


The
Plenitude

Creativity, Innovation,
and Making Stuff

Rich Gold

foreword by John Maeda



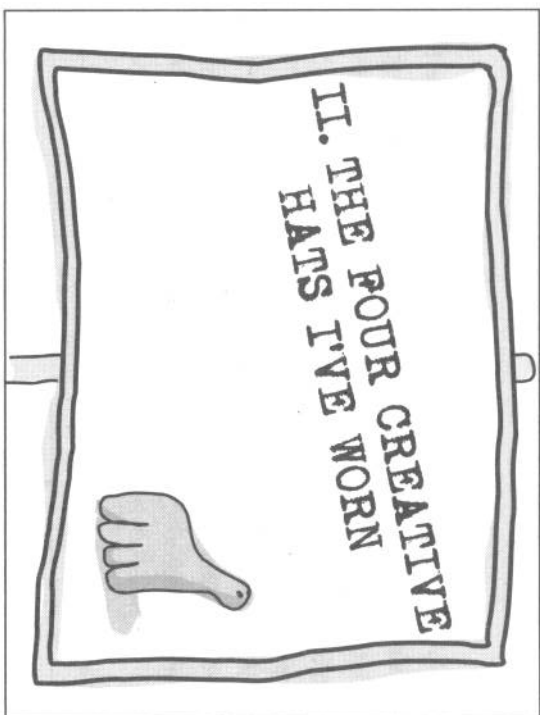
DESIGN, TECHNOLOGY, BUSINESS, LIFE



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. I've tried to capture something of their sound, look, and feel. Clearly, something odd happens when genres jump media. In this particular case it is obvious that narrating a slide from the stage is different from 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 groaning and laughter are different from private groaning and laughter.

The next chapter, *The Four Creative Hats*, concerns itself with art, science, design, and engineering, the four professions that collectively have created about 95 percent of the Plenitude. Following that, *Seven Patterns of Innovation* explores some common methodologies I have found useful in the creative professions. Lastly, *The Plenitude* looks at the big picture, the nature, physics, and moral stance, the future and consequences of the Plenitude. It asks, given all this, how we should act, knowing it is hard to even make a living without making more stuff.

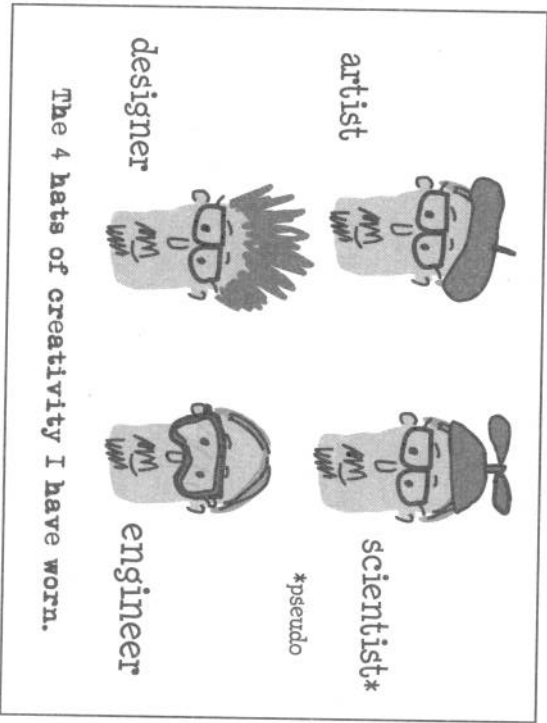


Creativity is highly prized in our society; it has, as the marketers say, high positive valence. If you want to compliment a mother tell her that her daughter is "very creative." If you want to praise a child, tell them that their essay was "very creative." The United States partly bases its dominance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

In this context, creativity is not just making things (factories do that), it's creating new things, things that 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 that 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 com-

