundreds or thousands of times, and yet are still you, the parts of the Plenitude come and go. If the cycle stops, if it stops changing, then, *and only then*, is the Plenitude in trouble.



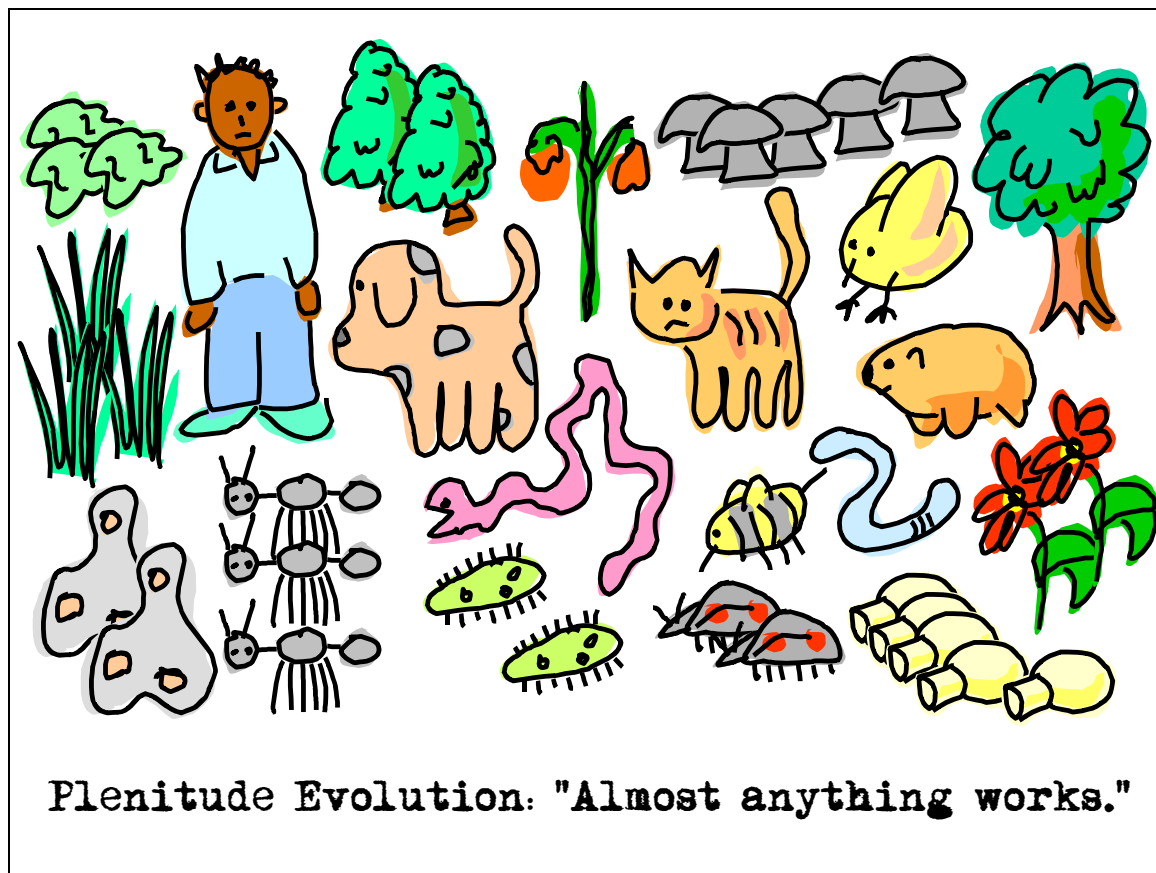
Contrast this concept, this idea, this feeling, that life is Plenitude with the dominant, current metaphor of Western thought:

Life is the hard-ass fight for survival and only the toughest, the meanest, the fittest, the most ruthless survive.

Life is a giant sieve and only the biggest and the best make it. Life is hard. And because life is hard, each individual life is precious. Is unique. Is fragile. Each organism, if it dies, is an indescribable loss.

Life is fragile and living is tenuous and deadly. Living serves up a mean brew of justice and pitilessness. It takes half the scientists in Harvard to figure out why someone might want to commit an act of kindness. That's how hard life is.

If you are still alive, you are just lucky.

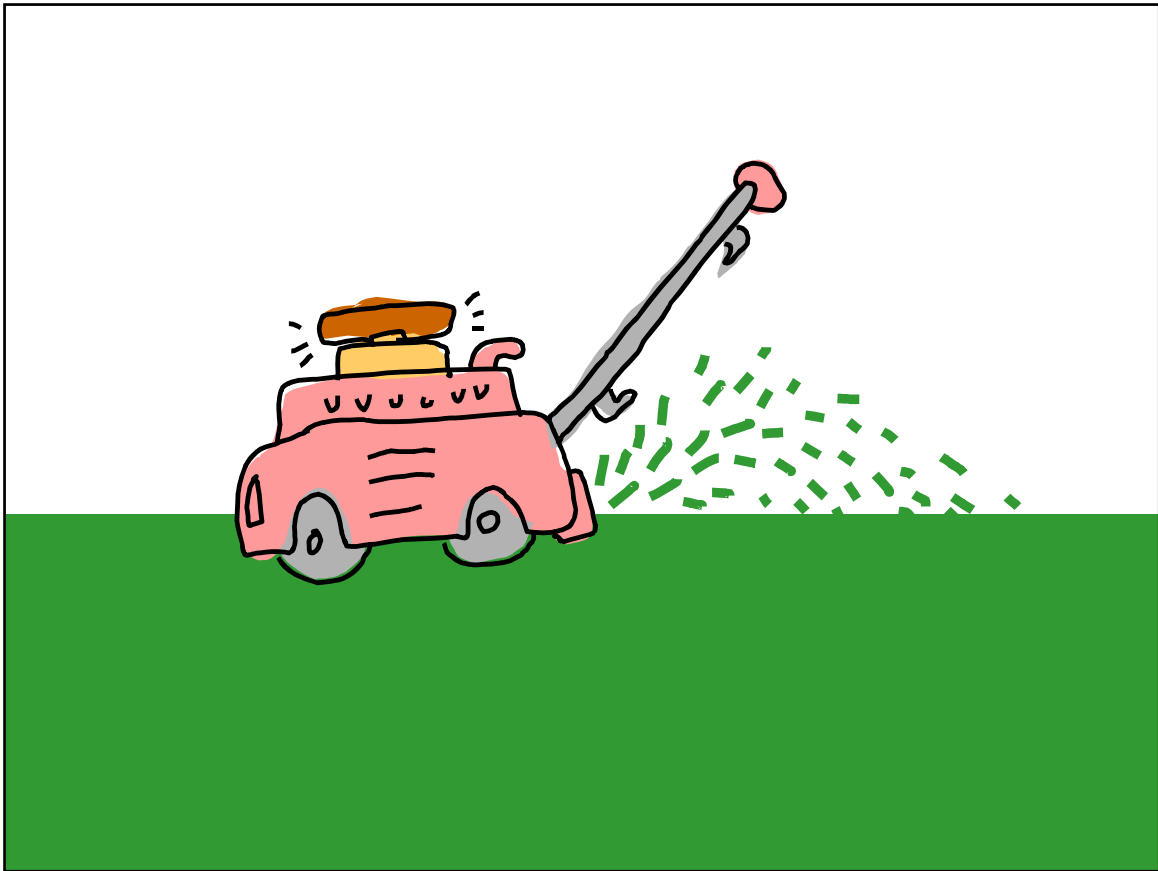


Darwinian Evolution, with its concentration on the individual, makes it seem like "almost nothing works" except that lone, lucky, fittest one. But there is another way of looking at Nature.

When my wife and I step out into our backyard we are faced with a literal circus of wildly differing plants and animals. There are big animals, like me and Marina; there are smaller animals like the cats and dogs, mice and raccoons; there are even smaller animals by the truckloads like worms and ants and caterpillars, bugs on six legs and centipedes on a hundred. There are birds that fly around in the air (and not just one kind, but lots of different kinds). And there are microbes and viruses and spores and amoebas and who knows what else. And that's only the life that moves!

There are the big trees with their huge leaves. There are bushes. There are flowers in a riot of shapes and sizes. There are grasses that tile the lawn. There are mushrooms and fungi and lichens and ferns and bamboos. This is just my back yard I am describing, not even a real jungle. Here is the way I describe this glorious scene:

ALMOST ANYTHING WORKS!



In the Plenitude almost anything works. You name a mode of locomotion and some animal or plants uses it. You name a size and there is some animal or plant of that size. You name a color, a method of eating, a way of reproducing, a means of playing and there is some animal or plant who has developed that method. And new methods are being created all the time.

Life is so easy that it is like falling off a log. It is explosive and creative and nearly infinite. Don't concentrate on the individual. The individual will get eaten, will get a disease, will die of something or the other. Concentrate on life itself. On mother Nature. On the Plenitude! And in the Plenitude almost anything works! In the Plenitude innovation is all around. It is easy and simple and massive. Life explodes forth at every seam.

For Marina and I, the difficult act in our backyard is not to create life, it is to keep the Plenitude under some sort of control. It wants to explode in every direction. Every Sunday I mow the lawn. Marina has taken to pruning every day. It hardly matters. The Plenitude thrives despite, or rather, because of, the pruning.

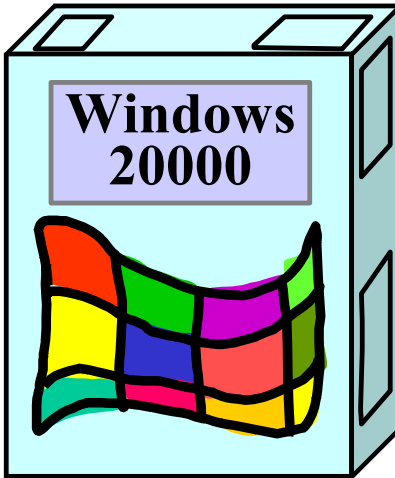


In Stuff Evolution both success and failure matter.

But I don't want to talk about nature, or certainly abortion with its complex moral system. I want to talk about the making of new stuff, the kinds of stuff that most people in the U.S. are employed to make or to dish up or to move around. There are many similarities between life and the stuff we make. Both seem to evolve. This year's product is only slightly different from last year's product. Lined up end to end, Chrysler cars have clearly evolved from 1911 to now with barely a surprising break from one year to the next.

It is also interesting to note how, like their bio-counterparts, stuff falls into species and phyla. Into genre. There are vehicles. There are cars. There are sports cars. There is food. There is breakfast cereal. There is kid's breakfast cereal. And so on. And over time the number of these ontological distinctions increases. There are more and more kinds of communication devices and there are more and more kinds of phones and there are more and more kinds of phone services.

There *are* differences between the bio-Plenitude and the stuff-Plenitude. As far as I know there is nothing quite like *brands* in nature. But the big difference is this: Whereas in nature *failures* play no role in the next generation of plant and animal, in the world of stuff they play a large role. If a green doll is introduced one year and does poorly, green dolls will not be introduced the next year.



Most think of survival of the fittest product.

It is commonly believed that new stuff is hard to make. That it is hard to invent, that it is hard to create, that it is hard to develop, that it is hard to manufacture, that it is hard to market, and that it is hard to distribute, that it is hard integrate it into our culture. There is generally assumed to be such a cut-throat slaughter of new ideas at every level that only a small amount makes it. That it is a winner take all economy. That only the fittest, the toughest, the most ruthless products make it to store shelves let alone survive.

In this view, the evolution of new Product is very much like the evolution of life as Darwin saw it. That given how hard it is to imagine something that doesn't already exist, and given the number of constraints that a new thing must satisfy to make it and to procreate, it is simply a miracle that we have any products at all in our homes. And it is certainly true that giant corporations feel as though they are about to be crushed in the international war for product niches.

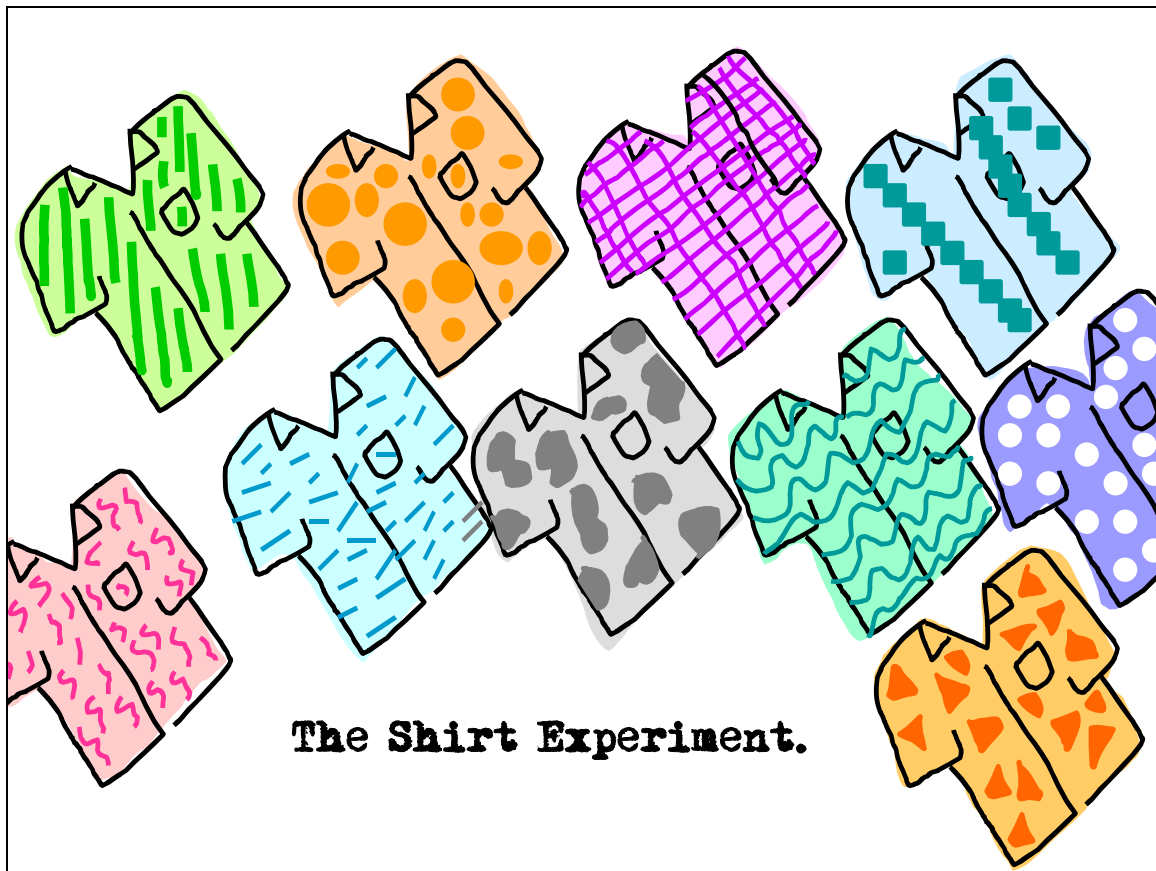
as WebVans. And each of these product eco-systems is loaded, stuffed, teeming with different forms of products.

