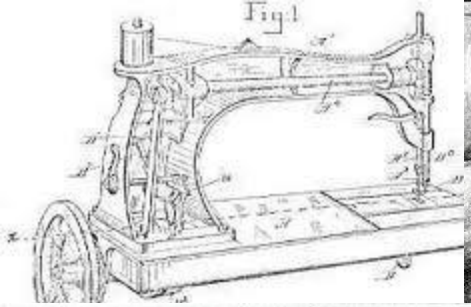
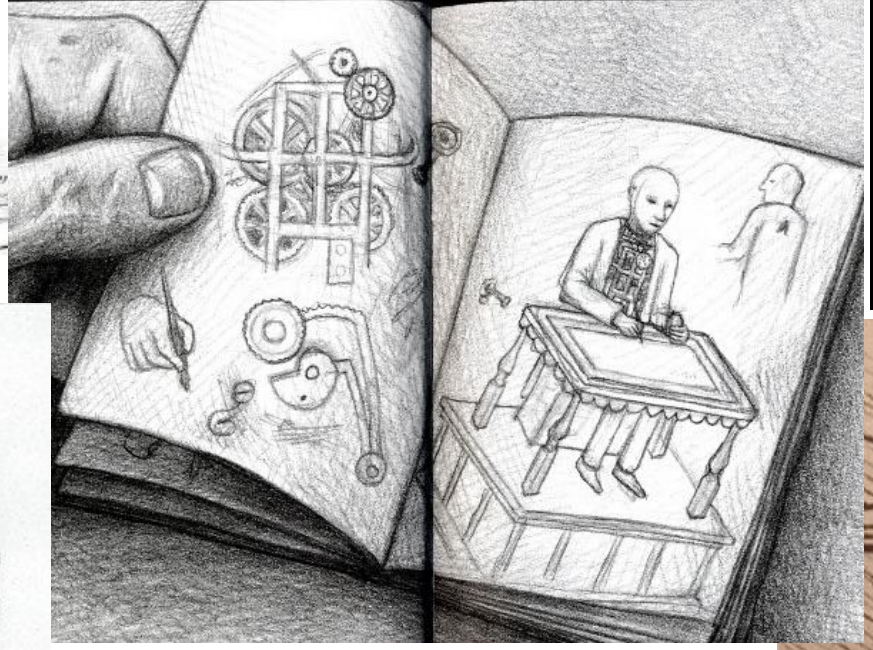
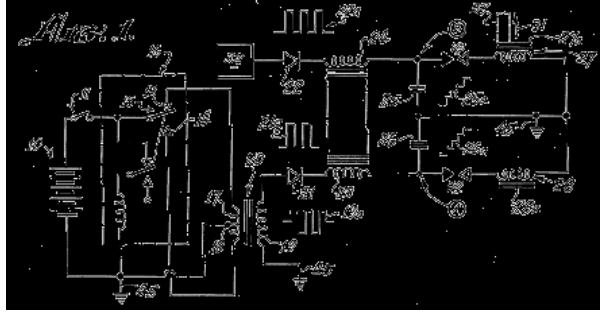
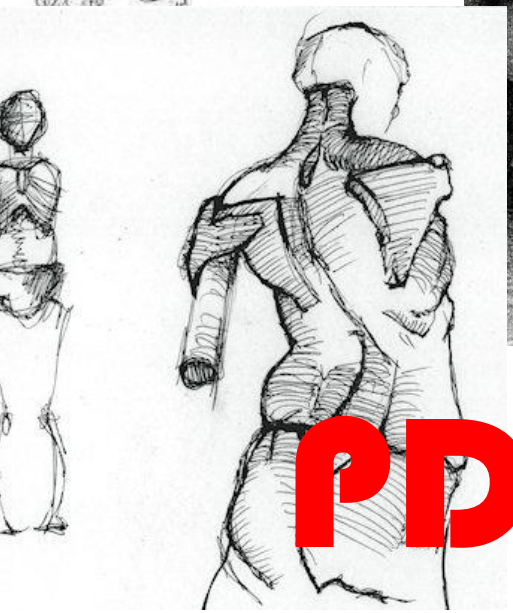
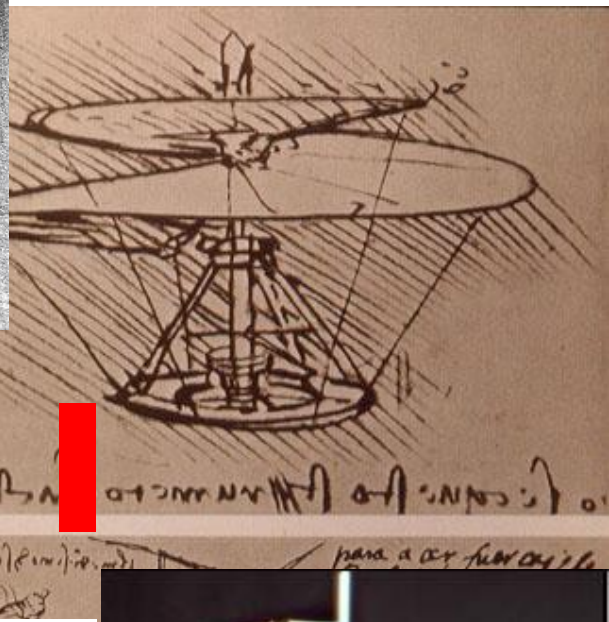


Fig1

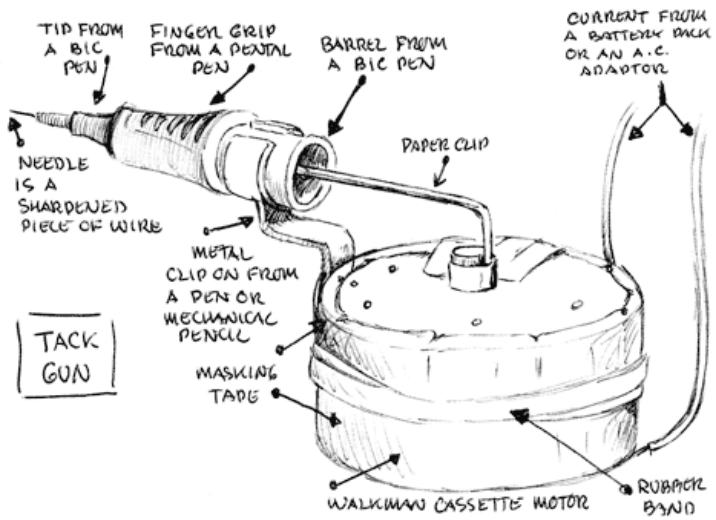


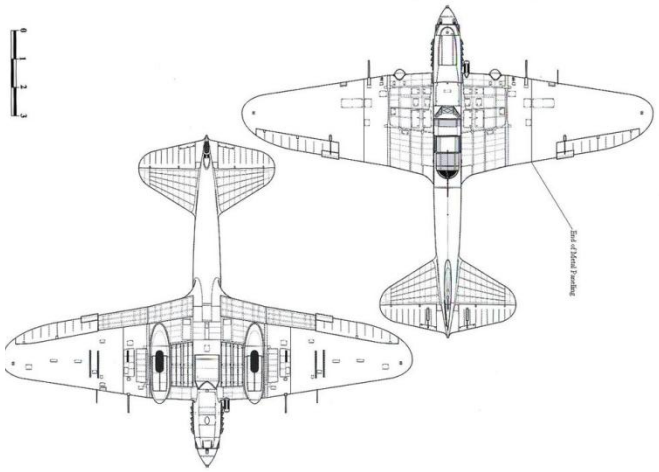






PDI STUDIO I


TIP FROM A BIC PEN
FINGER GRIP FROM A DENTAL PEN
BARREL FROM A BIC PEN
CURRENT FROM A BATTERY PACK OR AN A.C. ADAPTOR
PAPER CLIP
NEEDLE IS A SHARPENED PIECE OF WIRE
METAL CLIP ON FROM A PEN OR MECHANICAL PENCIL
TACK GUN
MASKING TAPE
WALKMAN CASSETTE MOTOR
RUBBER BAND