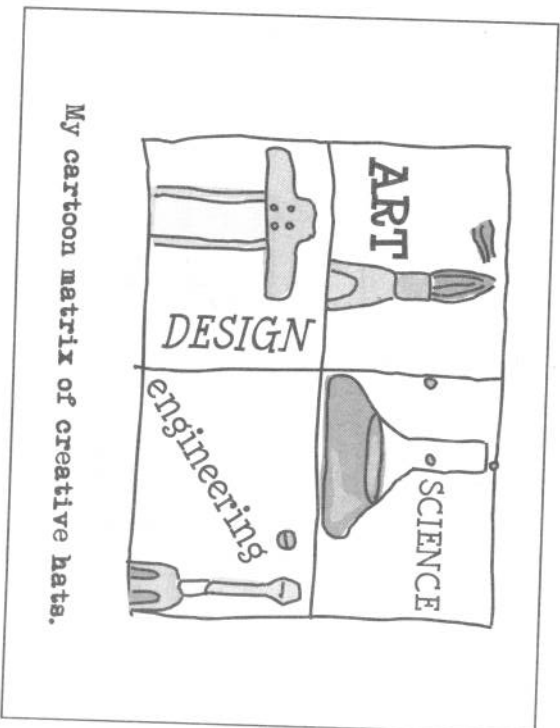
missions set up to find other definitions, but this is the one I am interested in: the creation of new stuff that creates new categories of new stuff. It turns out that there are different methodologies for such creation, well-worn paths that we have turned into professions, complete with unions and uniforms—let me call them *hats*.

Did I mention that, where others might observe complex shadings and infinite textures, I see the world as a cartoon? This is one of those cartoons.



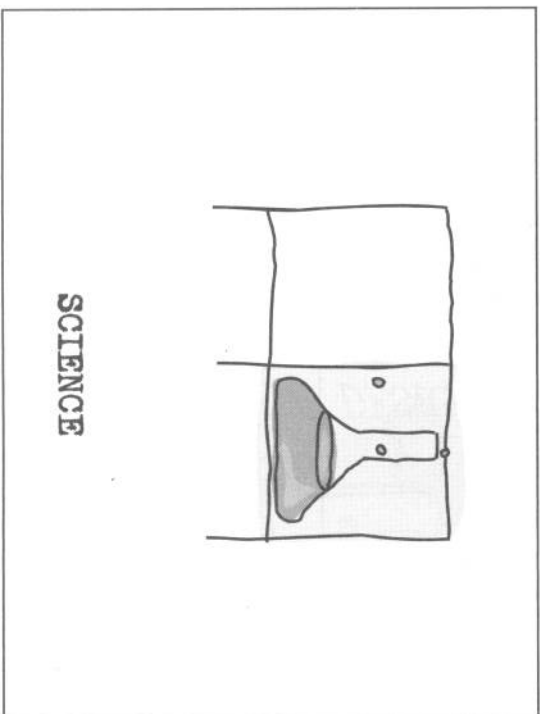
During my life I have put on and taken off four hats: artist, scientist, designer, and engineer. Sometimes I pick one up after the other like a circus clown. Occasionally I put two or more on my head simultaneously. Each one is distinct—with its own methods,

world views, precedents, predecessors, dress styles, interior decor, histories, vocabularies, alliances, prejudices, tools, techniques, and demeanors. In some real way, for me, they are states of being as different as alligators and elephants. I can walk into an office and know immediately if it is a designer's office or an engineer's office. I can instantly tell an artist's loft from a scientist's lab, even if they are filled with the same digital tools. All of the hats can be creative, innovative, productive, even revolutionary in both the political and marketing sense. 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 definitions.

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 postmodernist 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 might 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 Pythagoras surrounded by scrolls and compasses calculating the relations between the sides of triangles. Now picture a contemporary scientist in a white lab coat, amid 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 to 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 latter believing that they are in the supernatural, the former 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, that test these visions. These experiments are observed

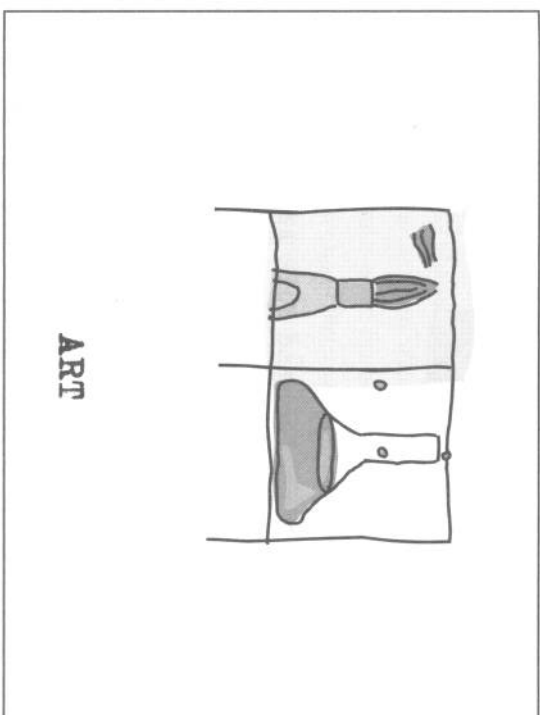
and the resulting data are reworked into a series of equations and placed within a peculiar form of literature called a paper. The paper is peer reviewed by other scientists and, one hopes, published. Once published yet other scientists may try to replicate the results. Slowly, but surely, the equations 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 in the same matrix as designers and engineers. Heaven forbid.