Not only are there hundreds of kinds of toothbrushes, just to pick one example, available, but each kind comes in multiple designs, colors, stiffnesses and packaging. And these toothbrushes co-exist with other members of their species: water picks, rotating toothbrushes, laser cleaning, vibrating brushes and on and on.

The mall is a dense jungle of every kind of product and species of product. Sure lots of the products will die out this year. More will be back next year, slightly improved, slightly innovated. Not only does this not matter, but the whole economy would grind to a halt if it wasn't mostly different next year. Toy companies replace eighty percent, or more, of their SKUs each season. If they didn't, they would go out of business because kids already have last years stuff and more importantly, what they really want, is, simply, the new. It is only the Plenitude *as whole* that is stable.

And here's the really amazing thing. What you see is just a tiny percentage of all the things that were created, dreamed up, brought to prototype, market tested, worked out, or sold somewhere in the world. For every one toy that made it out of Mattel, there were a thousand toys that ended up on the workshop floor. The magnitude of the Plenitude is difficult to grasp. It simply doesn't matter that most things don't work out, for even as it is, the Plenitude maybe too fecund for the planet to absorb.

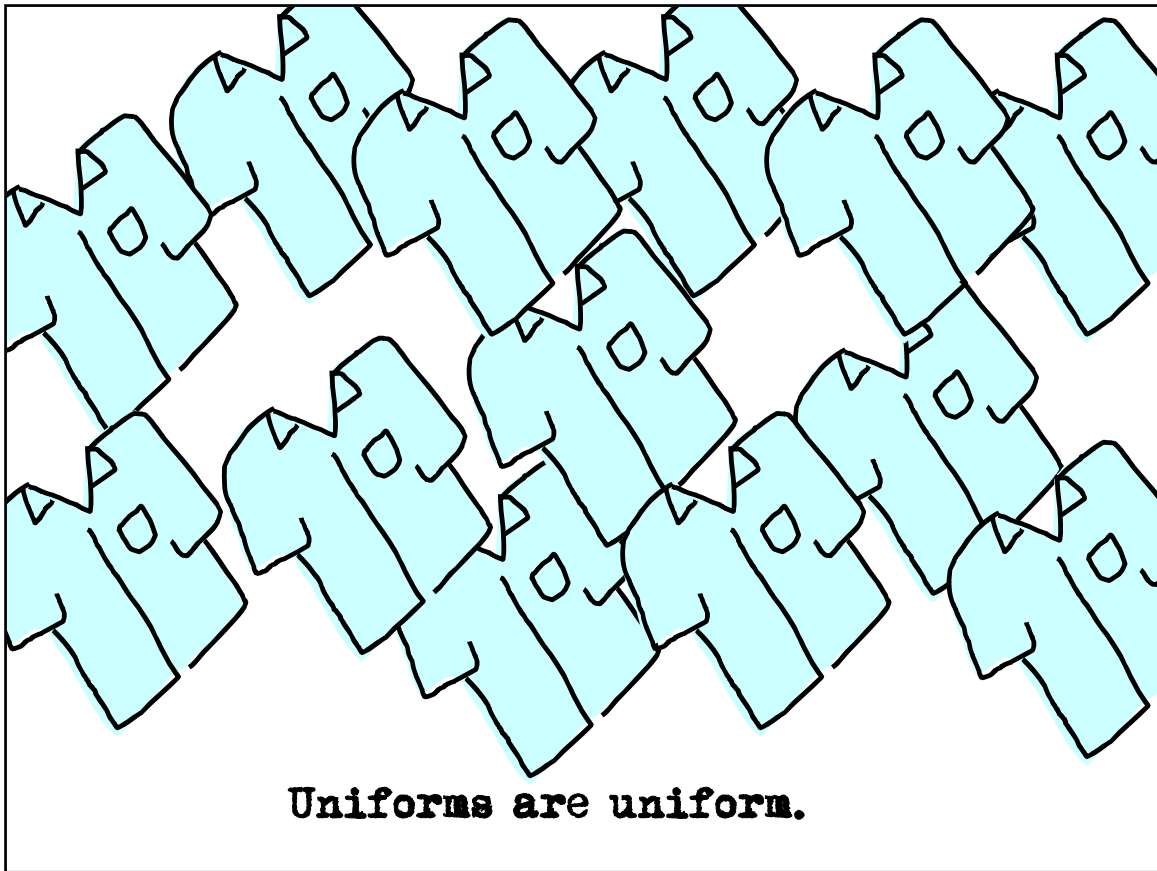
Truly, it has only one major tenet: *ALMOST ANYTHING WORKS!*



Here is an experiment that I often give during my talks. It usually works for crowds up to two or three hundred people:

Look around the room. What is particularly striking is that everyone in the room is wearing a different shirt! Different colors, different patterns, different cuts. Imagine, for a minute, the vast design energy that is required to make this many different shirts. The cloth designers, the fashion designers, the factories, the seamstresses, the shippers, the clothing stores, the advertisements. Really tens to hundreds of people were involved in the making of each one of those shirts.

And here's the even more amazing thing: if everybody comes back tomorrow to the same room, say to hear another speaker, then everyone (except a few computer nerds) will be wearing yet a different shirt!

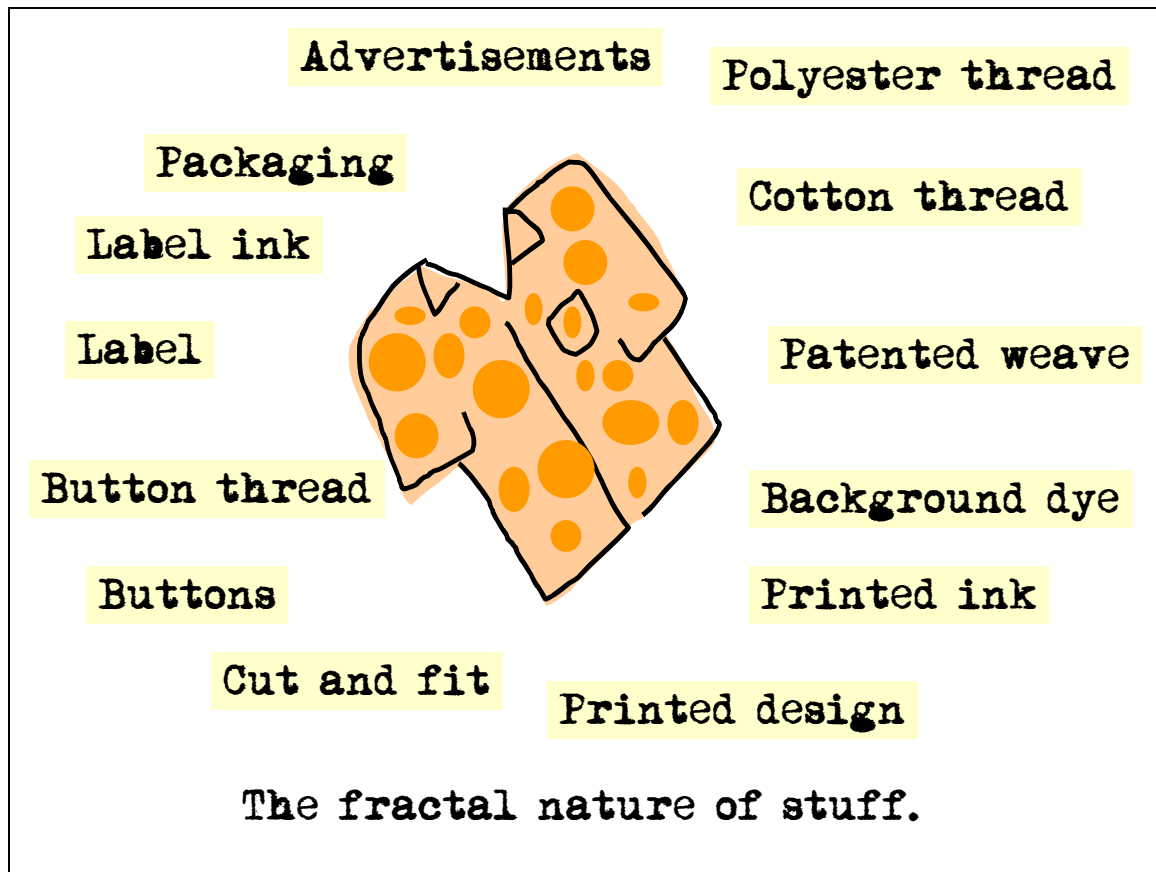


There have been a few occasions when this experiment failed. For instance, I once gave the talk to the Coast Guard. The men and women in the audience stared at me as they sat in their identical powder blue short sleeved shirts. Of course that's why we call them *uniforms*.

Here's a story: there was a researcher at Xerox PARC who came from a small country in Africa. He said that when somebody in his village wanted to get a new shirt that person would go to the *shirt guy* in the village and they would go together into the jungle and the shirt guy would make a new shirt. It would take three or four days. When they came out the shirt was unique - but it also reflected the person who wore it at a deep level. It was a beautiful shirt and it was highly meaningful to the wearer. And the wearer wore it every day.

I can almost guarantee that almost nobody in one of my audiences cares deeply about the shirt that they are wearing. They may not even remember where they bought it. If they close their eyes, they might not even be able to recall what shirt they are wearing.

The important thing is that they are wearing a physical representation of the Plenitude.

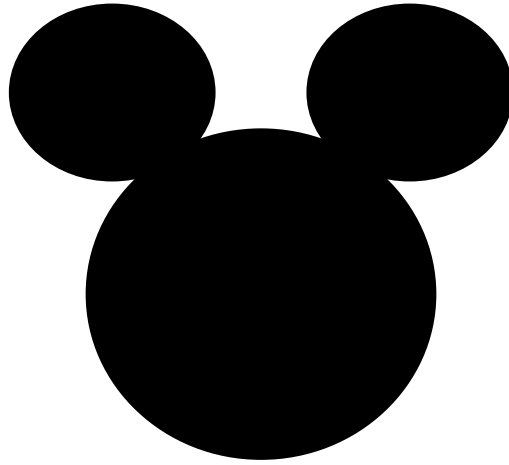


I once asked Hal Varian, the economist, how much stuff is there in one room? “Well, what’s the definition of a piece of stuff,” I think he asked? “How about: something that was individually designed, shipped, marketed and sold,” I replied. “OK,” he said, “then there is no answer, *for stuff is fractal.*”

What he meant (I believe) is that while we might say that a shirt is a single piece of stuff in the Plenitude, I could also say that each button was individually designed, shipped, marketed and sold. The same for the thread. And the dye that colored the thread. The weave of the thread might be patented and based on equipment which was designed, shipped, marketed and sold. The cut is no doubt itself a copyrighted legal entity. The advertising for the shirt, which made me buy it and which covers the shirt with a sparkling aura, was also designed, shipped, marketed and sold. And on and on.

Not to mention the genetically engineered cotton.

The Plenitude is fractal and it goes all the way down.

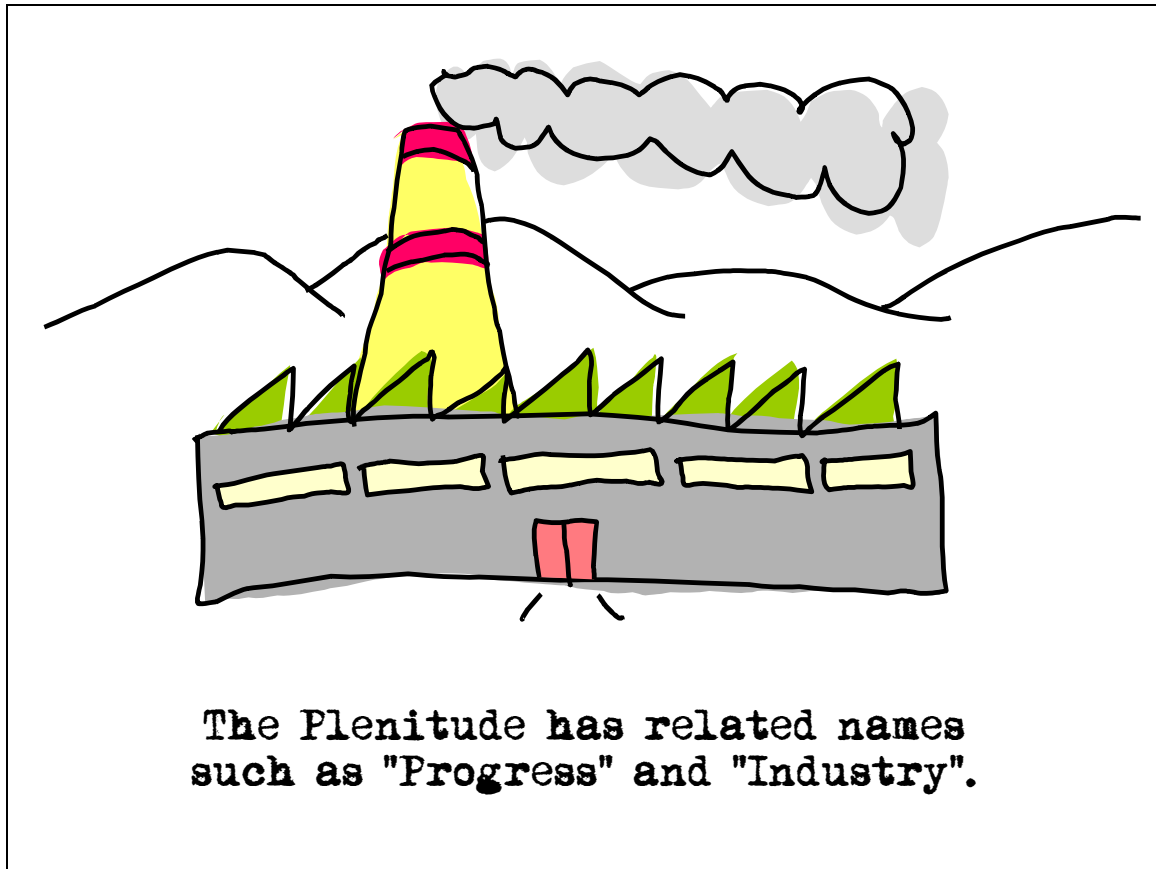


**We must make new things by law.
Its illegal to tell the same story again.**

As I have already noted, in many cultures, including ancient cultures, the telling of stories is about telling the stories that your parents told you. And the stories that they told were the stories that their parents told them. And on and on back through time. We still see this in religious settings - say the telling of Bible stories, or the reading of the Talmud. We even see it a little in the origin myths of America itself. The Constitution is often replicated and referred to.

But in the Plenitude, that is not what happens. Every story must be *different*. You are not allowed to tell the same story that you heard. It is in fact, **AGAINST THE LAW!** Your story must be different than all other stories.