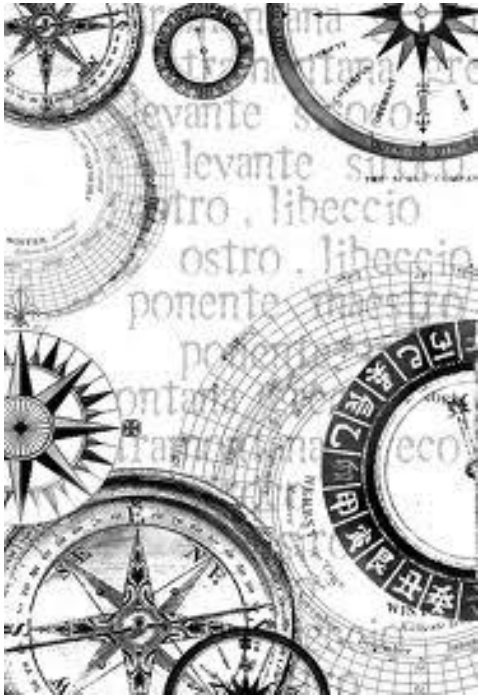
PRODUCT DESIGN AND INNOVATION

- Orientation to the DSI program
- What is the goal of Studio 1?
- Going over the syllabus
- What is Creativity?
- What is Critical Inquiry & ‘Learning to learn’?
- What is Design and Innovation?
- Other things

Introductions

- Professor – Burt
- Teaching Assistant – Gareth
- The Students- You

ORIENTATION



DSI combines techniques and ideas from the social sciences, arts, and technical disciplines applicable to design across multiple situations

Design Innovation and Society

Program Educational Goals

- **Engineering/Other Technical Field**
  To achieve a basic knowledge of a technical field such as mechanical engineering or management

- **Social Sciences**
  To understand the social shaping and social impact of technology
  To understand the ethical and policy dimensions of technology
  To develop social science research skills, especially as they apply to design

- **General Design**
  To understand fundamental design skills such as iteration, problem redefinition, aesthetics, design-related computer programs, representation, drawing, and creativity
  To have substantial team/collaborative experience in a studio setting

WHAT IS THE GOAL OF STUDIO 1?

This Program was designed…

Product Design and Innovation: A New Curriculum Combining the Humanities and Engineering

John Schumacher Dept. Science, and Technology Studies,

November 10 - 13, 1999 San Juan, Puerto Rico 29th ASEE/IEEE Frontiers in Education Conference

In **PDI 1** students learn that getting started, formulating a plan, becoming totally involved (willing to try something even at the risk of failing), being honest about empirical data, demonstrating a willingness to listen and to change one's mind, and persevering in the face of countless obstacles are all key ingredients that go into the inspired idea. **PDI 1** provides students with hands-on experiences in understanding the human body, heightening observation and perception, facilitating communication and visualization—especially in the human interface with inventions—as well as in drawing, building mock-ups, and photography. Above all, the initial design experiences in **PDI 1** are intended to stress open-ended exploration and creativity.

DESIGN AND INNOVATION: A NEW CURRICULUM COMBINING THE SOCIAL SCIENCES, DESIGN, AND ENGINEERING

Gary Gabriele, Rensselaer Polytechnic Institute, Department of Mechanical, Aerospace and Nuclear Engineering,
Frances Bronet, Rensselaer Polytechnic Institute, School of Architecture
Larry Kagan, Rensselaer Polytechnic Institute, Department of the Arts
Ron Eglash, Rensselaer Polytechnic Institute, Department of Science and Technology Studies
Jeff Hannigan, Rensselaer Polytechnic Institute, Department of Science and Technology Studies
David Hess, Rensselaer Polytechnic Institute, Department of Science and Technology Studies
Barbara Seruya, Barbara Seruya & Associates, New York, NY

International Conference on Engineering Education August 18–21, 2002, Manchester, U.K.

Product Design and Innovation I

PDI 1 is based on the premise that disciplined, creative design is learned through the act of doing and making in the studio experience. PDI design studios seek to develop active, dynamic drivers of innovation, and strive to uncover, and get rid of, overt and tacit barriers to creativity within each student. The central concerns of this semester are to open up ways of being in the world—through sensory awareness, through experimentation and physical engagement with artifact, client, site and program and through working methods for suggestive and precise communication. These studies are meant to encourage curiosity and risk while maintaining exhaustive rigor and investigation. The development of reflective judgment is a significant aspect of this course. At the same time, the first design studio (PDI 1) begins the process of building a toolkit—primarily on the exploratory and aesthetic side—that the student will use throughout the entire program.

So What does one need to learn?

- Skills for seeing and learning about the world
- Skills for making, representing, modeling, and describing the object of design
- Skills for evaluating and refining the process of design
- Deep understanding of Innovation as working to remake the world for the better.

PRECEPTS

One must Learn to learn

Learn skills and fundamentals (not facts first), discipline in problem solving, so that you can apply them in new situations.

The Sensibility/ Mindset of design

Includes an risk taking attitude, be open, questioning, curious, flexible, use empathy, have commitment.

Make decisions based on facts not guesses and know the difference

Design starts from understanding users, needs, current events, technology, politics

At each step question in a structured way.

Recognize your choices and their effects. Ask big questions, what makes great art, what has made designs great, what does the world need, what do people need?

Learn to Research, See , and understand

Drawing/sketching, Listening, Researching, in Critical Engagement allows you to learn the details needed for strong innovation and successful design.

Document your work, so that others can replicate it.

GOING OVER THE SYLLABUS

- A syllabus is “An outline or a summary of the main points of a text, lecture, or course of study.”
- *In Law*: “A short statement preceding a report on an adjudged case and containing a summary of the court's rulings on each point involved” In this sense it is our contract with the students, and them with us.

Summary

Books

Edwards, Betty. *The New Drawing on The Right Side of the Brain*. Penguin Putnam

von Oech, Roger. *A whack on the side of the head: how you can be more creative.* Warner Books

Primary Assignments

Journals?

Drawing, Seeing and thinking exercises?

Capstone Project?

Note about doing things that are hard

- Everyone is different, people have different kinds of strengths.
- Skills are learned, but may take longer for some than others.
- In part this means that we gain by working in groups, in recognizing our weaknesses, and trying despite them.
- One should expend extra effort in developing skills that are more difficult.