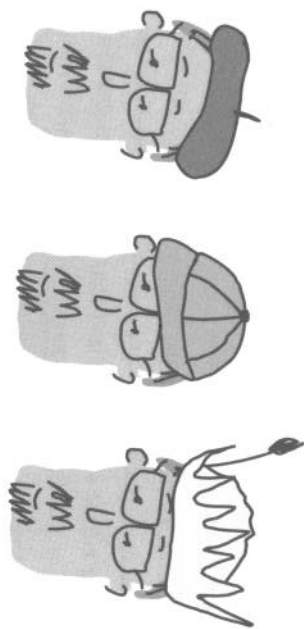
But the world is far messier than the ideal, for not only do we think of scientists as having created everything from rocket ships to cures for cancer, from genetically modified corn to atomic bombs, but so do the scientists themselves. In some cases these inventions were the goals of the scientific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

People wearing the hat of science also create rooms full of 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 tools; they alone qualify the scientist for a hat in the Plenitude. It is, after all, the equations that flow from the scientist's bench that give the engineers their head-starts, their big hints, allowing them to

make the goods that fill our shopping centers. Seen this way science is amazingly creative. It may be that, without science, there might be no Plenitude. But . . . this enthusiasm for new stuff threatens to overwhelm us.



I passed over the different subhats of science—for example the differences between applied and fundamental science, or the distinctions between natural and artificial science. For art, however, I am compelled to delve more deeply into subhats. That's what happens when you get a master of fine arts degree. Suddenly these sorts of things matter. I speak from the viewpoint of a recovering artist—or perhaps postartist is a better term. To my cartoon eyes, there are three kinds of art hats to be found in the Plenitude.



Fine, Pop, and Folk Art.

Fine artists, as symbolized in this slide, wear berets. These artists work from within themselves, from their visions. They try to express themselves and their ideas, and the resulting art is a representation of those ideas. Beret wearers seek a kind of truth (they often use the word integrity) where the art they produce is equal to the visions. Compromising the vision is seen as a form of evil. They study the world and art history and immerse themselves in an ongoing, esoteric dialogue that chatters away unbeknownst to most people. This process generates the art you see in museums, galleries, books, magazines, and mansions.

When this method works, when the beret is really cooking, the work has a semimagical, 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 moral debates about whether soldiers should risk death trying to save works of fine art. Or whether a public sculpture that inconveniences or offends some people can be removed. Or whether it is right for one country to own the art works of another. Not the sort of bottom-line, branding questions that arise when talking about, say, Swatch watches.

The basic economics of the fine art beret goes like this: Those who wear it make their living (if they make a living) by producing a small number of objects that 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. 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 paint on cloth, interactive gizmos, or whatever for large sums of money—artists must convince patrons that they, at least when wearing the beret, are of a special nature and embody a unique process. They are not like accountants who could have chosen to be dentists instead. It's not uncommon for artists to claim that they were *born* artists, that they

have always been artists, that they can't help but be an artist. From inside this special self emerges an idea or vision that 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 his or her 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.

With the beret of fine art on, a creator looks within for inspiration. The art flows from personal vision and from a unique sense of self. 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, linguistic, 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 benefit that accrues 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 dialogue 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. 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, 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. Nonetheless, it is an extraordinarily useful hat to put on from time to time, even for the nonartist. The hats of design and engineering need the deep infusions of vision that the beret can provide. Without artistic vision stuff tends to asymptote to commodity. Lesson for corporations: If there isn't a little art in what you do, the kids will wander off to buy somebody else's sneakers.

Many artists believe that wearing the art beret is antithetical to the Plenitude, maybe even its antidote. Or at least a refuge from it. They believe that art's close ties to the ruling classes are just a ruse, a trick pulled on the patron 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 postmodernity—art and society are strange and perfect twins.