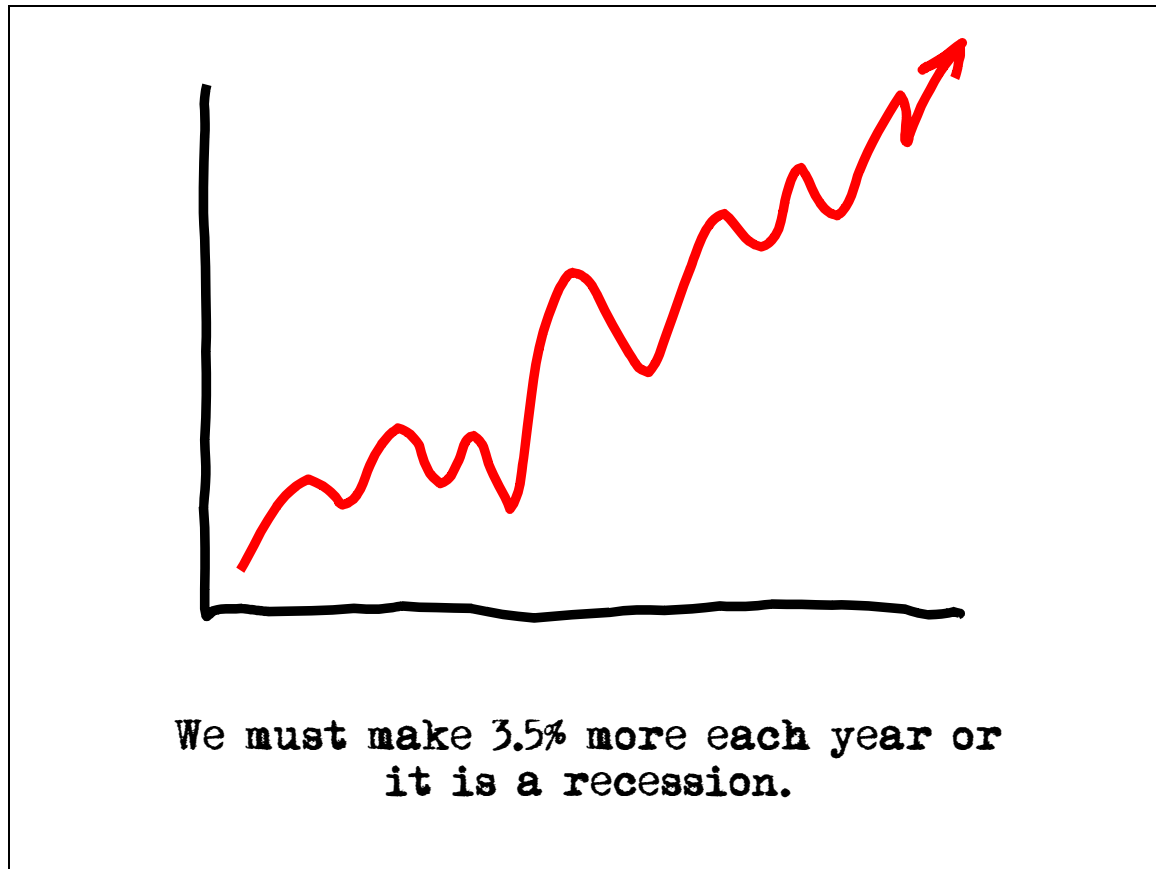
And this is true across the entire Plenitude. Not only is it considered in poor taste, and probably not profitable, to produce something identical to something else, it is against the law. Variation is built into the legal system of the culture itself. It is this variation that is at the heart of the Plenitude. It would probably still work without the legal aspects - it is simply our cultural nature now to look for the new, the different, the creative, the innovative. Those are the things we like and those are the things we buy. But, remember, they can throw you in jail if you violate the laws of the Plenitude.



The Plenitude is related to other concepts besides *innovation* and *creativity*. For instance, it is similar to (but not the same thing) as *progress*. The primary tenet of progress is that every year the things we make are better than the things that came out the year before. A car built in 2001 is better than not only a car built in 1910 but, theoretically, even one built in 2000. Occasionally we find where something from the 50s that is better than what we currently have, but that is rare and is remarked upon with a sigh.

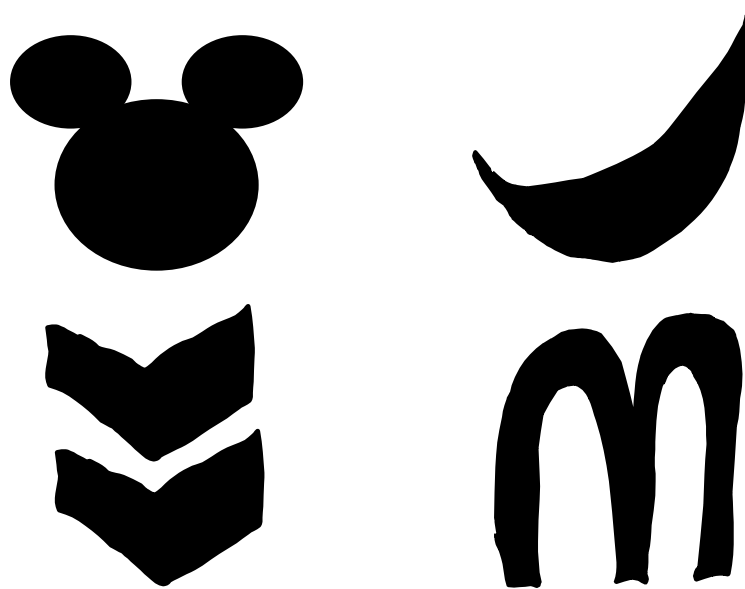
Industry is another term deeply intertwined with The Plenitude. While we might imagine a new world of *e-everything* and *service-everything* else, in reality, we mostly make stuff and then move that stuff around. The web is just a big brochure. The Plenitude is *made*, and most of it is made by industry. The structure of industry (for instance, how it separates marketing from engineering) and the technologies of industry (for instance, the assembly line or the stock market) all feed directly into the Plenitude.

We can imagine cultures with industry, and with progress, that are not in the Plenitude. The Soviet Union tried to have industry without the Plenitude. Certain fundamentalist countries are also trying. It could be, of course, that progress, industry and the Plenitude are just too deeply intertwined to have one without the other. I am willing to entertain alternative theories.



Not only must this year's stuff be different from last year's stuff, but there must be, in a very real and measurable way, more of it. Precisely, there must be 3.5% more stuff this year than last year or it is considered a recession! Flat production is not considered good enough. There must be more.

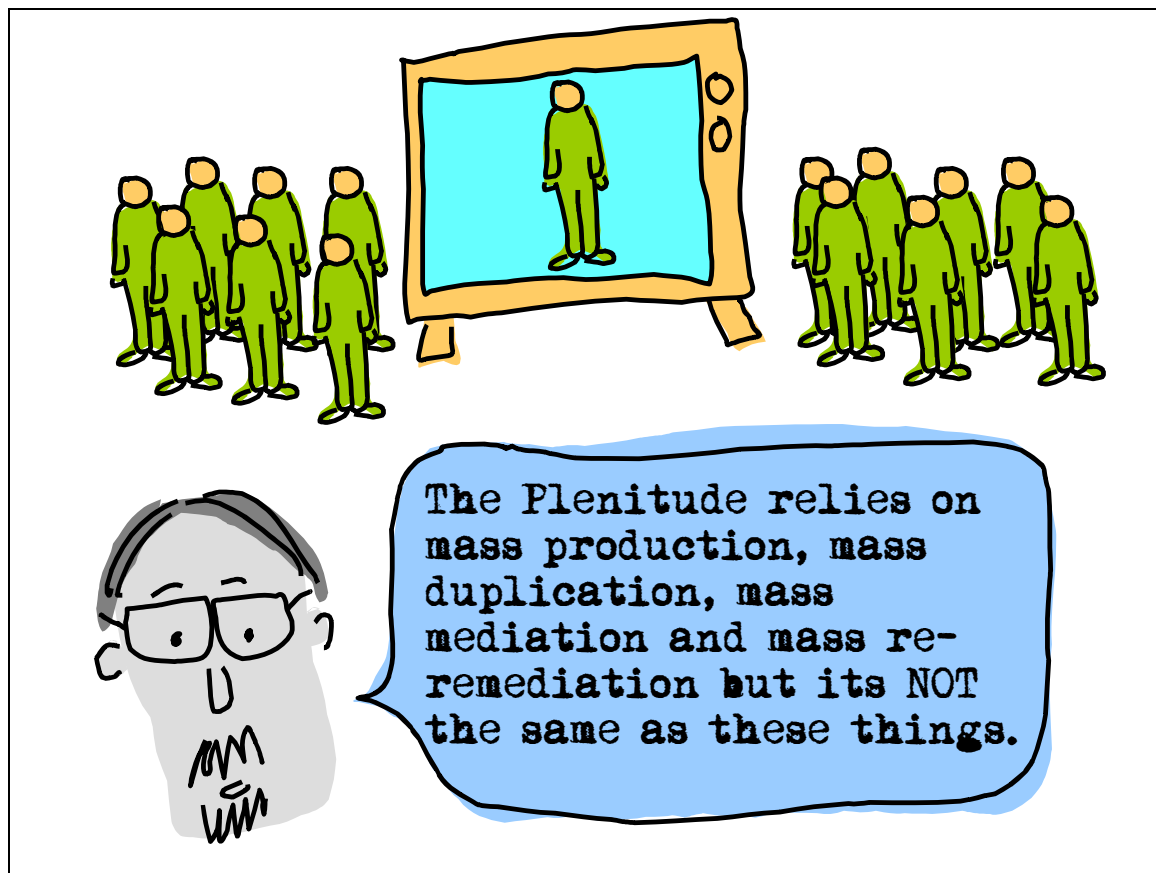
This actually creates quite a burden on the *consumer* (that hypothetical animal whose desires and fears are quantified in something called the *consumer confidence index*.) To buy more stuff they have to work more hours and if they work more hours they don't have enough time to buy and use more stuff. The real power of efficiency is to allow people to make more stuff in a smaller amount of time so they have enough time left over to purchase all the stuff they made.



While conceptually separate, there is little doubt that the Plenitude and the Corporation have grown up together.

Equally intertwined is the *corporation* and the Plenitude. While separate ideas, there is little doubt that the two grew up together and achieved a kind of mutual maturity together. The corporation *is* a peculiar entity with, on one hand, limited liability (stock owners are do not have to pay for losses) and on the other, many of the legal rights of individuals including freedom of speech. Corporations have a strong structural desire to grow and are only barely tied to place.

Corporations feed off the Plenitude and most are designed to their very core to create more of it. Most corporations have, not quite at their center but somewhere near it, some generative organ for creating new stuff. This might be an R&D department, an engineering group, a marketing division, a group that buys outside inventions, whatever. Corporations have to sell something after all, and most have to sell new stuff. Even corporations that rely on fairly unchanging commodities (such as corn flakes) have methods of making the flakes new and improved each year. Or at least their boxes.



How is the Plenitude related to mass production? Mass production, of course, is a process where one designed item - the item in which the creativity, or innovation, or ingenuity resides - is duplicated thousands, if not millions of times. Nobody in a given room may be wearing the same shirt, but there are thousands or millions of people wearing that same shirt somewhere else.

In general we think of two broad kinds of mass production. The first takes place in factories. The invented object is turned into a set of tools, dies and procedures. The factory is turned on. Raw material is dumped in one end and the tools, dies and procedures turn the raw material into duplicates of the invented object which leave the other end of the factory to be distributed to you. There are factories all over the world doing just this, though more found in poor countries than in rich ones.

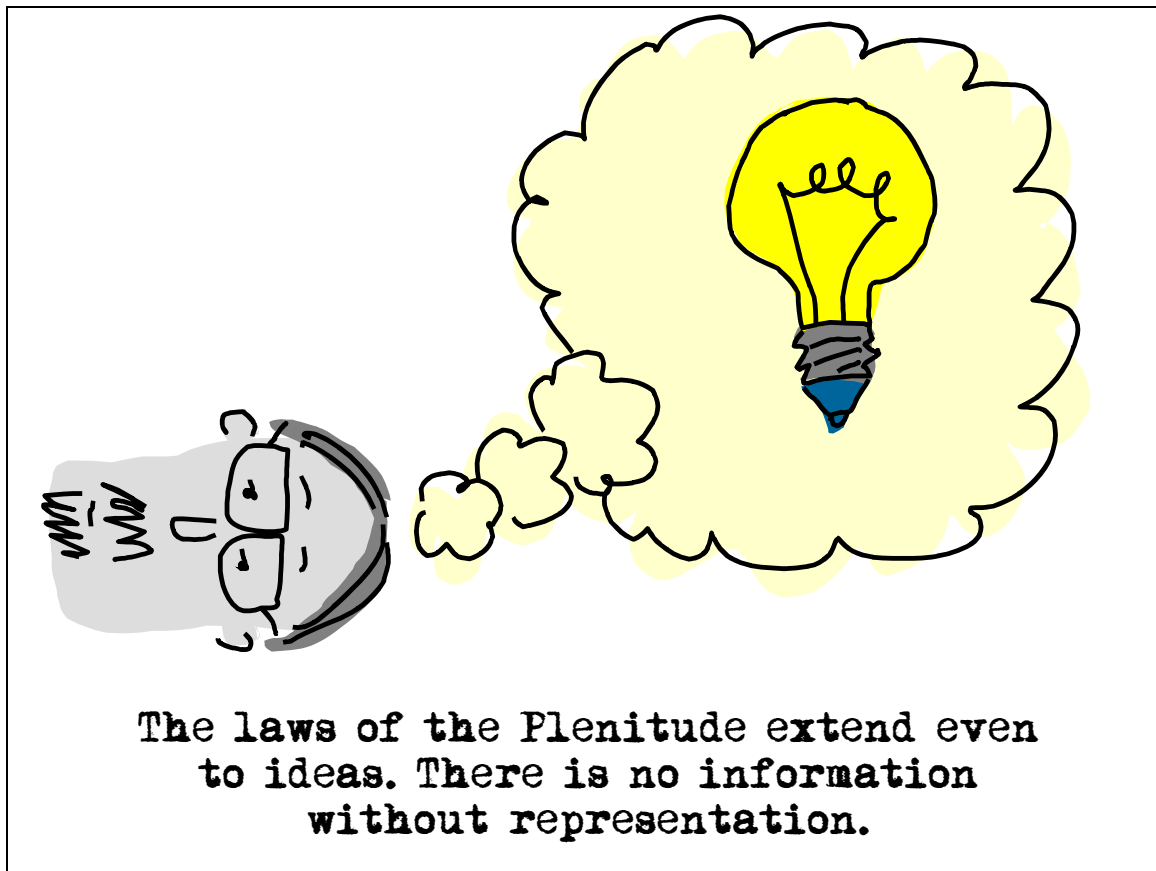
The second kind of mass production requires a certain kind of object, usually called a *medium* that can take another kind of thing, usually called the *content*, and display it. Media would include TV, radio, the internet, etc. Content would include TV shows, movies, news stories, etc. Using various forms of broadcast the content is sent out to the millions of mediums which can reproduce the content right there in the living room. A kind of factory for one. When you see *Survivor* on TV, millions of other people are seeing it too, on their own little content factories.