- One way to think about this is the theory of Multiple intelligences -Martin Gardner (1983)
- This work has led to lists such as Robert Slavin ‘s (*Educational Psychology*,. 2009, 117):
  - Spatial
  - Linguistic
  - Logical-mathematical
  - Bodily-kinesthetic
  - Musical
  - Interpersonal
  - Intrapersonal
  - Naturalistic

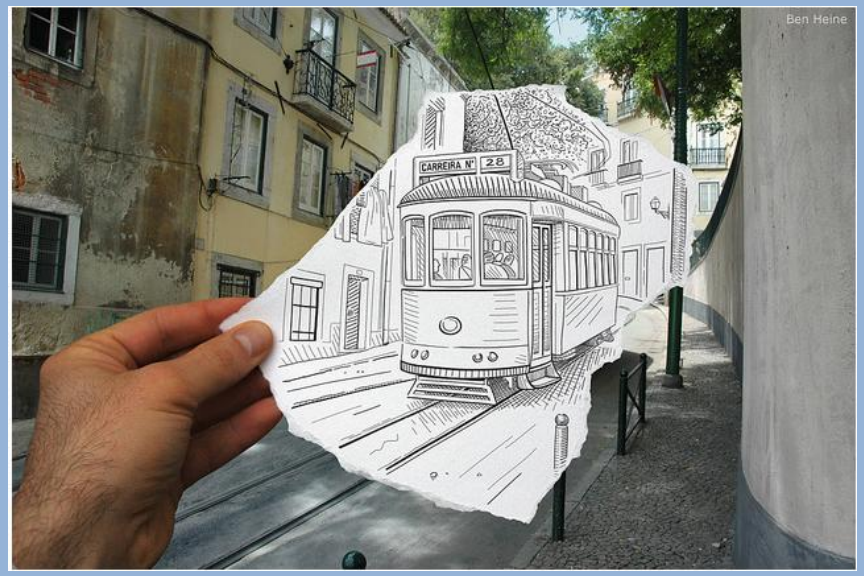
What is Creativity?

We need to be creative about how we see creativity.

"The eye sees only what the mind is prepared to comprehend." - HENRI BERGSON, French Philosopher and Educator

Creativity is about seeing things in multiple ways, and different ways.

And making it your own!