There is even an argument that our civilization's base capitalistic concepts first arose in the art world and were appropriated by the rising bourgeoisie; that the Plenitude is what you get when you cross art with the corporation; that if we're heading toward global destruction, the principles of Western art are not the life preservers but the ship that's taking us down! *Note to self: This is a flimsy argument.*

Second, there is the popular art hat, represented by the baseball cap. The cap-wearing popular artists focus less on their inner vision than on the emotions of their audiences. They, or their producers, managers, and agents, follow the top 100 charts with a magnifying lens; they study the box office numbers like accountants. They will do, and this is a major distinction from beret wearers, 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, antihelitist, and human. The idea of producing art that confuses or repels is deeply offensive to the baseball-cap artist.

The economics of baseball-cap art is to make highly replicable works—movies, pop songs, television, video games, 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) but the goal is to sell an enormous number of them for a relatively small amount of money. 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 artistic hat probably could not have existed much before the mid-nineteenth century. Today popular art constitutes a 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. It is the art type most indicative of our time. In a thousand years it's unclear whether the Beatles or Steve Reich will be remembered more clearly, but my guess is that it will be the Beatles. Perhaps to future listeners they will be indistinguishable.

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 pollution. When my Fleet-ing, trivial desires are amplified by focus groups and blared back out through multiple channels, even the car radio can become an unbearable torture.

Lastly, are those artists we might call folk artists, symbolized by the straw hat of the banjo strummer. This is a particularly unfair image, I must admit, for folk art ranges from people who make furniture in their basements to teenagers making rock and roll in their garages. Here's my definition: Straw-hat artists make art for themselves and for their friends; they 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; because it is a way of interacting with and strengthening the bonds between friends and family.

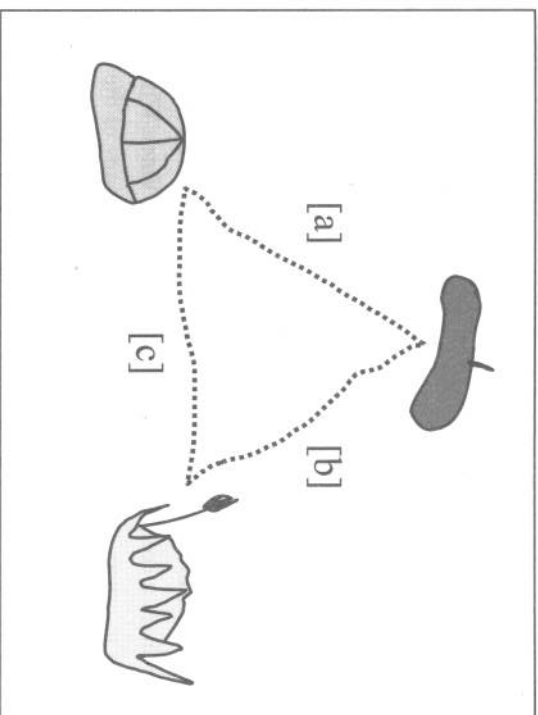
Until the first great washes of the Plenitude crashed over the populace, what we now call folk art was simply called music, or dance, or drawing and was the vast majority of art produced. It is still produced in some quantity, though it gets drawn like a magnet either to popular art (the rock band in the garage almost immediately thinks about selling CDs) or to fine art (the weekend painter almost as a reflex imagines his or her work in a gallery.) Or a Martha Stewart figure 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: While it costs something to produce 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 calls it *immediatism*, something that is done for immediate pleasure and for the immediate company. In our society fantasies of making money quickly overpower such activities. Another reason is time. 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 Plentitude.

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. We further denigrate such activity by using such phrases as weekend painter or vanity-press author. Straw-hat street forms, such as rap and break dancing, get 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. Even home cooking, a true folk-art form, has been greatly replaced by home-style meals you can buy in a supermarket.