There are other kinds of mass production, some quite interesting. Paintings in museums, which seem to be one-of-a kind things, are usually re-mediated for postcards, books, posters and the like. In many cases it is this remediation that makes the painting valuable. The image, removed from the canvas, is what is mass produced.

There are clearly close ties between mass production and the Plenitude, though we could imagine a culture that has mass production but not the diversity of the Plenitude. It is harder to imagine the Plenitude without mass production - the sheer quantity of stuff to be designed would be overwhelming. Furthermore, certain economies of scale facilitated by advertising simply wouldn't work.

On the other hand, there is an important change occurring within the factories, and to some degree within the media, that goes by the catch-all name: *customization*. It is rare for two cars from the same factory to be really identical. Clothing and shoe factories are also being designed to be able to spew out product such that each shoe or shirt is different - perhaps dependent on the wishes of a specific customer. We also find the same kinds of pressure occurring within the media. For instance, there are many websites where the content dished up to you is different than the content dished up to your neighbor based on your preferences and other factors they have been able to glean. That is, the content is based on your *profile*.

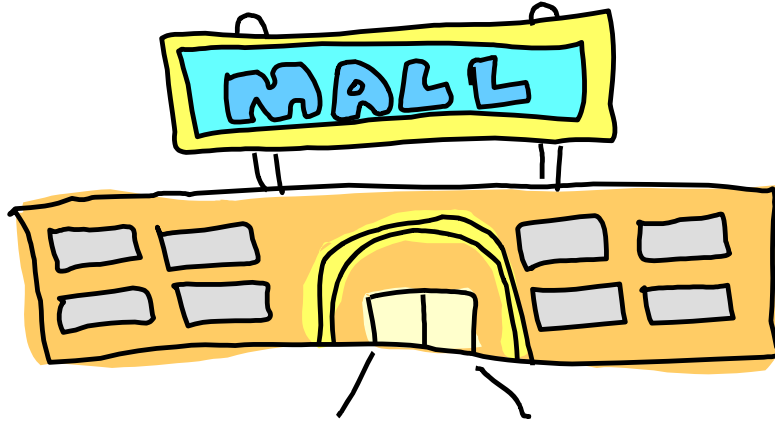
Better hope your profile is right.



Less straightforwardly, the Plenitude also exists in that ethereal realm of ideas, often for many of the same reasons it exists on the physical plane.

A bookstore is about ideas. The Plenitude one finds inside of a bookstore is probably the second most frightening place I can go in a mall. The sheer quantity of ideas, of thoughts, of worked out theories, of constructed fictions - most of which I will not have the time to know about, let alone read - is startling. They constitute one of the most prolific parts of the Plenitude.

The most frightening store in the mall to me, in case you are wondering, is the toy store. The toy store's purpose is quite precise and highly targeted. It is to teach our young the most important pillar of our civilization. It is to teach the Plenitude.



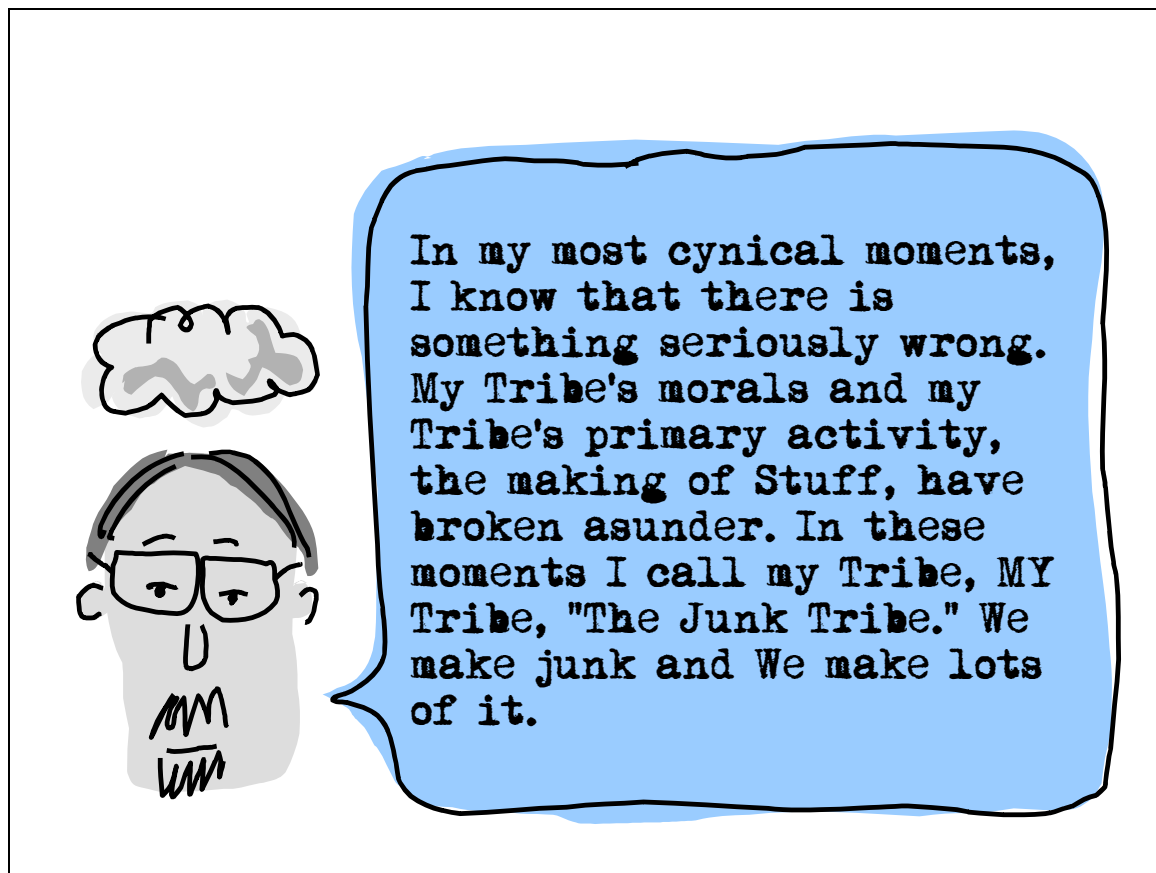
The Plenitude creates a dense, rich life. We are embedded within it and it is comfortable for the most part.

I know from experience that the readers of this work are already dividing into two groups. One group is thinking, “Wow, what a great culture to live in! I gotta get off my behind and start a business and start making things for the Plenitude. This is great.. I need to make stuff!”

The other group is thinking. “Oh my god! This is terrible. What an awful, superficial way to live life! I hadn’t fully realized - I am completely surrounded by the Plenitude, my whole life has been swaddled in it, I am a victim of the Plenitude. I have to figure out a way to get out, get off, get away.”

But, there is no place to stand without contradiction, either inside or outside the Plenitude. It is simply part of our condition. It is not just the readers who are divided; I am as well.

Many post-modernist critics, when they talk about the Plenitude, call it *Late Capitalism* as if it has pretty much run its course. I don’t see it that way. I think we are in the *Early Plenitude*. It is like living in Rome in 300BC. Things are just getting going. We have another five hundred or so years to go, if history is any guide on how long these sorts of waves last. Its just starting. I believe that the rules aren’t fully formed yet. There’s still wiggle room.



So, I know what you are thinking. You're thinking, he's getting pretty cynical here. There seems to be an undercurrent of negativism creeping into the book which started out as a kind of pleasant, if not a little self-centered, retrospective of a creative life. Does he, or does he not, like the Plenitude?

If only it were that easy. It is remarkable, in a way, that we can even conceive of disliking our own culture, or at least large parts of it. Important parts. I'm not sure what it means really. Its as if our moral framework has worked itself loose from the very matrix that produced it. What other rules can we use but our own? Its not like we are a conquered country with rules and mores dictated to us by some foreign ruler. *We are the Empire!*

Yet, I know designers in the toy business, who worked at Mattel, who would not let their children play with the toys that Mattel produced. There are toys that I won't let my son Henry play with. These aren't toys from some other culture - people just like me, living in L.A. or New York, designed these toys. I have a friend who wrote TV shows who did not let his kids watch TV. I won't let Henry watch some TV shows, shows designed exactly and precisely for him by people who look just like me. As a parent what am I to do with cartoons that present themselves as outsider, and anti-social, and that just happened to be produced by major corporations?

What's that about? Have there been other civilizations that produce things, not just peripheral things but real *engine of survival* things, that the populace itself has trouble with? That they won't even let their children look at?

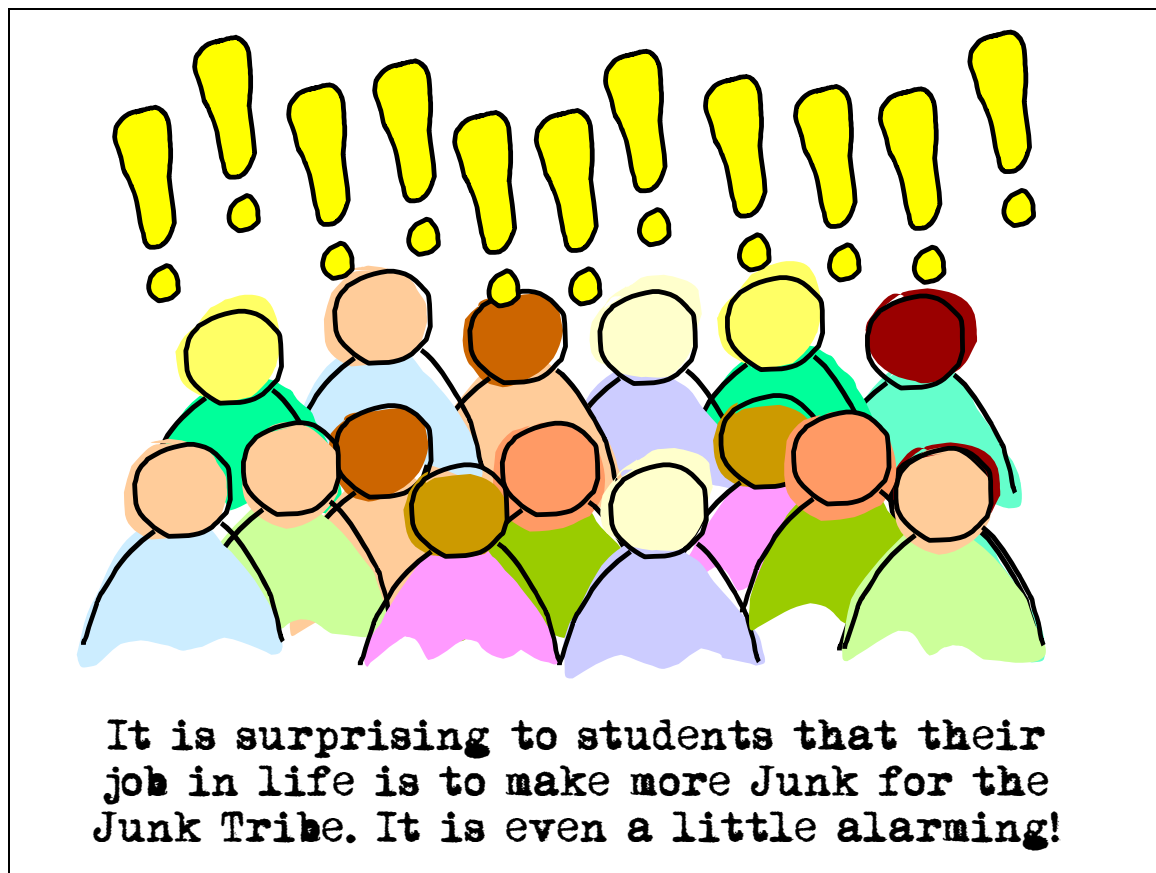
People will even say that a child sitting alone in his room, facing a computer for hours at an end, shooting virtual but very realistic humans with a wide variety of virtual but very realistic weapons such as sub-machines, is anti-social behavior! As if the video game wasn't created by our society, as if the computer wasn't created by our society, as if the chair and the room for that matter weren't created by our society. From the viewpoint of the Plenitude, if such things can have viewpoints, this is more social than going to church and praying to a Middle Eastern God from several thousand years ago. The people who created this experience are still alive and live next door.

But let me be clear. There is no activity I can think of that I enjoy more than making more Stuff for the Stuff Culture, or let's just call it by its other name, more Junk for the Junk Tribe. And I do enjoy going to Borders, or to the mall, or to the craft fair that takes over on Palo Alto's main street once a year. I enjoy being overwhelmed by the vast diversity and the breadth of our culture's creative energies. This is what we do and we are damn good at it, thank you very much.

Yet, yet, there seems to be something fundamentally wrong with spending one's life making and constructing the ever changing, the ever renewing, the ever growing at 3.5% per year, Plenitude. After all, our moral and religious systems spend Saturday and Sunday mornings arguing against it. Against the accumulation of stuff for its own sake. Against the worship of Mammon. Against material desire. Against the transient. Our children learn ecology in school *as if it were a religion*. Let's face it, when you have a culture built more or less around the centrality of corporations who promote consumption while the population worships a God of poverty and meekness while the children learn about saving nature in school, something has gone awry.

Sure, sure, I said that there is *no place to stand without contradiction*. And maybe that's right. Maybe its just one of those *who cares* kind of things. That would be good. And I mean that, maybe this slight queasiness is just what happens when you spend so much time looking at your self. You get dizzy. After a while you begin to wonder why you are alive, what is the nature of life, what is reality, what does it mean to exist? These are the questions that make all cultures dizzy.

Here's one more thing my father said: "I like to keep busy so I don't have to think about life." We are the Busy Culture.



When I give talks to college students on this topic they are often somewhat surprised. It really hadn't occurred to many of them that what they were learning to do in university is to make more stuff. They thought they were going to cure cancer, or help people communicate better, or make children happy, or solve security problems in email servers, or make really cool new shirts that will make the people who wear them look really cool. All good and noble pursuits.

It hadn't dawned on them that they are part of a process whose primary function is to create, churn out, more stuff. That it will be impossible for them to earn a living without making more stuff. We simply do not know how to make a living without making more stuff.