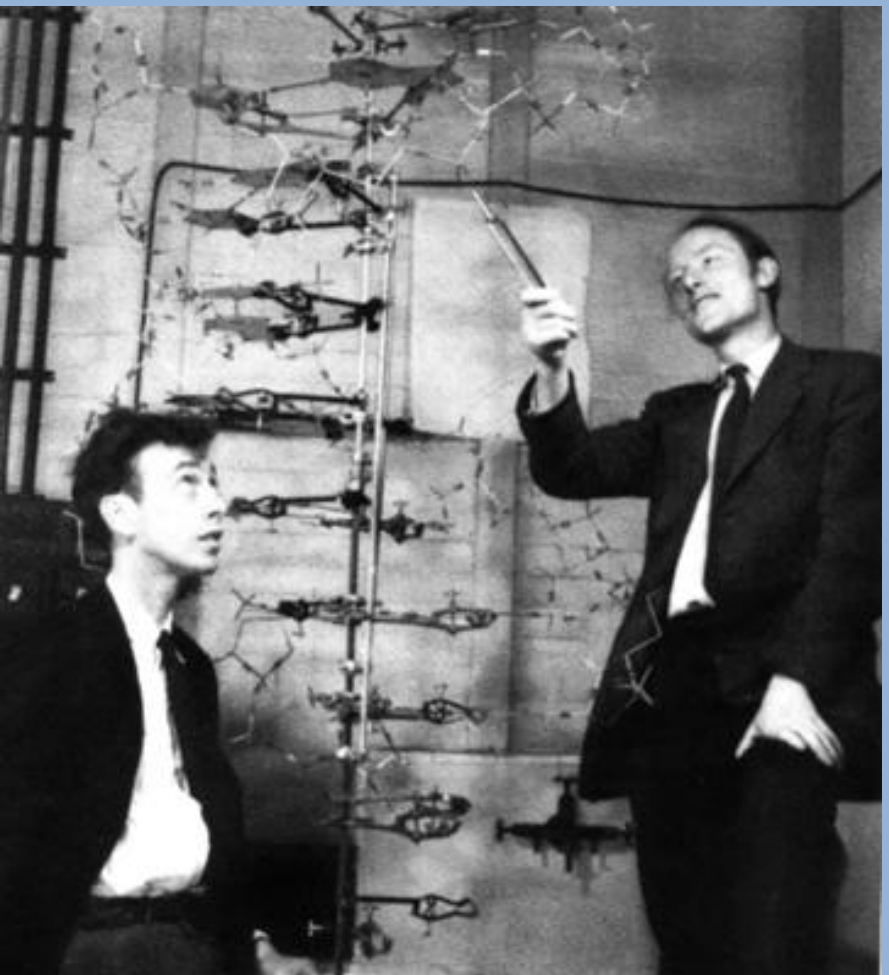


Ben Hiene

Banksy

Creativity and Design isn't just art it is in choices

Choices in Science

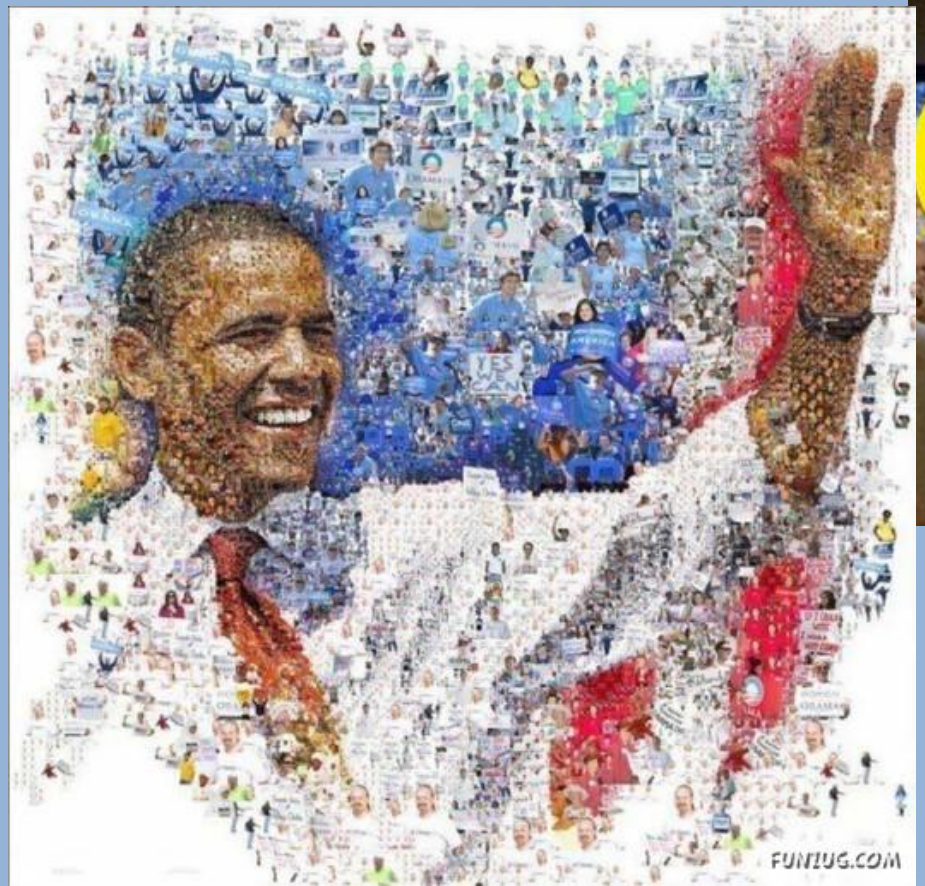


Choices in engineering

You need to pay attention
learn about the world

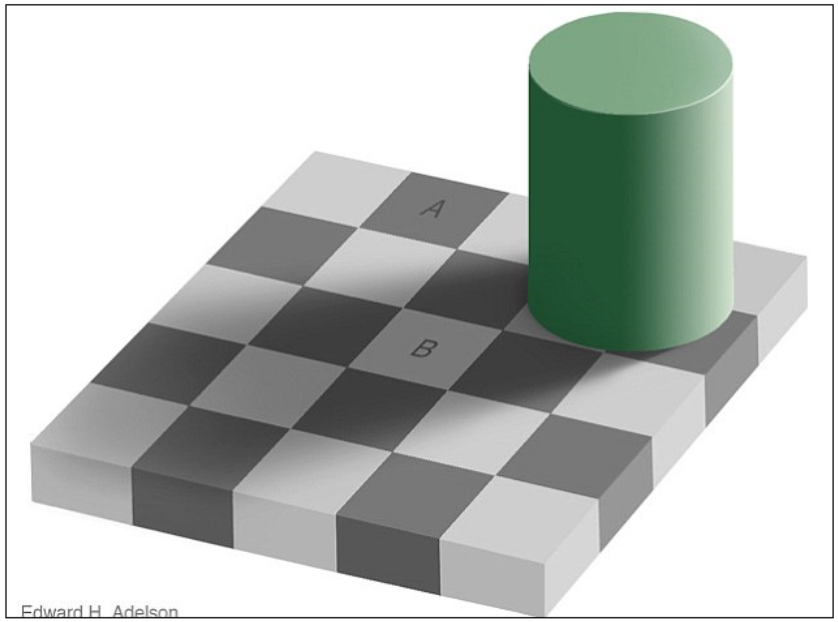
To the way it tricks you

Things most people don't notice



Visual design is knowing how we see, and then choosing how to use it

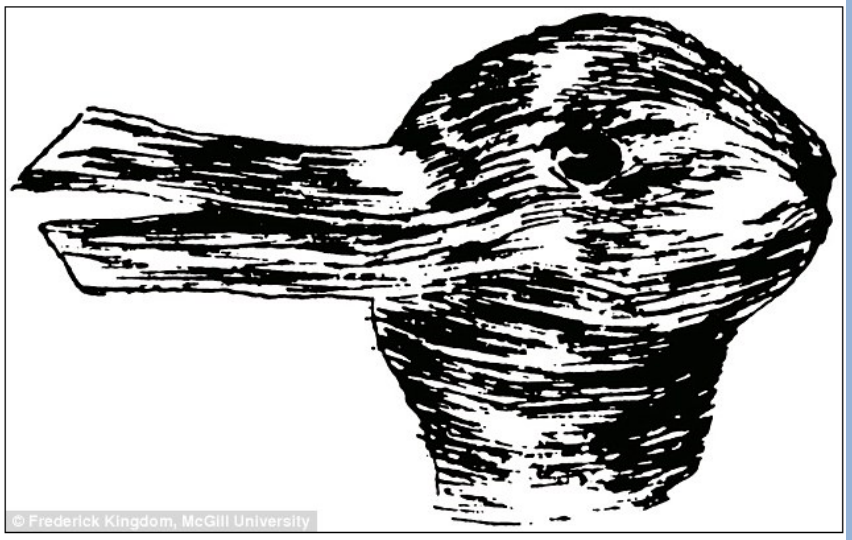
1. CHECKER SHADOW



Although it may seem impossible to believe, the squares marked 'A' and 'B' are actually exactly the same shade of grey

This amazing illusion was created by Edward H Adelson from the Massachusetts Institute of Technology. Although it may seem impossible to believe, the squares marked 'A' and 'B' are actually exactly the same shade of grey! Your eyes and brain are constantly trying to figure out the colour of the objects around you, and in doing so automatically compensate for shadows. The square marked 'B' is in the shadow cast by the green cylinder, while the square marked 'A' is outside of the shadow. Your eyes and brain see that the two squares are the same shade of grey, but then think, 'Hold on - if a square in a shadow reflects the same amount of light as a square outside of the shadow, then in reality it must be a much lighter shade of grey.' As a result, your brain alters your perception of the image so that you see what it thinks is out there in the real world.

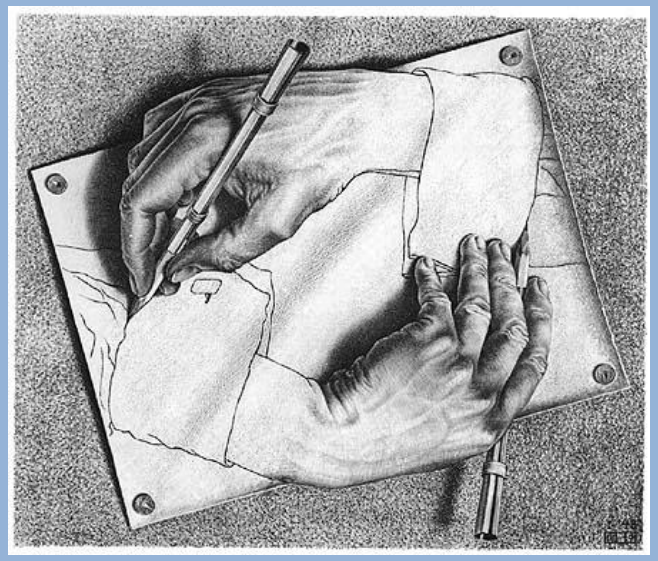
8. DUCK-RABBIT



This image is known as a 'bistable' image. You won't be able to see both pictures at the same time and will instead flip between seeing the duck and then the rabbit

When you first look at this picture you'll probably see a rabbit facing to the right. However, if you continue to look at the picture it'll flip to become a duck looking to the left. This is known as a 'bistable' image. You won't be able to see both pictures at the same time and will instead flip between seeing the duck and then the rabbit. This illusion was originally popularised in 1899 by American psychologist Joseph Jastrow, who used it to make the point that we 'see' with our brains as well as our eyes.

You can use the way people see



MC Escher, Drawing Hands, 1948

1965 Fastback Mustang

Dancing house, Czech Republic

Kansas City Library

You can break expectations

Marcel Duchamp, 1917, "Fountain"

Breaking from classic accepted designs

A Mouse trap

Space heater

USB Keys

Defining Creativity?

From *Human Motivation*, 3rd ed., by Robert E. Franken:

Creativity is defined as the tendency to generate or recognize ideas, alternatives, or possibilities that may be useful in solving problems, communicating with others, and entertaining ourselves and others. (page 396)

In order to be creative, you need to be able to view things in new ways or from a different perspective. Among other things, you need to be able to generate new possibilities or new alternatives. Tests of creativity measure not only the number of alternatives that people can generate but the uniqueness of those alternatives. the ability to generate alternatives or to see things uniquely does not occur by chance**; it is linked to other, more fundamental qualities of thinking, such as flexibility, tolerance of ambiguity or unpredictability, and the enjoyment of things heretofore unknown.** (page 394)

From *Creativity - Beyond the Myth of Genius*, by Robert W. Weisberg.

All who study creativity agree that for something to be creative, it is not enough for it to be novel: **it must have value, or be appropriate to the cognitive demands of the situation**."