In densely worded papers, contemporary cultural theorists like to claim that folk art still exists at the edges of popular art—from making new houses for The Sims, to writing Kirk/Spock homoerotic stories (and posting them on the web), to remixing pop songs, to recutting Star Wars movies, to inventing strange rituals in Ever-Quest. 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 the truly beautiful explosion of graphic arts in the mid-1990s that 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 some data points:

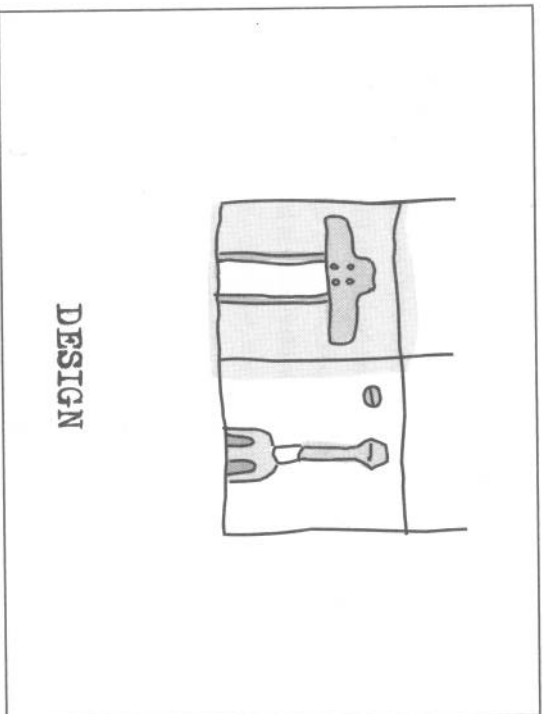
Rock and roll is generally thought to be a popular art form with its genesis in the folk art forms of blues and country; Dick Dale says that his surf music was the combination of rock and Lebanese folk music. There are fine artists who experiment with rock and roll (e.g., Laurie Anderson) and pop stars who toy with fine art (The Beatles' "Revolution #9"). Fine art composers have often drawn on folk art (Stravinsky and Bartok come to mind); much piano playing

at home is actually of Bach; Bob Dylan rewrote folk music and then his songs were sung around the camp fire as if they were as old as the hills. 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 the are 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.

There are many similarities between the hats of art and science. They 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. They both speak of the future (and claim to precure 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.

Both artists and scientists talk about nature. For the scientist it is a central object of study. Artists ping all around the concept—from postmodern denial of its existence, to making it the central theme of their work. It is, as they say in the lofts, a site of contention. Both artists and scientists speak of personal vision, of having and working from visions, which are different than mere ideas. They think of themselves as unique (for the artist this is the bankable commodity). They both speak, in other words, in transcendent signifiers, giant words that by their nature are outside the world. Both hats contain a concept of genius, what the Nobel prize is all about, and how both Picasso and Hawking are referred to. The art community might make noises about there being “an artist in all of us,” but

try telling that to curators, dealers, and acquisitions committees of museums—all artistic homunculi are not equal. There may be talk of the “little scientist” in each child, but the adult scientific community (not without cause) has rigorous entrance standards.



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 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 those who mistake an artist for a designer and ask 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 toward 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 that 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

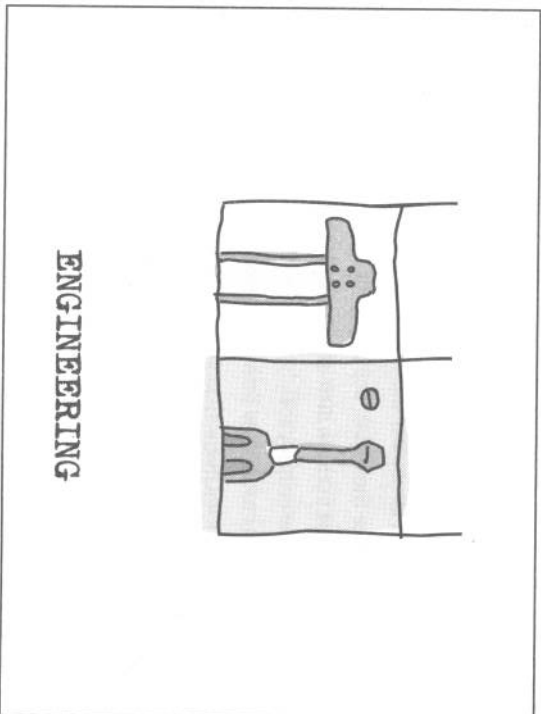
it is simply to entertain, beautify, or sell something. It can be used to communicate, make something easier or more comfortable. It is often used simply to say, "I care about you."

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 semimystical realm of art. There is much less transcendent signification in design than in art. It is not above the world, it is of it.

In our culture the artist is more revered than the designer (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 that 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 that 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. 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 at the trends that 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.