But what were these somewhat shocked students thinking (as if you could shock students much?) Let me refer back to my 2 by 2 of the four creative professions and construct a matrix of possible thoughts:

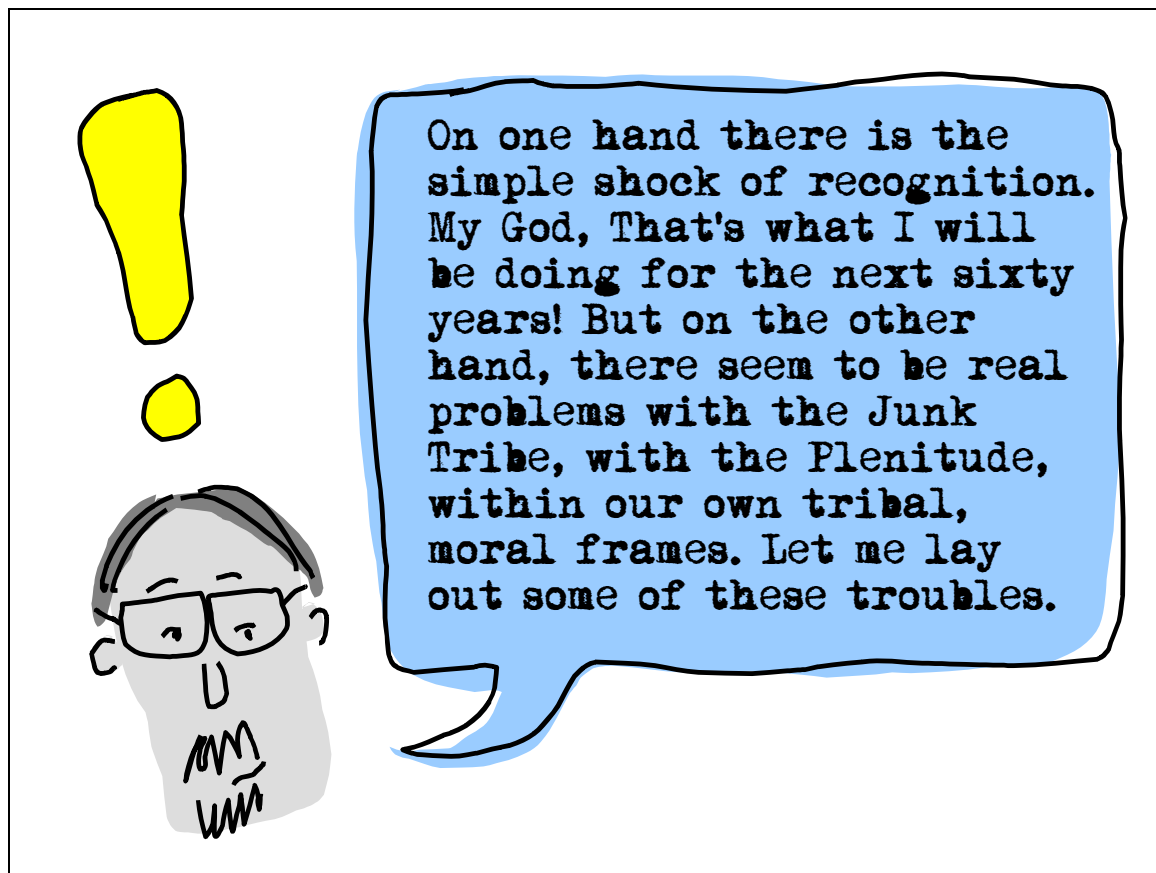
The student *engineers* saw the world as a series of problems to solve and assumed that by solving these problems the world would become simpler, nicer, more humane. The computer, for instance, would simplify office work by making it more pleasant to spend eight hours at a desk. In reality, of course, such solutions are not

only almost always more complex than the system they are trying to fix, but they are additive, layering on top of the old solutions. That's one of the properties of stuff I haven't mentioned, it piles up. Offices now have both computers and filing systems. Its just a fact.

The student *scientists* also thought that they were simplifying the world. After all, each round of physics theory seems simpler than the last. And each equation is meant to be true forever. Science seems the opposite of junk. And yet, and yet, each new equation opens vast vistas of new stuff which then pours from R&D departments all around the world. Scientists have a wonderful phrase for this. They say "The genie is out of the bottle and you can't put him back in." And we know what that means. It means once we have created the formula, the stuff will flow and you can't do anything about it.

Now student *designers*. When they are asked to design, say a new toy, they imagine that the child is just playing with just that one toy. All alone in a pristine child's room. But that isn't how children play. A toy is just a component in a vast configuration composed of multiple toys. Toys - all designed stuff - is additive. It bunches up under beds and on living room shelves. Simplicity, when we do see it in design magazines or interior decoration books, is always, very, very expensive. It costs a lot and remarkably, takes a lot of time. Only the rich can afford that kind of simplicity. No one toy satisfies a child. That's not what toys are about. Toys are about *lots* of toys and about *ever different* toys. I am looking for a new suffix - the continuous plural - to indicate this. Perhaps three "s" in a row. Only toysss will satisfy a child.

Student *artists*, of course, rarely thinks of themselves as training to make more stuff to fill an already stuffed world. But here's something... in some states, including California, it is illegal to destroy an art work. In the middle of a war, say World War II, people will actually risk their lives to save the art. Everybody is always looking for a definition of art, well maybe this is it: its stuff you are not allowed to throw away. And so it collects in vast and dusty collections in rich homes and in funded museums. A city may have homeless people, but it almost always has a home or two for their art. And there are lots of colleges turning out lots of artists to make more of it. Stuff you can't throw away.



So why were the students shocked? Really? One reason is that, put this way, it seems like an fairly empty life - just making more stuff. Another reason is that by using the slightly pejorative word "stuff" or worse "junk" it doesn't seem possible to make something truly revolutionary. The desire of most creative folks in America is to make something revolutionary. Part of our heritage I suppose. A new car, or a new email browser, or a new sneaker, or a new chemical for binding IC chips to circuit boards, just doesn't sound paradigm shifting enough when it is referred to as simply "stuff."

But there is another reason. Its true that we don't think of ourselves as a particularly moral culture, one that develops deep moral convictions. Our concept of the *free market* is usually about as deep as we go. We say that we are a nation of laws, not morals. We even believe that each person can choose their own religion, their own moral percepts. That's how little we think it matters. Just come up with your own religion and as long as they don't violate our laws - the important part - then fine. That's why we allow Wiccans on the radio.

But in fact, it's not true. We *are* a moral culture, all cultures are moral cultures, and I believe that the morals we have are at odds with the Plenitude. There is a sense in which living in our own tribe, the stuff tribe, is itself an immoral thing to do. When

a parent says “no more TV” to a child it is this very tension coming to the surface. We seem to have a moral aversion to ourselves. It is the exposition of this moral/culture schism that shocks the students and makes them blanch. They are morally outraged to discover that they are being trained to help make the culture that they live in.

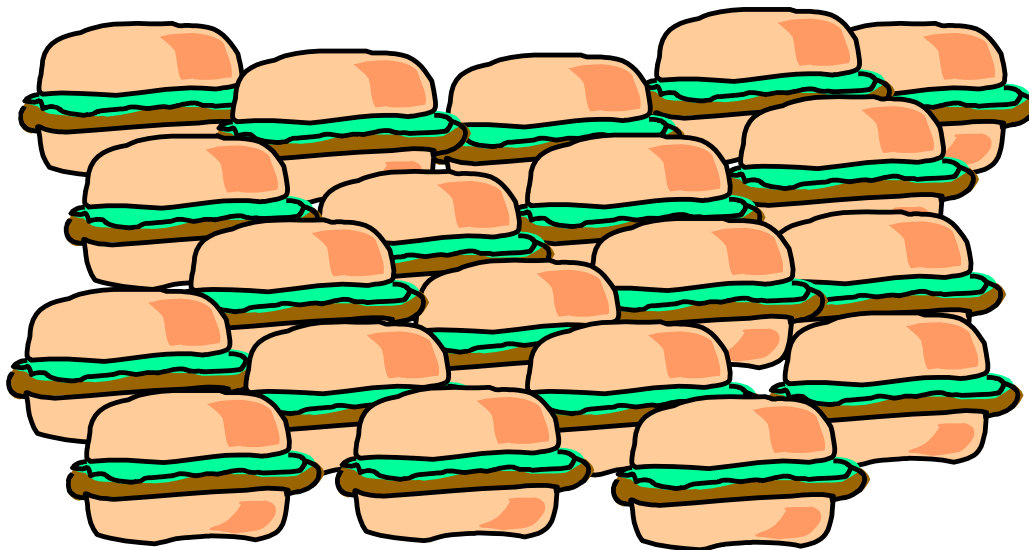
I would love to go on about the Plenitude in moral or even religious terms. It seems fitting for somebody who spent his childhood creating *cults*. But I don’t feel qualified. It is, after all, I who will be brought up on charges of Crimes Against Humanity for making all this stuff at some People’s Tribunal of the future.

Rather, I am going to explore on a more concrete level some of the problems of the Plenitude. As an engineer does, I will try to lay out some of these systemic *problems* so that later, maybe, we can find solutions to them. So that we can reduce the Desires that are inherent in their formulations.

All complex systems have two competing properties. They are *homeostatic* and they are *self-adjusting*. The first maintains the identity of the system, essentially keeps it the same and invariant. The second changes the system in response to an altered environment, or possibly, for self improvement, or sometimes, on occasion, just out of boredom.

The most interesting systems are the highly homeostatic ones that can find *problems* within themselves and then *self-adjust* to maintain *homeostasis*. We like to think of the United States with its amendable Constitution this way. It may also be true for the Plenitude. Most solutions to the problems of the Plenitude also maintain the Plenitude.

“So what exactly are the problems with the Plenitude,” asks the maker of stuff?

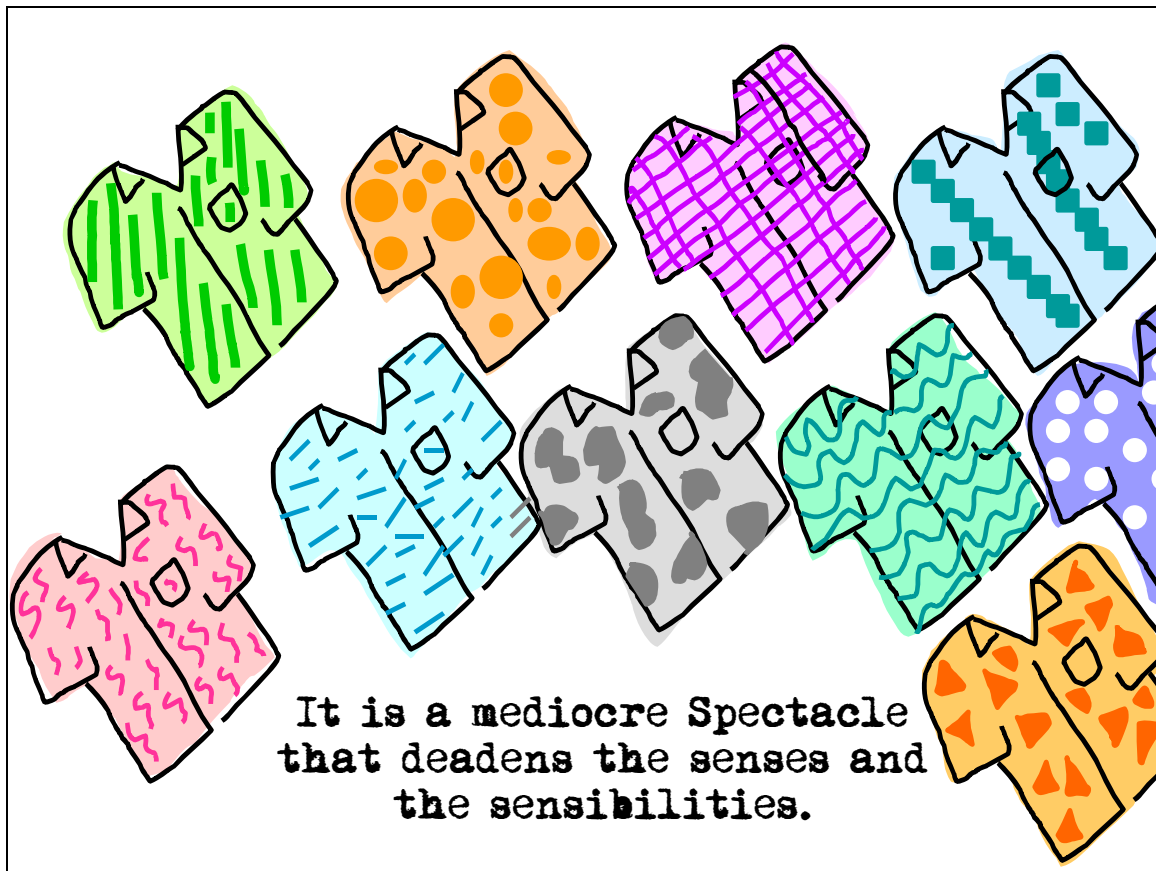


One: The Plenitude creates a world
somewhere between the bland the ugly.

The first *problem* is that the Plenitude creates a world that any dispassionate observer would have to say lies somewhere between bland and ugly. Sometimes it is the individual objects themselves - say that MacDonald's hamburger - but really, it is more the totality of the vision, the whole, that is so deadening.

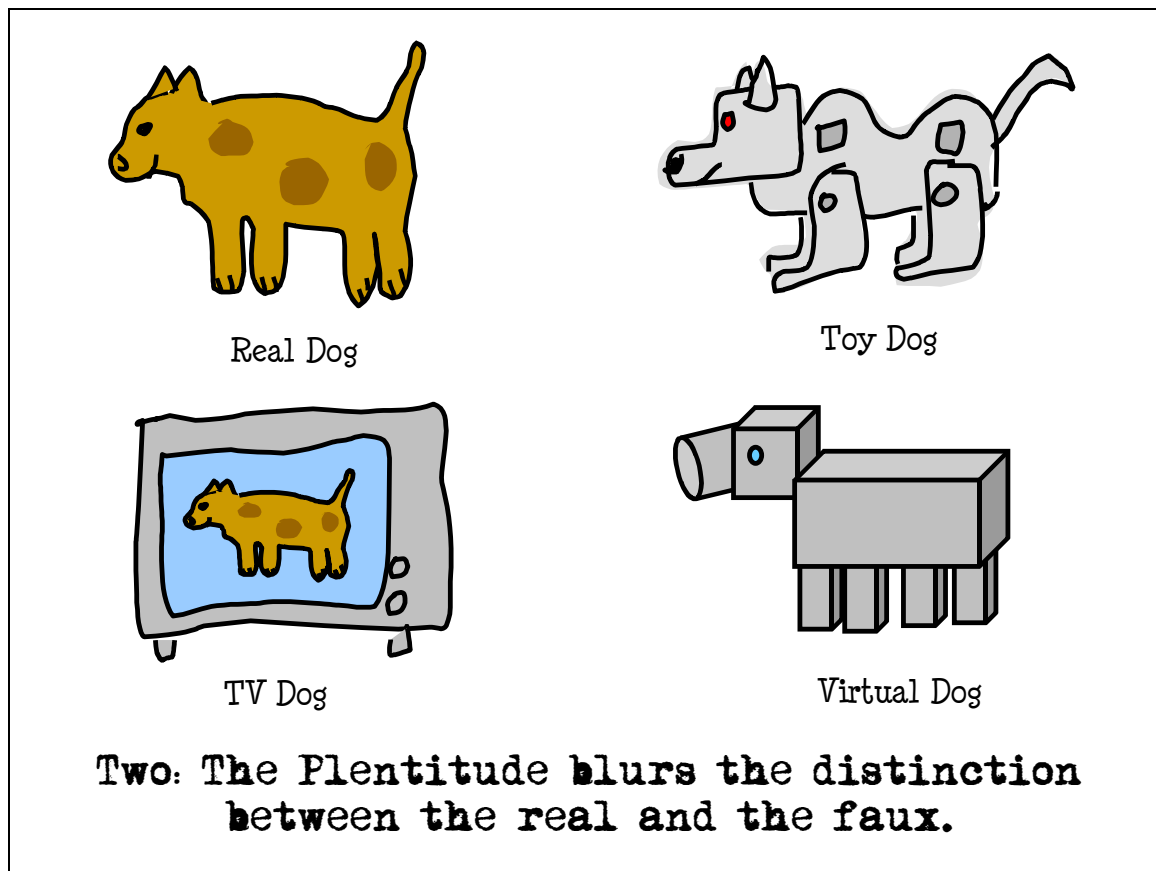
One of the current trends in museums is to take some specific object from the Plenitude, pull it out of the clutter and present it alone, showing how, in its essence, it is beautiful. But of course this only proves the point. The Plenitude, when viewed as a totally interconnect mesh, is ugly. Its not that there isn't art within it, its just that the mesh transforms its individual threads. Some of the threads maybe gold but the Plenitude is burlap at best.