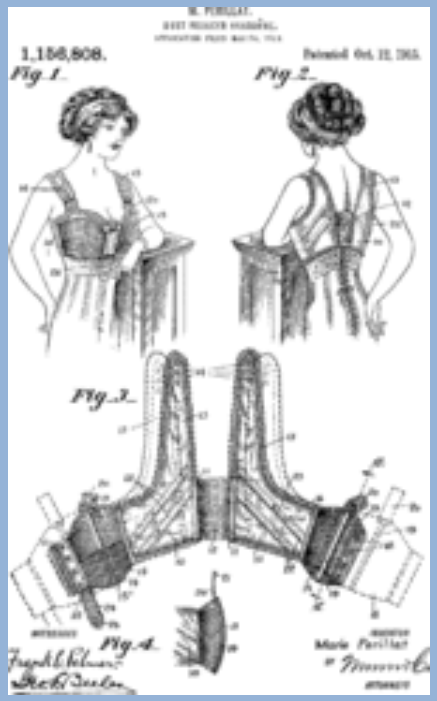
(page 4)

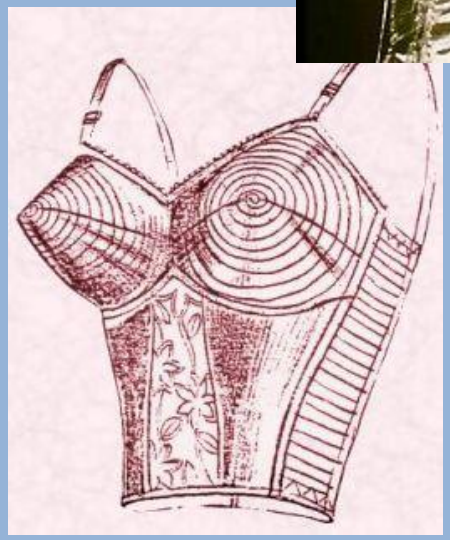
Creativity is always about understanding what we are trying to do, AND what we are actually doing

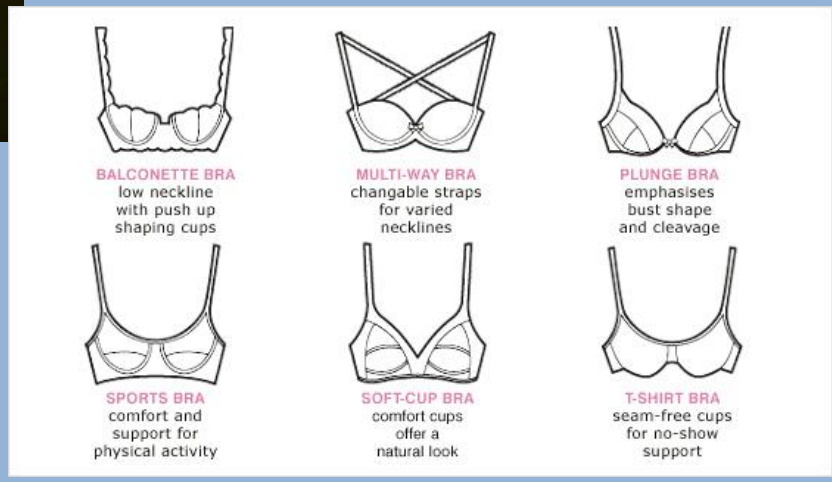
- The creative process isn't devoid of values, whether technically driven or aesthetically.
- The product of creativity is understood as worthwhile by the creator and the audience based on their understandings of the world
- The more you know about people, about the world, about intended and predictable unintended consequences the better.

Objects Change
When Values Change, Styles Change

1920s 1950s 1980s Contemporary







So then creativity is

- Responding to a situation in an unconventional way
- Using something in an expected way
- Responds to a previously unarticulated need
- Connecting many ideas or finding the missing
- By conceiving of the situation from a new perspective
- By understanding its past context and users
- By keeping an attentive and critical eye on the world and gaining appropriate knowledge to see an alternative

In order to be creative

Ask what is there?

Study the world, observe, learn how to learn more.

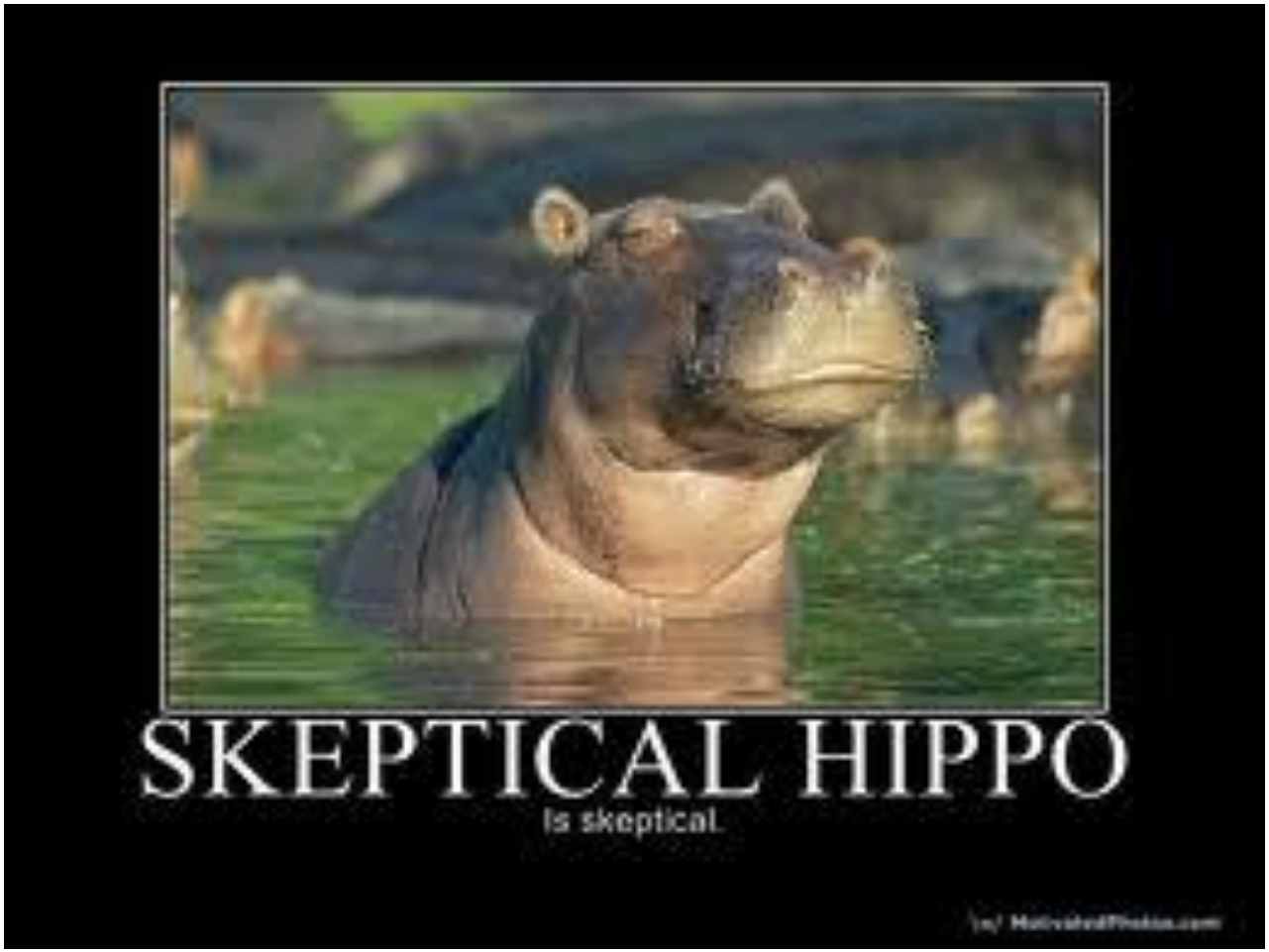
Ask what can be there?