In the lower right corner is the last of the four hats of creation. Engineering 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 "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 closely related to the hat of design. Both work from need and desire. Both are concerned primarily with the user and the world—the "real world," as they like to say. Unfortunately, in most companies design is pitted against engineering, a battle that 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 of the four creative hats. Egyptian or Roman engineers (pyramids and aqueducts) are almost indistinguishable from contemporary ones in their methodologies and basic world view. Of course their tools have changed, as have their books of formulas,

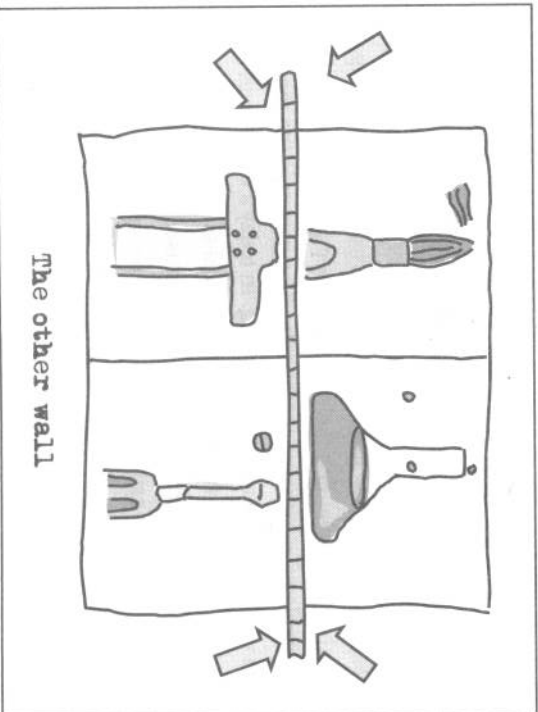
rules of thumb, exemplars, and equations. But these are always on the march. Engineering, without science, might well have created the entire Plenitude, though a somewhat different one and it would have taken longer. From the cathedrals of Europe to the airplane and the car, from Chinese porcelain to 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, not the hat of science.

Science, to the engineer, does two things: First, it presents new equations about how the world works that enable the finding of engineering solutions. Second, and more interestingly, science creates new desires and needs that 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.

While science is a hat of laws, engineering is a hat of violations. Engineers spend a lot of their time engineering out the exceptions. Most of the stuff in a high-speed printer is there to take care of the jam that occurs only once 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 lifetime. 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 expands constantly. Engineering forms the backbone of invention of the Plenitude. If you want to make sure your child has a job in the future, have him or her 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, not a scientist.

Design and engineering are much more related to each other than art is to science. It's not good design or engineering unless other

humans like it, buy it, use it. It is irrelevant whether it satisfies its creator's vision. Design and engineering create the physical artifacts by which we interact and communicate with one another. Your clothing is a visual language that is perpetually speaking; your car is a socially negotiated piece of metal to get you from one human to another. We might treasure a design/engineering effort from two hundred years ago, but it was created for a moment. What is good design/engineering today could be bad tomorrow. Good design in one part of town could be bad in another. 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 in a dialogue about everything from how we will house the elderly to how we shake the salt.



The other wall

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*. But in my cartoon model, the biggest schism is between art and science at the top, and design and engineering at the bottom. The horizontal line is called the Wall and it is notoriously difficult to get something over it. 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. 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 a committee of 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.

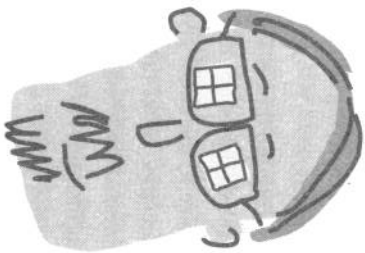
All professions have "others"—other professions or groups to which they are deeply related. One of the big differences between art/science and design/engineering are their *others*.

In art and science 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) agree that it is true. For the artist the peer group is 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 or 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 antiestablishment artists trying to have their work presented in patron-sponsored museums.

For design and engineering the others are the User and the Client. The client presents the designer or engineer with the problem and pays them a fee to solve it; 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, one hopes, 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 asymptote to commodity, and in the globalized world, if you are merely producing commodity, you're dead. Learning to cross the wall and making peace between the peers, patrons, users, and clients is the most important lesson I know of for a corporation.



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) 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, while 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. You will seldom mistake an art conference for an engineering one. The designer's studio is rarely confused with a scientist's lab.

Though having said this, it is just these confusions I find most interesting.
And it's been the story of my life.