There are moments, of course. Los Angeles, for instance, is the epitome of ugliness despite moments of local charm. Yet at night, up in the hills looking down on the spider work of street and car lights, there is a gorgeousness that rivals the stars themselves. But these shiver moments are rare. In general, I would have to say that the Plenitude edges towards the ugly on the scale from bland to ugly. The problem is, there is something physically damaging, something punishing, about living inside of ugliness. Jails aren't ugly because they are cheaper to build that way, the ugliness is part of the punishment. The Plenitude's aesthetic takes its human toll.



Debord, the Situationist philosopher, called our culture *The Society of the Spectacle*. I know what he meant, and it should also be clear that he was not talking about an awe inspiring spectacle of beauty. It is a deadening spectacle, one that strips the senses and the sensibilities of meaning. When I look at an audience of two hundred people, yes I see two hundred different shirts. That should bring tears to my eyes, I should be blinded by the effort of art and design to enrich and enliven my world. But no tears come. Not even close. Not one shirt in the crowd, my guess, actually means anything to the person who is wearing it. The totality of the spectacle does not provide a deeper meaning, a more complex woven pattern, does not point to a deeper truth. It points nowhere. Perhaps it points to the aptly named *GAP*.

Diversity in this quantity, as any trip to the mall will attest, is overwhelming and it drowns out beauty, drowns out anybody trying to say anything. The collective dazzle results in a dullness that can actually ache. If, by some miracle force of will, somebody really does make a shirt with meaning the Plenitude will quickly, and effortlessly, mass produce that shirt wiping out the meaning. Only the shirt in its abundance remains. Tie-dyed shirts, perhaps the last shirts with real meaning, aren't even tie-dyed anymore, the very act that gave them individuality. Now they're printed.



Problem number two. We have remarkably small brains. That's why pornography works. Our tiny brains make little distinction between a real naked person, a picture of a naked person or even the description, in text, of a naked person. Yes, of course, we know that these are different, but on a more fundamental level, on the level where we react and act, we can't actually make the distinction. That's how puny our brains are.

Here we see a real dog, the video image of a dog, a toy dog and a virtual reality, highly interactive dog. Or perhaps you see four PowerPoint dogs. Whatever, the amazing thing is that you see dogs at all. There are no dogs in front of you. That's how small your brain is.

Until very, very recently, far too recently for evolution to have adjusted for it, there were no images and certainly no verbal or textual symbols. In some odd way symbols work because our brains are so old-fashioned that we can't really make the distinction.

We still make fun of early film goers who ducked when the black and white train came at them, but we still get scared at horror movies, and cry at tragic love stories,

and get aroused when looking at pornography. Small brains.

So, so what?

The Plenitude not only revels in the smallness of our brains it actively courts the muddling of the real and the image of the real. We in the Plenitude live in a perpetual fog of blurring between the symbolic and the real, the picture and the thing. When I listen to a CD it is as if I am listening to real people playing real music. When I read a book it is, first of all, as if I am listening to a real story teller, then if the story teller is any good, it is as if I am living in the world he or she spins. From the soda I drink to the car I drive, from the patterns on my shirt to the nature shows on TV, every reality is layered with one, two, three, ten layers of unreality. Ten layers of indirection. Or as they say in the computer science world, of *operator overloading*.

Our small brains reel in this confusion. Even things of such dense reality as war spread out as a system of signs and counter signs, symbols and words, TV shows and newspaper photos.

This doubling, this doppelganging, of the world, where everything has both a real and a referential part, where there is actually a genre called Reality TV which is not only on TV but which is staged, should make our lives shimmer with possibility. But I find that there is something oppressive about it. A Plenitude of mirrors makes it hard to tell what's real, makes it hard to act and react meaningfully.

And without sounding too pre-post-modern, and hence too easy to reject, there *is* something real in the world. There is a real world that one can not only engage in, but which one *is* engaged in. A reality one can't get out of. It is *not* human defined symbols all the way down.

But the Plenitude, unexpectedly, with all of its stuff, pushes us from this reality, making it hard for us to see it, to understand it, to act, to react wisely within it. To engage in thought out homeostasis and auto-correction.

I'm not sure that we can create a Plenitude that is not based, in some large part, on reference, but we have certainly not done so. Our Plenitude is itself a language. A car is not a car, but a means of saying something to others, to ourselves; a complex language that not only deadens, but can kill. The same is true for the other 10,000 objects in each of our homes. It is quite a language.



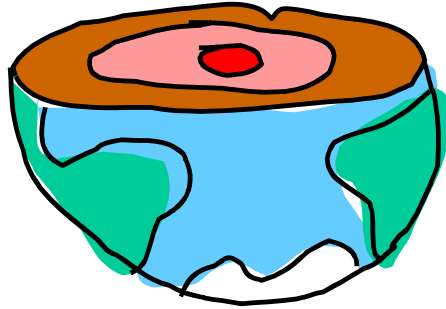
One solution to the information explosion.

To restate *Problem* number two: The Plentitude blurs the distinction between the symbolic and the real. This blurring in turn creates a world that overwhelms us, confuses us and creates anxiety, paranoia and confusion. Information overload is not about too much information. As Dr. Weiser pointed out there is more information in a forest than in a suburban house, but too much symbolic overloading. A flower in the woods has a meanings; a flower on the side of Kleenex box has ten meanings, all operating simultaneously and often in opposition to each other. After all, it has to mean both *natural* and *manufactured* at the same time.

As a thought experiment, what if we had two heads, one for the pre-symbolic world and one for the symbolic? This may soon be possible given the rapid advances in genetic engineering. Wouldn't that reduce the information overload by one half?

I once presented this, what I thought clearly facetious, solution at an engineering conference. A hand immediately shot up in the audience. "This is a well known problem," said the bearded man. "You need at least three heads, one to mediate between the other two, otherwise the system starts to thrash." Thrashing is when a computer system spends all of its time switching between programs and never doing any real work. In the Plentitude we all thrash all the time.

In the unPlenitude a simple plastic bag is valuable.

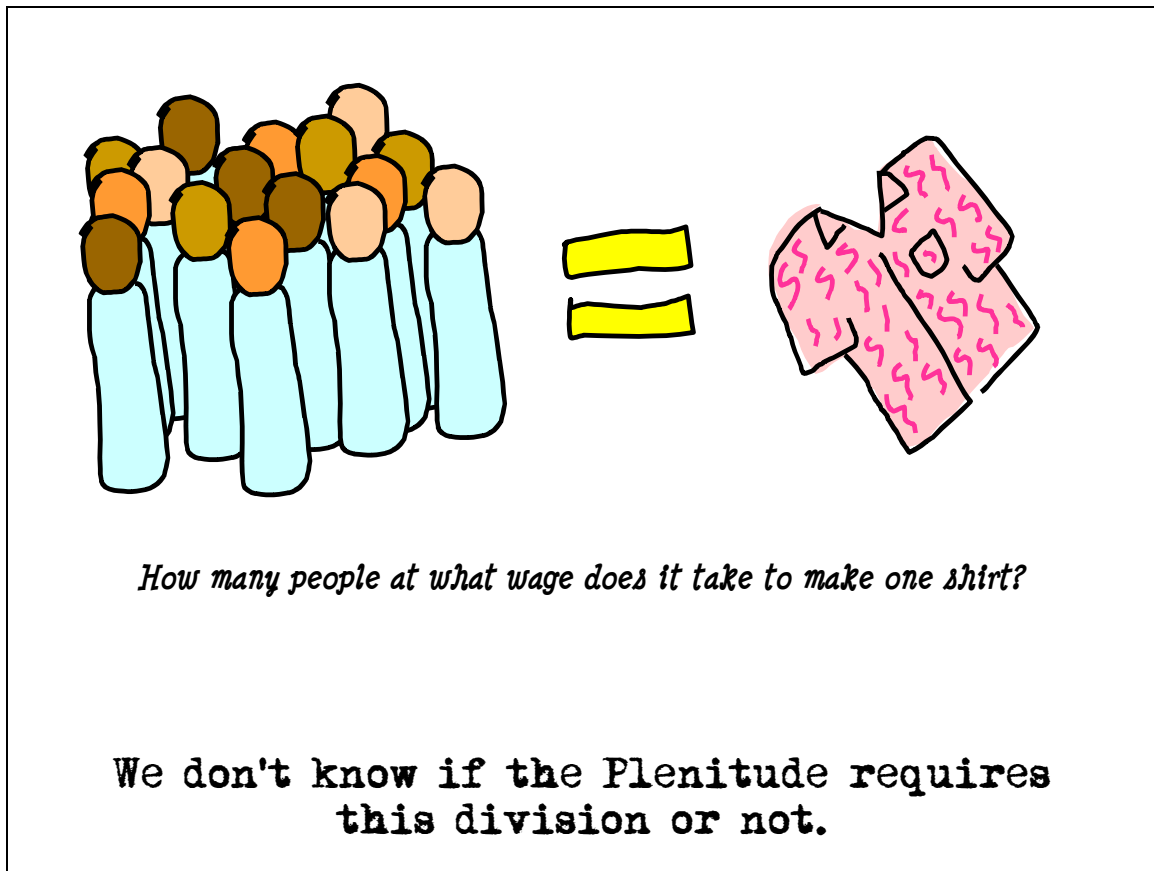


**Three: While we live in the Plenitude
half the world lives on less than two
dollars per day.**

The third *problem* with the Plenitude can be simply stated as this: Half the world's population lives on less than \$2.00 per day. And at least a billion people live on less than \$1.00 a day. In other words while we live in the Plenitude, most do not. What I pay for a cup of coffee is what most live on (including food, housing, clothing, education if any, entertainment if any, medicine if any) per day.

Some of the moral groundwork that the Plenitude rests upon is a general belief that while yes, some people are richer and some are poorer, nobody is living on garbage heaps making \$1.00 per day. Such a fact calls into question the wisdom of the whole enterprise. We aren't talking about some fringe element here, some bums who don't want to work. We are talking about more than half the world.

Even those among us who are not offended by this reality on moral grounds, believing that it is simply not our problem, are beginning to realize (due to certain world events) how small this shrinking world is. And if I would have to say what the most powerful shrinking agent is, it is the Plenitude.

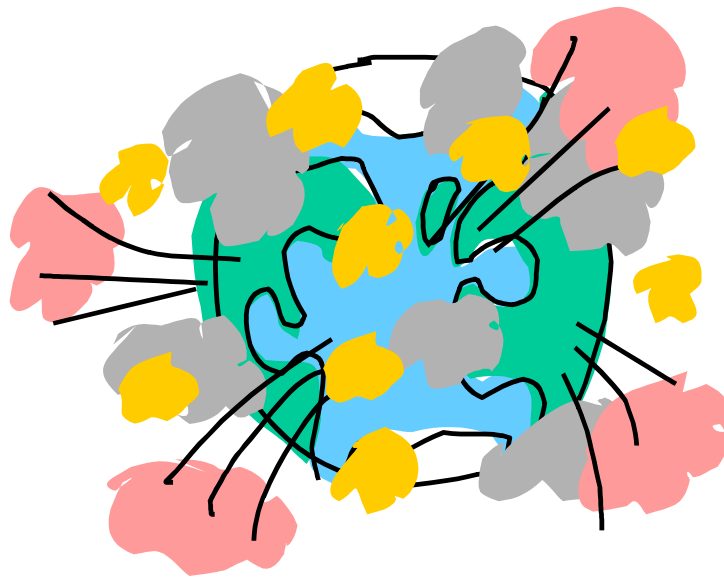


Does the Plenitude require this division between the vastly wealthy, us, and the very poor, them? Is the only way to have the vast array of shirts, pants, cars, computers, breakfast cereals and oil here is to have extremely cheap labor somewhere else. If the rest of the world made *our* minimum wage would the Plenitude grind to a screeching halt? I don't know. Maybe.

There are counter arguments. One is that the only hope for the rest of the world is to embrace the Plenitude. There is reason to believe that this might be coming true. That a hundred years ago, nine tenths of the world that was in dire poverty, so things are improving.

Is this the bargain: Embrace McDonalds and in return you get the rest of the Plenitude including medicine, housing and television? One question is, *is it worth it?* Many in the world today rejects this bargain for it means the destruction of their own culture, which is often deep and beautiful. The second question is, *can we keep the bargain?* Is it a real bargain, or just something we say to keep the World Bank and the IMF in business? After we put a McDonalds next to your holy sites, after we cut down your rain forests, will we still hire your people at one dollar per day?

There is rioting in the streets over these questions, the answers are unknowable.



**Four: The Plenitude may very well
destroy the world.**

The fourth *problem* with the Plenitude is not an aesthetic, linguistic or even a moral question one about whether it is OK to eat hamburgers while others starve. It is a rather practical question about whether the Plenitude will destroy the world. Of course all such questions are moral ones. Only on a moral basis can we say yes, it is wrong to destroy the world. The universe certainly doesn't care. The universe will sooner or later destroy the earth on its own.

The Plenitude could destroy our world by simply using up all the world's resources so that like a fish out of water, we simply suffocate to death. We could use up not just the oil, but the trees, the arable land, the metals, the flora, the fauna. Now it might be argued that this won't destroy the world so much as destroy the Plenitude, but that isn't strictly true. Once these resources are gone they are gone for other systems as well. In the end, perhaps no human society will be able to exist.