Study technique, science, technology, find there limits, find what has been left out, not noticed, assumed. Try to conceive of something that responds to that, imagine what fills, makes, does, changes, in that space you've discovered.

What should be there?

Then ask yourself about its effects what sort of world it will be part of making, what sort of world you think should be made.

What is Critical Inquiry & ‘Learning to learn’?



Space is Designed

Since the turn of the century the design of work space has been increasingly centered on specialization and decreased interaction to provide for heightened worker efficiency.

19th Century "Hodge podgy" office

Action office circe 1968

Taylorist 'open office plan' 1920's

Modern Cubicle "farm"

But what is Value and Utility? Absolute Temporal Efficiency?

Le Corbusier, 1935, 'Ville Radieuse'

Wrigley's Barcode 1974

Chicago – Cabrini Green

Google Zurich

The office is open and playful, based on the assumption that comfortable worker interaction is neccesary for creativity in teams

Particularly during the Technology Boom, based on a specific conception of skilled labor competition, the workplace was reimagined to be fun, it is intended to encourage workers to be creative, and to distract from or change the experience of expected long hours of work.

Learning to learn
-Education as Skill Not Quantity

Education is what remains after one has forgotten what one learns in school.-Albert Einstein (physicist)

Education... has produced a vast population able to read but unable to distinguish what is worth reading. -G.M. Trevelyan (historian)

The object of education is to prepare the young to educate themselves throughout their lives. -Robert Maynard Hutchins (philosopher, president Univ. Chicago)

Education is the ability to listen to almost anything without losing your temper or your self-confidence. -Robert Frost (poet)

Much education today is monumentally ineffective. All too often we are giving young people cut flowers when we should be teaching them to grow their own plants. -John W. Gardner (Secretary of Health Education and Welfare, under Johnson and architect of the "great society" domestic agenda)

Critical Inquiry

- "Too often we give children answers to remember rather than problems to solve." - Roger Lewin (physical anthropologist/ evolutionary biologist)
- "No way of thinking or doing, however ancient, can be trusted without proof." - Henry David Thoreau (writer/philosopher)
- “But if thought is to become the possession of many, not the privilege of the few, we must have done with fear. It is fear that holds men back — fear lest their cherished beliefs should prove delusions, fear lest the institutions by which they live should prove harmful, fear lest they themselves should prove less worthy of respect than they have supposed themselves to be.” - Bertrand Russell (philosopher)

What are Design and Innovation?

"…design is a topic that lies at the junction of these two ways of thinking about, and interacting with, the world. It sits at the meeting place of Science and Art – but it is neither science nor art, it is simply and fascinatingly design."

Walker, Stuart. Sustainable by Design: Explorations in Theory and Practice. London: Earthscan, 2006. p 5

Defining Design and Innovation

The current description on the website states:

"We operate under the assumption that students benefit from understanding different 'cultures' of design and innovation"

A design "culture" may contain things like:

Genre/Culture, Convention/Style, Technique/Medium, Professionalization/Role, Institutions/Work site

Nigel Cross, 2006, Designerly ways of knowing

- **Understanding the appropriate forms of knowing in a disciplinary culture:**
- "the transmission of knowledge about a phenomen of study"
- "a training in the appropriate method of enquiry"
- "an initiation into the belief systems and values of the culture"
-
- **In design we draw on multiple expertise which have arisen out of the values and emphases in different disciplines**:

	Core Commitment of understanding	Methods
Sciences -	"natural world"	"Controlled experiment, classification"
Humanities -	"human experience"	"Analogy, metaphor, evaluation" history
Art & Design -	constructed/"artificial world"	"modeling, pattern-formation, synthesis"

- **Each brings a strength when connected into an interlocking systems work.**

- Sciences: ideals and methods of objectivity and neutrality a concern for truth
- Humanities: Imagination, Commitment, understanding of subjective experience,
- and a concern for justice
- Design: Practicality, ingenuity, empathy, and a concern for "appropriatness"

Thomas Lockwood (ed) 2009 Design Thinking: Integrating innovation, customer experience and brand value

- Key Phrase: Integrated thinking
- Understand costumers or users based on rigorous fieldwork research, keep awareness of the users or participation by users in the process itself.
- Collaboration is key, it allows expansion of knowledge, shows places of conflict, overlapping views cover blindspots, and leverages multiple perspectives on values and goals.
- through visualization, hands-on experimentation, and quick prototyping are good ways to think with and through a problem, allow user feedback, and document the process and thinking throughout stages and iterations.
- Keep business, technical, imaginative and other long range concerns in the process, don't let design be closed off, bounce off the context and future directions or placement of the product at every stage.

Von Oech,1983. Whack to the head , identifies ten "locks"

which limit (if not preclude) creative thinking:

The Right Answer
That's Not Logical
Follow the Rules
Be Practical
Play Is Frivolous
That's Not My Area
Avoid Ambiguity
Don't Be Foolish
To Err Is Wrong
I'm Not Creative

Design process helps move away from getting locked up by promoting and allowing “disruption” or “Disruptive Technology” (respectively from - Clay Christensen 2010; Tom Lockwood 2009)

From pocket knife to Swiss army knife

In 1891, Karl Elsener, then owner of a company that made surgical equipment saw the need for a Swiss made pocket knife for the army to replace an inferior quality knife imported from Germany. He leveraged nationalism, awareness of users, creative design, technological expertise, and today the company produces not only for the Swiss army but the German army as well.

Design and Innovation are linked

To Design Is:

"to conceive or fashion in the mind"

The process of coming to understand and then imagine a response to a situation or need

With awareness and consideration using skills in the process of planning to make or use materials for a purpose

Innovation Is:

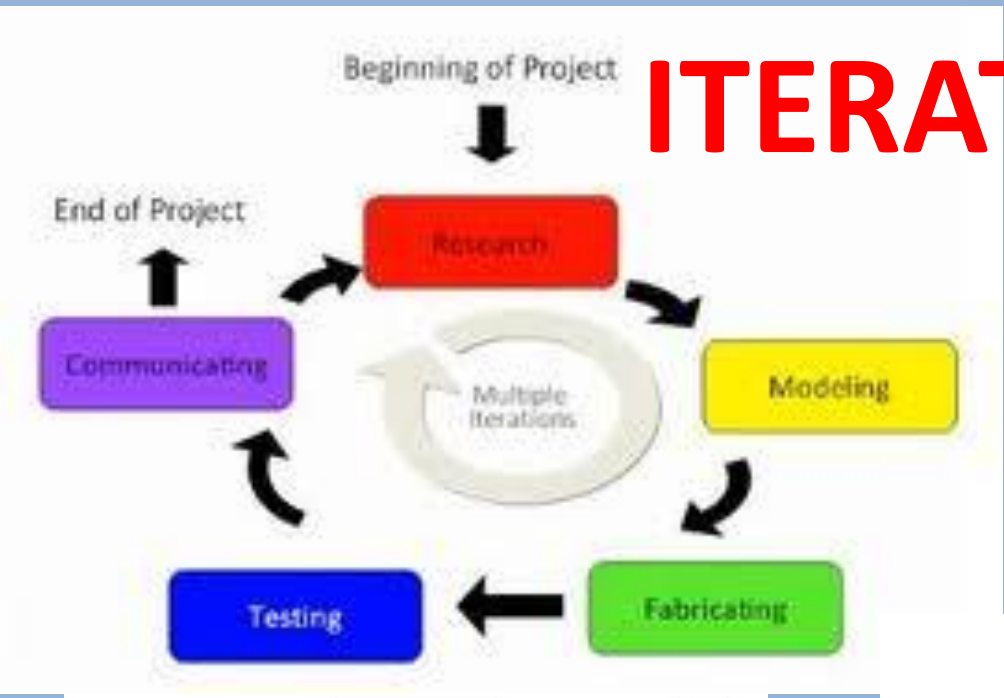
"the act of introducing something new"