The Plenitude also has a nasty habit of polluting the world in such a manner that little life may be able to survive the toxicity. Poisoning the world is probably a better way of putting it. It has already radically altered the air, the water and the soil. It has not only changed the chemical nature of the biosphere it has changed its weather patterns with waste heat. Left unchecked, it has become a common belief that not only will this put an end to human life, it could put an end to almost all life.

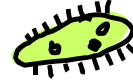
We have become so worried about this little side effect of the Plenitude that we teach the evils of pollution in school as part of civics. Schools paid for by sales taxes on the Plenitude itself.

Lastly, the Plenitude has a peculiar relationship to the much older institution of war. The Plenitude certainly did not invent war but it is extremely good at producing it in a magnitude that was unheard of before. There was nothing like World War II, a true war of the Plenitude, ever before in the history of humankind. The nuclear bomb is almost a perfect weapon of the Plenitude and we have manufactured enough of them to, with no qualifications, eliminate all life on the planet. For good.

It has been argued that the Plenitude loves peace, for in peace there is the real money to be made. Better to sell refrigerators than drop bombs. But if most of the raw material, and most of the raw labor, comes not from the lands of the Plenitude but from the lands of the two-dollar-a-day worker, then the military and its might are more than simply a habit which has hung around too long. It's the underpinning. We certainly know that the only countries with real working weapons of mass destruction are those of the Plenitude.

There have never been armies like the armies from the lands of the Plenitude. Some large percentage of the stuff of the Plenitude is weapon stuff. This sub-structure of armor seems necessary for the Plenitude's existence. But it is an unstable foundation in a world that has also become digitally wired together.

If it blows we will get to watch the experiment again of how long it takes life to develop. But to paraphrase the poet, it won't be the internet.

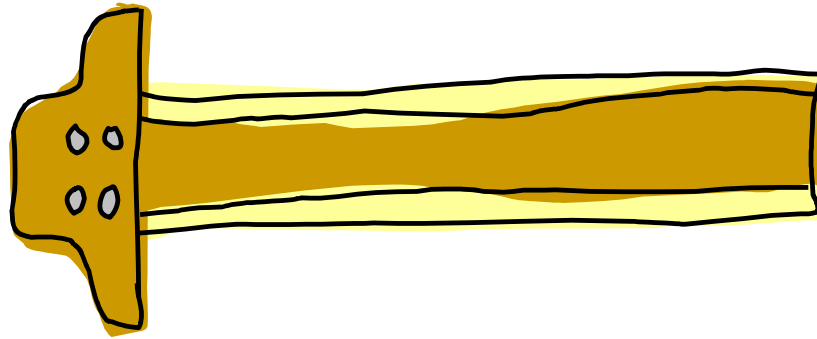


Five. How many genetically modified organisms gone wrong will it take to bring our life support system down?

The Plenitude seems to be able to produce a plenitude of means for destroying the earth just as it is capable of producing a plenitude of different colored shirts. Who could have imagined a hundred years ago, fifty years ago, that the Plenitude could create entirely new creatures, big and small, whose habits and proclivities are as of yet completely unknown and that we would nonetheless release them into the bio-sphere in the name of feeding poor people? We can't engineer a car that doesn't kill people, we can't create a computer that doesn't crash, and yet we are now re-engineering the bio-sphere with new life forms.

The fifth *problem* with the Plenitude is that it has no way of stopping. There is no boundary it won't cross. After filling supermarkets with new and improved products, it has decided to re-engineer the biological Plenitude so that it could make even more products to fill the shelves.

We are now creating new species as fast as we used to create new shirts. Each new species solves some problem created by some other part of the Plenitude. Pesticides killing your crops? Let's bio-engineer a solution to that! Let's genetically engineer an entirely new species of crops that aren't effected by the poison so we can pour on even more poison. *And why can't they play at night?*



**OK, Rich, why do you
continue to make
stuff for the
Plenitude?**

So, you might ask me, Rich why Do You Continue to Make Stuff for the Plenitude?

You would ask this because I just laid out five compelling reasons for us to seriously consider that the Plenitude is not a good thing. First, its causes an ugliness that damages. Second, it blurs the distinction between the real and the virtual to a point where we can't act intelligently. Third, it seems to keep one half of the world in dire poverty. Fourth, it looks as if it is on the verge of destroying the planet. And fifth, if Plenitude doesn't destroy it, it will re-engineer nature into a product that will.

Of course most people within the Plenitude see these problems only hazily, in the distance, in the periphery. The Plenitude has such a remarkable ability to provide all the basics in such wild abundance, and in such endless variety and quantity, that to those within it, it is barely distinguishable from Heaven.

What would the answer to this question your question look like? That nothing is more enjoyable to me than making stuff for the Plenitude? That I am part and parcel of this culture and it is impossible to act outside of it? That the Plenitude is an amazing engine and it will find the solutions to these and all other problems just at the last second? That life is always hard? *That there is no place to stand without contradiction?*



There is no other place where I can go where it is all right. There is no place to stand without contradiction. Where it all works out. No system of economics, of human interaction, that only has a positive side. Every culture has its own contradictions, its own confusions, its own ends-of-the-world. This is our culture and we cannot see outside of it. All the solutions that I will shortly present are solutions that somebody who grew up in the Plenitude came up with.

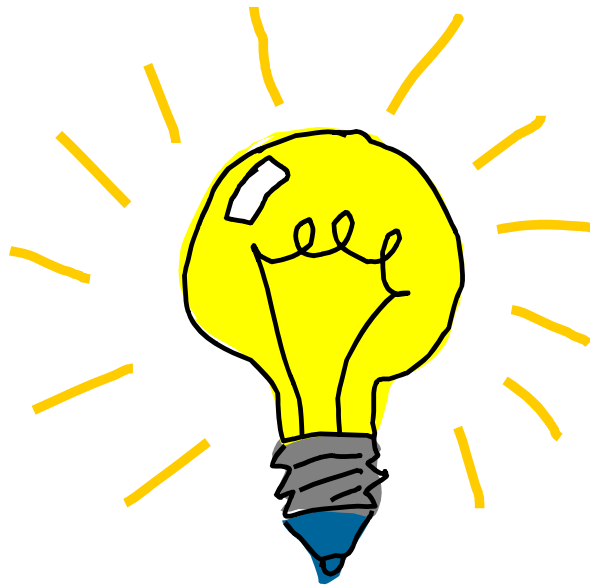
But I will say this about the Plenitude. It has built into it *the concept of change*, continual change. If I say something like, well, lets try to figure out ways of changing the Plenitude so that it works better, so that it solves some of the problems I have outlined, few will brand me a heretic to be burned at the stake. This is unlike many other cultures, where in fact, a burning at the stake is exactly what I would receive.

To those inside the Plenitude the idea of changing the Plenitude is no different, or radical, or unusual, than if I stood up here and said: "You know what, I think we need to change Microsoft Word to make it better." Or, "I think we need to change cars so that they run more efficiently." Or, "I think we should create a new fashion for shirts this year because last year's were so dull." There might be a difference in magnitude, in the level of hubris, in the scale, but changing things is what we do. We are the *new and improved* culture.

Now changing the Plenitude is somewhat different than changing Microsoft Word. For starters, there is only one Plenitude and it is the system in which all the other stuff resides. *It is the Operating System*, and when you change the operating system lots of other stuff tends to break. But I think we are compelled to try and change it despite the recursive problems created when we bring to bear the rules of the system on to the system itself. We have to be careful, of course, this is exactly how Captain Kirk destroyed many an artificially intelligent computer system in deep space. By using its own logic against it. Be prepared for smoking ears.

We can take the Seven Patterns of Innovation and apply them to our own culture, our own tribe, to the Plenitude itself. We can get this to work.

At least that's what I tell myself on certain days... you know those days. When I have my engineer's hat tightly on my head.



**"So are there any solutions," the kids ask?
"Necessity is the Mother of Invention," I
reply. Innovation churns at every level in
the Junk Tribe, within the Plenitude.**

When I present these ideas the first question I get, invariably, is: "Isn't there anything we could do about this? After all, Necessity is the Mother of Invention! After all, Innovation is a Thing of Genius! After all, All we have to do is Change the Definition! You said so yourself!"

The for most of the Q&A I would field solutions. They would span quite a gamut. Some kept the Plenitude intact, just cleaning up the edges. Others would transform it into something quite different. Some suggestions only a Dadaist could admire. But on the whole, each audience presented more or less the same solutions. I think that these are the solutions which come most readily to mind, or maybe they are the only solutions.

In no particular order:

You can make only



things in your lifetime.

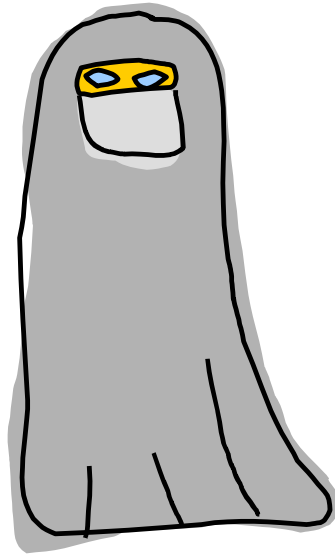
One: Pass a law.

One. We could pass a law. Here's a good one: You can only make five new things in your lifetime. That's it. Five. Anything else gets destroyed and/or you go to jail. If you multiply five times the number of people on the planet, 6 billion, you still get an awful lot of new stuff for the Plenitude. It just limits it a little. And it does one other important thing. If you can only make five new things in your lifetime, perhaps you will think about each one much more carefully than people currently think about the new things they make. Quality would go up. Things would be better.

I like this one of course. But it does presuppose a legal system and the police muscle to back it up. It presupposes, in other words, a rather powerful State. Downer.

It pretty much guarantees a very active court as people try to figure out what constitutes a new thing, versus a variation of an existing thing, or just a duplication. Is a variation on mom's soup a new thing? Is a weekly magazine one thing or 52? Is a rock album 12 songs or a single musical experience? How does manufacturing play into this? Broadcast? Computer programs that can generate a million other things?

I suspect there would be a lot of 10,000 page books and 1000 foot long paintings.

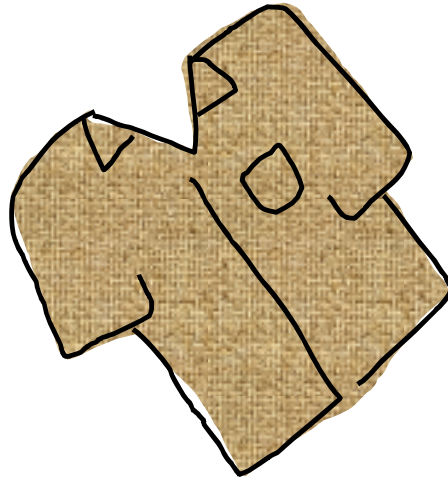


Two: Reject the Plenitude.

Two. Simply reject the Plenitude. This is of course what many fundamentalists in many different religions around the world suggest. It is what the American Puritans suggested and several commentators on the Plenitude have suggested that our current concerns stem from these Puritanical moral underpinnings. It is what Thoreau suggested sitting around Walden Pond and it is what Ted Kazinski thought about sitting in his cabin in the deep woods. It is a deep tradition and it may be why, when I talk about the Plenitude so openly, we are all a little nervous.

For each of us, to some degree or another, there is some part of the Plenitude that we reject. Perhaps you won't eat junk food. Perhaps you won't wear T-shirts with writing on the front. Perhaps you won't watch daytime TV. Perhaps you think that tearing down the rain forests to make way for cattle farms is wrong.

People who hold two belief systems simultaneously often pick one and go overboard. It is hard to find the middle ground and defend it. Perhaps the Plenitude is so massive and overwhelming because we also have a fundamentalist streak that we have to constantly suppress. Reject or embrace. Nothing is harder as a parent than to say to their child "you can watch only one hour of TV a day." None at all, or on all the time, is easier. So, simply reject the Plenitude.



Three: Quality over Quantity.

Three. The third commonly suggested solution to the Plenitude centers around the opinion that the primary problem with the Plenitude is not its Plenitude-ness, but its *Junkiness*. No one seems to mind a massive plethora of fine restaurants, its only the plethora of McDonalds (to unfairly single out a particular chain) that is loathsome. The *Quality over Quantity* argument suggests that if we could jimmy the Plenitude sideways just slightly, life would be good.

What would it take to re-engineer the Plenitude for quality or quantity?

First it would require a different mode of production, one that honors craftsmanship over identicalness, for we often see the human hand as part of quality.

Second, it would require high quality, lasting materials, put together with intelligence instead of the cheap, the temporary and the robotic.

Third, it would require expensive and complex design methods including deep customer engagement and feedback. To put it bluntly, it would require that we replicate the production methods that the wealthy currently use. As an example,

think about the difference between how a wealthy person has a new house designed and built and how a middle class person finds a house to move in to.

When these three principles (and there are others) are applied across the board from the poor to the wealthy there will be at least two immediate implications. The first is that most people will have to have fewer things, though the things they have will be of higher quality. Instead of ten twenty dollar shirts hanging in the closet there will be two hundred dollar shirts. But they will be great shirts and you will look great in them.

The second thing that will happen is that the hundred dollar shirt will require five times as much labor to make as the twenty dollar shirts. This isn't bad since otherwise people will be out of work from all the closed factories and malls.

It should be pointed out that this solution only works if Quality can be substituted for Quantity in such a way that the velocity of money, how fast it moves from one set of hands to other, remains the same. This is a stringent requirement and it is unclear whether it can be effected.

And it certainly will only work if one other, much more unlikely thing is true: that a huge re-education effort takes place to teach the average consumer about contemporary, high-end design making it not just desirable but necessary. Necessary in the sense that if somebody sees you with a twenty dollar shirt they will think ill of you; while if they see you with a hundred dollar shirt, even if you have worn the same shirt five days in a row, they will not.

I think this is an iffy proposition. There is something wonderfully democratic about the Plenitude; something really neat about ten cheap shirts vs. two expensive ones that will be hard to alter. And as many have noted, these days, even rich kids like to eat at McDonalds.



Four: Zero-growth economies.

Four. Related, but not the same, is the popular concept of *zero growth economics*. Here the problem of the Plenitude is reduced to the part which says that it must grow by 3.5% every year or be declared a recession. What if we hold it steady at whatever trillion dollar per year mark it currently sits at. If it starts growing we slow it down. If it starts slowing down, we speed it up. But it should average no more than its current size.

Ecological side-arguments often thrown in. For instance, it shouldn't simply be monetarily neutral, it should also be environmentally neutral. Everything, from shirts to washing machines, should be fully recyclable. When you're done with your goods they go back to the factory to be reprocessed into the next round of goods. Packaging should be so degradable that you can simply throw it into the backyard where it will become plant food with no extra work.

New raw materials must be reduced at least to the point where there is an equal flow between new material and material heading back to its raw state. We must plant forests at the same rate that we cut them down. We must refill mines and we must mine garbage heaps for raw materials. We must actually, actively, clean the air in equal or greater proportion to the amount we dirty it.

One way this vision works is to increase in the amount of service sector jobs and decrease the amount of manufacturing jobs. That one begins to accumulate service stuff in the way that we once accumulated physical stuff. A Plenitude of service. Service, in this way of thinking about it, is virtual stuff. A person having a personal butler might be considered as having a higher status than one buying another car. Indeed, having a limo pick one up would be better than driving. Eating out every night at a different restaurant would be considered better than having a full kitchen with its infinite number of accoutrements. This is not, as you can see, a Puritanical, anti-Plenitude vision of the future.

There is a related version of this 0% growth Plenitude future which I find personally distasteful but which I find lots of college kids liking. That is, make all reality virtual, as in Virtual Reality, goggles and gloves and all. All experience becomes a computer experience. Everything is just data. Once you have the computer and the computer infrastructure, then it is all just cleverness and art. You can start by eliminating all books and magazines. Those are just ASCII and JPEGs anyway. Why go on vacation? Have cameras all around the world so you can see from your desktop the Taj Mahal or a Brazilian beach. Add in a chat room, and hey, it might actually be better. Clothing is reduced to avatar clothing. You buy and sell avatars and their accoutrements. And you furnish your virtual house with lavish virtual furniture in whatever virtual neighborhood you want. This is not that crazy, not only does my eleven year old son spend an enormous amount of time furnishing his Sim house now, but he sells his Sim houses for Sim money on the internet.

And why have a real Porsche when you can have seven *virtual* Porsches and drive them in any virtual city in any virtual world? And crash them too, without getting hurt! Hit a button and it's back whole again.

This solution works, to the degree it does, because, as I've noted before, we have tiny brains and the experience of driving a Porsche on the web turns out to be only somewhat different than driving a real Porsche on a real street. Its not the same, or as computer gurus always say: *Not the same YET*. But perhaps that small difference is worth it if it saves the world from destruction. Let's take full advantage of our tiny brains. Until the genetic engineers get at them. Perhaps the solution is to make our brains even smaller.

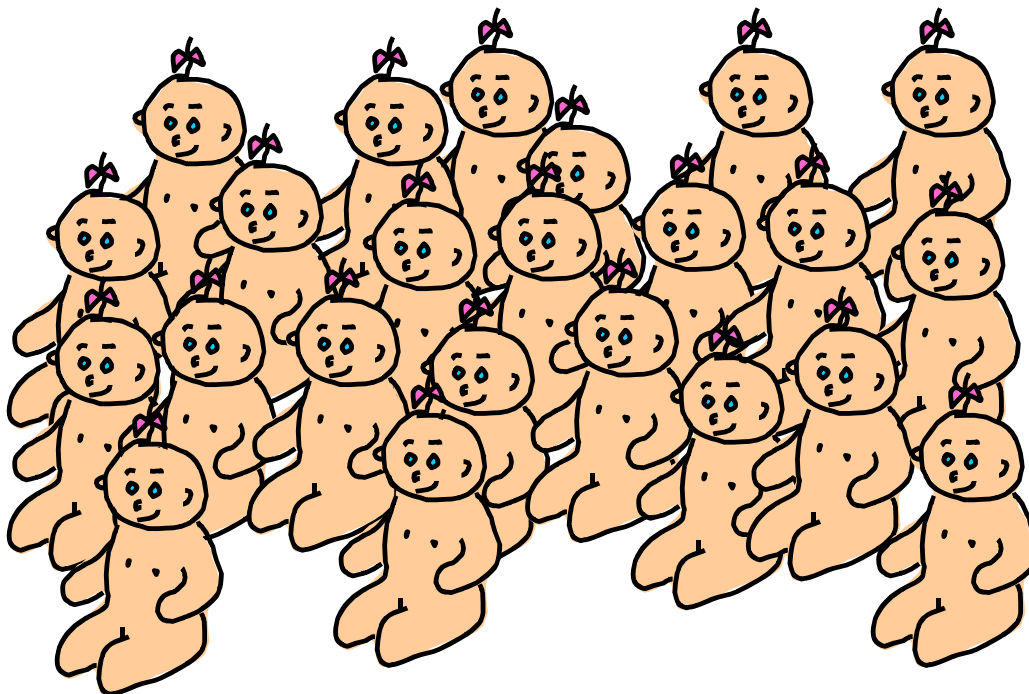


Five: Just make the good stuff.

Five. Let's just make the good stuff - the important stuff. Just the food, the medicine, the housing, the necessary clothing, perhaps the communication system, maybe throw in a transportation system or two, and of course the art. Art being good. And music. Maybe not all music.

Take the good parts of the culture, but leave the rest. Leave the bad TV cartoons. The lousy shirts. The put-it-together-yourself particle board furniture. The pulp novels about detectives and terrorists. Just have the handmade furniture, the medicines that cure cancer, the really good plays and books.

Without even thinking about the legal system this would require, there is a question about whether this works. Doesn't it actually take the full throttle of innovation at every level, including that of producing new cheap shirts and hamburgers, to also get the highly rarefied and valuable stuff like new medicines and new communication systems? Is it even possible to have rapid innovation in only designated zones? Isn't innovation linked at a deepest levels. The goods at K-Mart and new anti-viral drugs are perhaps are not as separated as they might first appear. It is common, for instance, for the same designers to design both toys and medical equipment. The same brain, operating in about the same way, comes up with visions of both while showering in the morning.



Six: Real problem is too many people.

Six. I like this one though it is hard to see how we get from here to there without going through some, well as they would say on the streets, *nasty shit*. This starts with the thought that, over all, the Plenitude is pretty cool. It is fun, exciting, charming, fulfilling, interesting, engaging, enjoyable, sexy, diverse, life affirming, whatever. What's not to like? Except for this little problem that it might destroy the earth.

It would clearly destroy the earth if all 6 billion people on the earth lived at the levels of plenitude that the people in the U.S. currently live at. Even if they lived at the levels of the people of the U.S. who are in what we call poverty. Even with half the world living at less than \$2.00 a day the Plenitude still might destroy the earth.

But what if there were only, say, 500 million people living on the planet? While it is hard to run the numbers, I suspect that this would allow each of us to live in the lap of luxury and still be a small enough number for the world to recover and even regenerate. It could become a moveable feast or an Alice's tea party. The 500 million could move from continent to continent every ten years allowing the other continents to lie fallow and regenerate for sixty years. Or we could all spread out and each live on our own 1000 acres, content and happy, even as Nature, that curious non-entity, recovers her- or himself.

Will this work? Or do half of these 500 million also have to live at less than \$2.00 per day? Or without draconian measures, do the 500 million quickly become 5 billion again? Or possibly, do the 500 million discover a new level of heaven on earth that even uses up even more resources?

And exactly who is it that would make up the 500 million and what do we do with the other 5.5 billion? Do you picture a future world as diverse as this one, or an homogenous place, all of one tribe, where nothing is wasted on inter-tribal warfare?

We may get to try some version of this solution in our lifetimes if some of the problems of the Plenitude beat the solutions to the finish line.

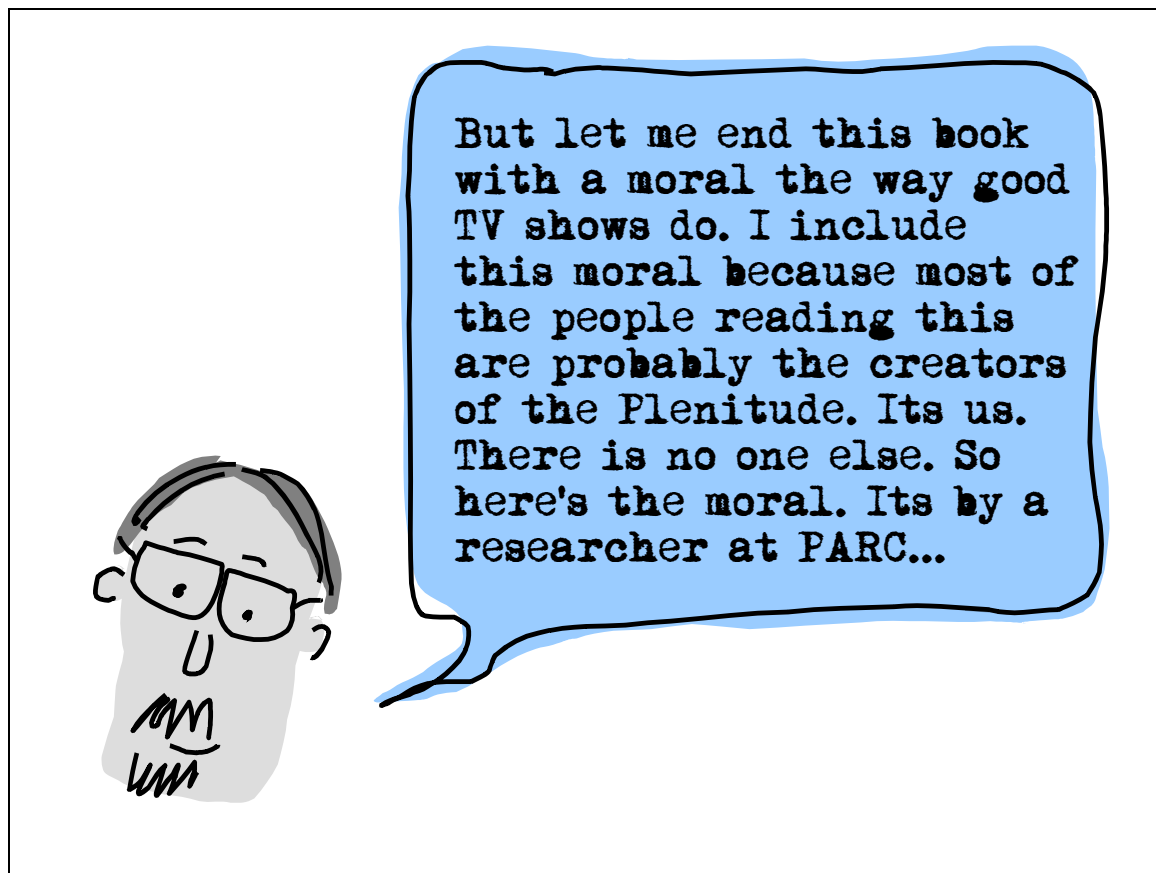
**Seven: Just love it. We are invisible
at the scale of the Universe.**

Seven. Lastly, I'd like to present this solution, which doesn't always come up, but comes up enough for me to realize that a transcendentalism still runs beneath us like a deep underground river.

The planet is 4.5 billion years old. We have been living on it for such a short amount of time, that on a time line of the earth you can't even draw us with the sharpest .01 pen. And we are part of a galaxy with billions of other stars no doubt with billions of other planets no doubt with billions of other life forms no doubt some of which with their own Plenitudes.

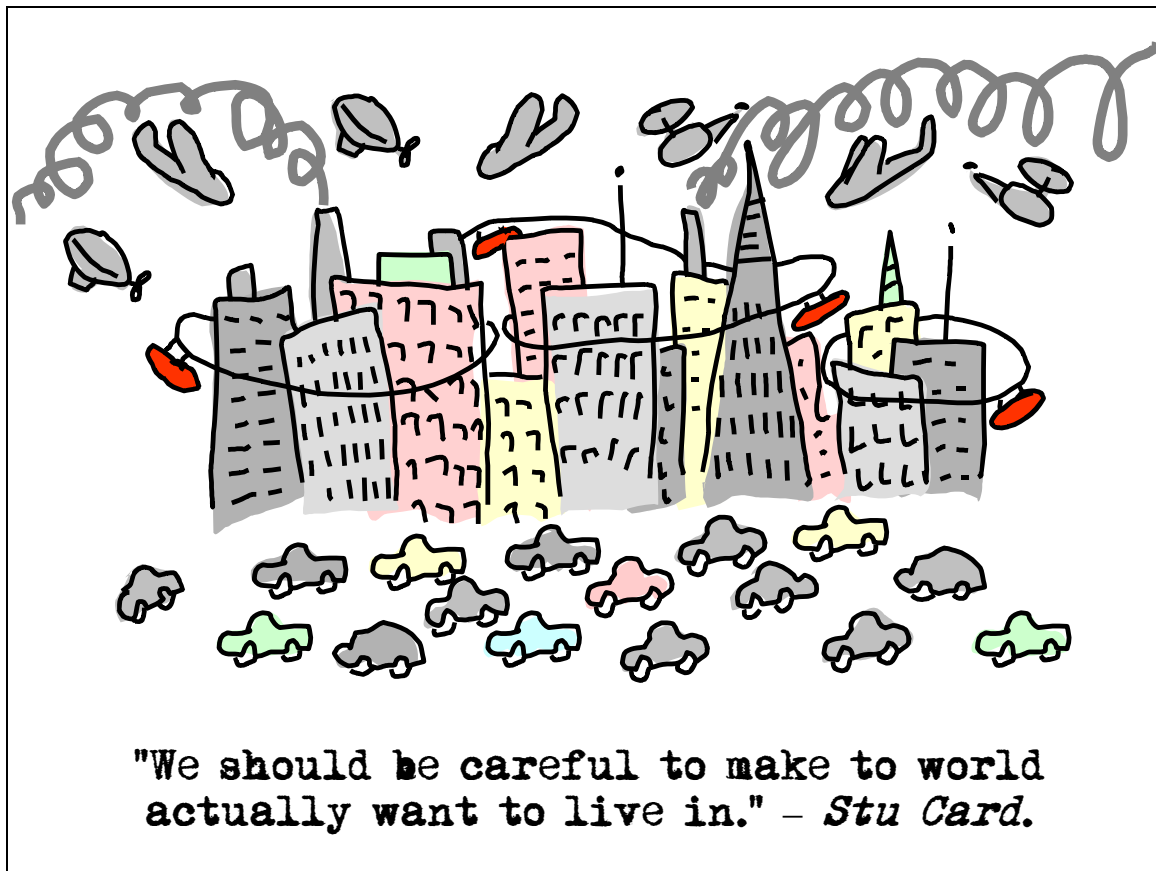
And this is just one of billions of galaxies. And the universe is billions of years old and will continue on for trillions of years. And this might be only one of a near infinite number of universes. And they might each cycle, breathing in and out, forever.

That at the scale of the universe, both in time and space, we are infinitesimal. We are invisible. It just doesn't matter. And so why not live it in the Plenitude? I mean, who cares?



We are the creators of the Plenitude. Its not somebody else. Its us. Yes, we are only part of it, but we are a rather important part of it. We create the new stuff.

So here's a little moral fragment that I find useful to carry around with me and insert at the end of most of my talks and books. It is by a researcher at Xerox PARC named Stu Card...



Stu says, "We should be careful to make a world we actually want to live in."

I think that is good advice.