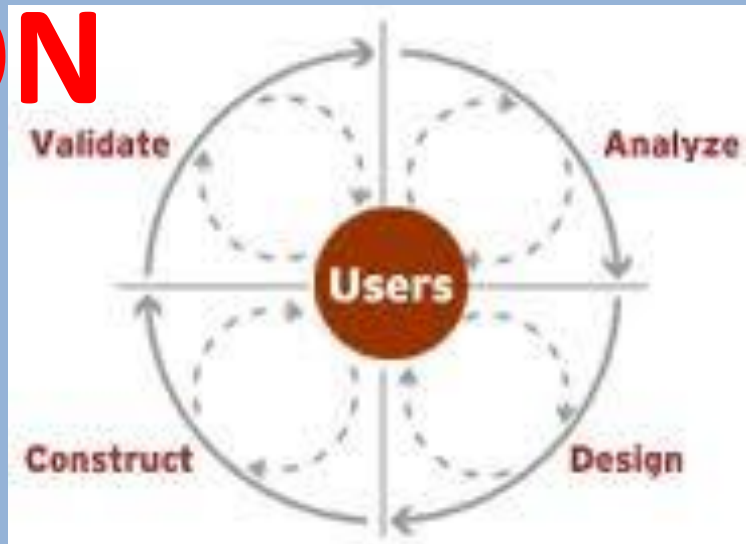
Using creativity to solve a problem

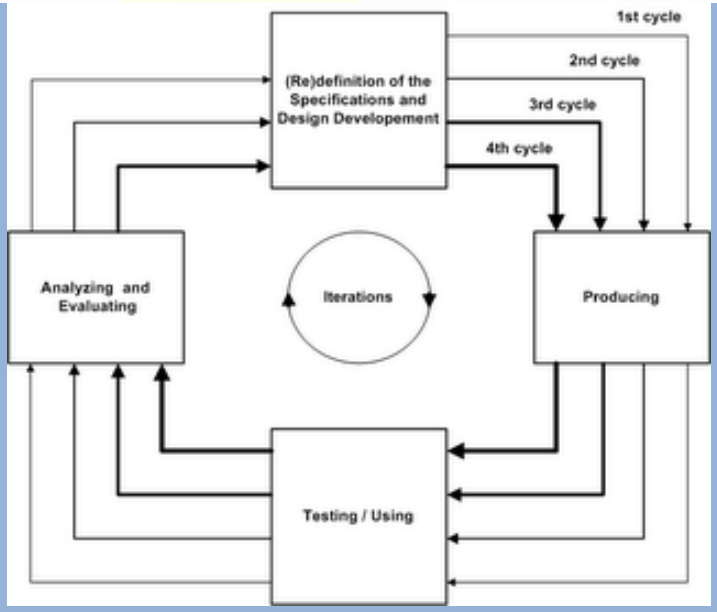
Repurposing or creating something that has value within a context

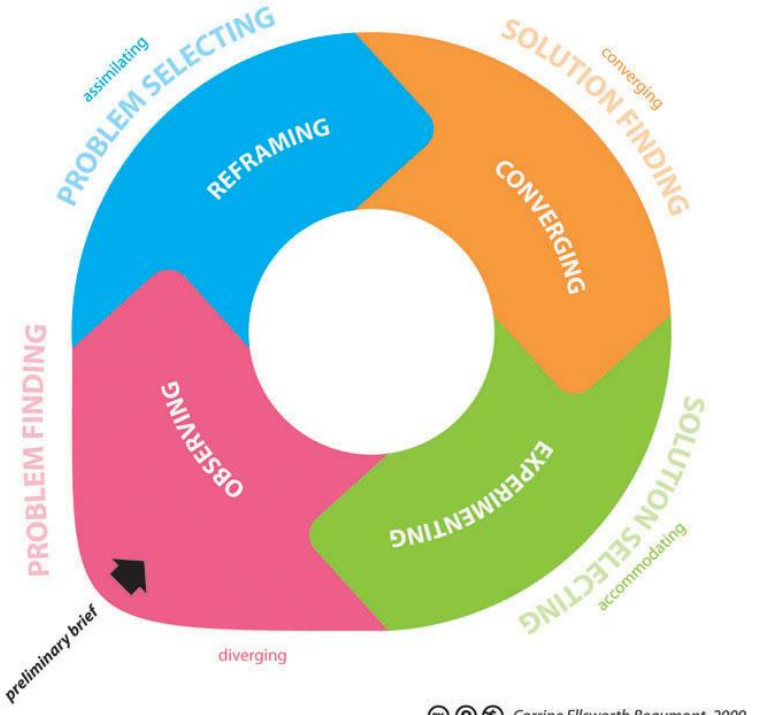
Awareness of outcomes that leads to successful implementation

ITERATION


Beginning of Project
End of Project
Research
Communicating
Modeling
Multiple Iterations
Testing
Fabricating


Validate
Analyze
Users
Construct
Design


1st cycle
2nd cycle
3rd cycle
4th cycle
(Re)definition of the Specifications and Design Developement
Analyzing and Evaluating
Iterations
Producing
Testing / Using


PROBLEM SELECTING
assimilating
REFRAMING
SOLUTION FINDING
converging
CONVERGING
PROBLEM FINDING
OBSERVING
EXPERIMENTING
SOLUTION SELECTING
accommodating
preliminary brief
diverging

An example of Design and Innovation

Ecovative Design LLC.

Gavin McIntyre (left) and Eben Bayer
Started at RPI 2006/2007

What they did?

- They started learning about organic glues, and considered mushrooms.
- Looked for an approriate alternative and came up with Mycelium (a mushroom)
- The Mycelium was better at making foams than glue
- Realized there were problems with the production, use and disposal of plastic foams like polystyrene and Styrofoam
- Tried to find a way to use it to replace plastic foams.

Ecovative (cont.)

- Initially only considered their innovative material as household insulation.
- Researched the issues, demands, users and markets
- Among other issues determined that people were worried about allergenic reactions, and tested to make sure they could reassure people. Improved the technology and their marketing
- Then they realized that commercial packaging was another use, and because it is immediately disposable, one in which a ‘green alternative’ was even more pressing to them and marketable.
- They added another partner to the design team, Jerry Weinstein, a retired vice president of Owens Corning, an expert on the uses and mechanics of the technology they seek to replace
- Started to look at how to market and manufacture packaging they came into communication with Ford Motors
- They now are working to develop an automotive version.

OTHER THINGS:

- Expressing yourself
- Example: The Elevator Pitch
- Heuristics –tools to think with
- A Primer of Drawing Concepts

Expressing Yourself is thinking with others

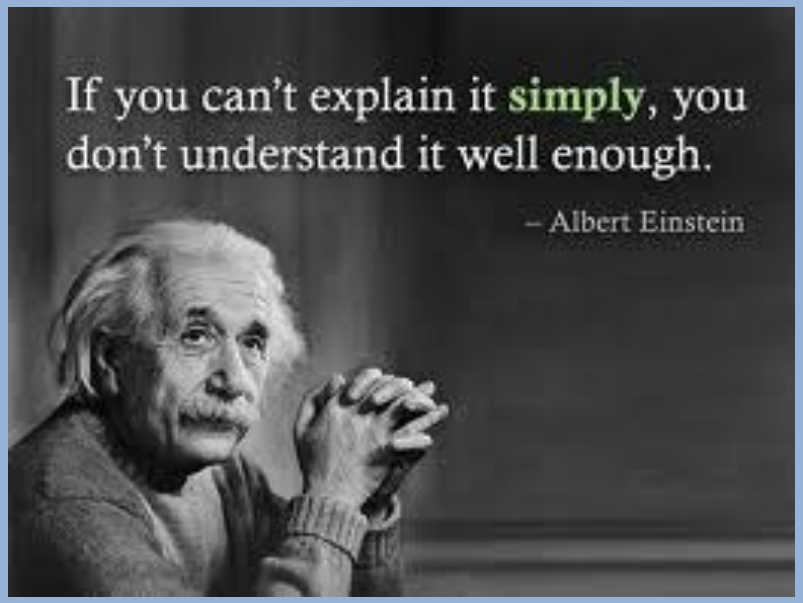
- There are many modes of expression and each allows and aides in different ways of thinking for you and those you communicate with.
- A theory, a process like drawing, a kind of statement, a metaphor or analogy, are all ways of understanding and thinking as well as ways of communicating.
- Tools to think with can be called heuristics, and choosing

The Elevator Pitch

How to make an elevator pitch

- Recognize the audience, reasons will depend on who you talk to, remember different cultures of design.
- Three sentences- Describe a need, a solution, and an appropriate detail.
- Prepare and practice ahead of time.

The Problem is you make all your thinking and context invisible

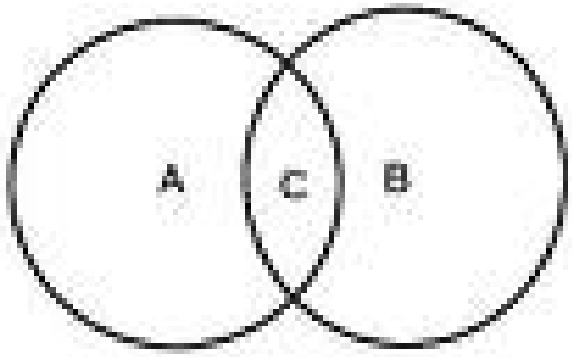


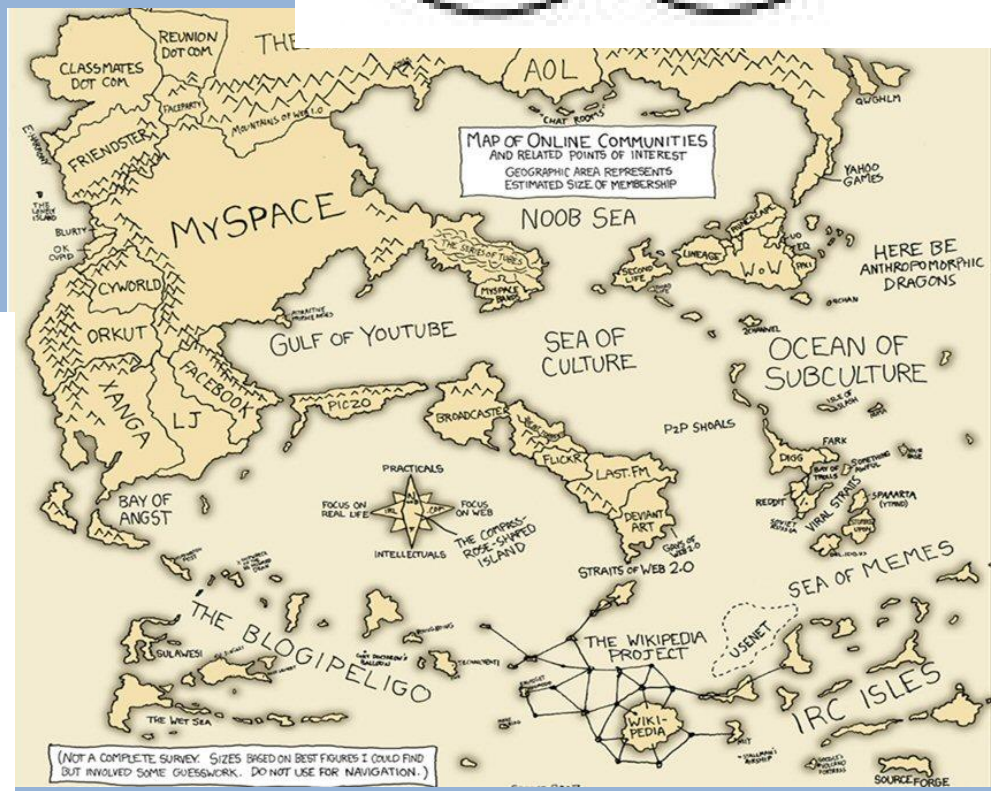
Remember the pitch is designed for others, not you.

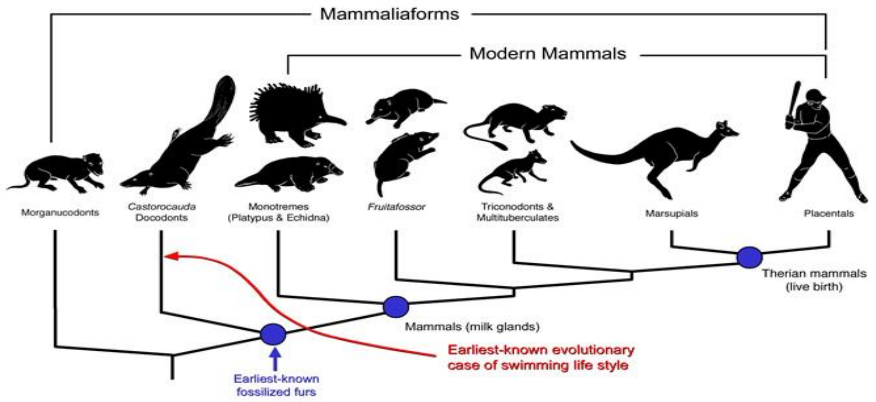
- Your simple explanation isn't wrong just because it is incomplete.
- Law of Parsimony (Occam's Razor) isn't a natural law, but rather a **heuristic**, stating not that the simplest explanation is always right, but rather, if you consider the causes, reasons for a proposition, then you can decide about its accuracy, and if two plausible explanations rely on more or less basses than you should choose the simpler.
- Rhetoric- is the art of convincing someone -is about understanding their position, conceiving of reasons appropriate to them, and forming a persuasive way to demonstrate in light of those reasons
- Like any design, you choose it based on its being context appropriate given available means to achieve your goal,

Drawing and graphic expression as Heuristic

- "A picture is worth a thousand words"
- Drawing makes you go through many steps in a way that makes the work material quickly







Where does *Castorocauda* fit on the mammalian family tree?

Graphics: Mark A. Klingler / CMNH

Critical Inquiry and Heuristics

- Heuristic Evaluations are basically any non-data driven experimentation done to learn, discover, or solve problem
- Evaluations are opportunities to consider what went into them, and what comes out

Like any research or hypothesis you need to be careful about bad thinking:

"selection bias"

"anchoring" or loyalty

"herd instinct" & accepted common-sense

Mistaking Correlation and Causation

Confirmation Bias – False premise may lead to a mistaken outcome

A primer of drawing concepts

Drawing is a technique of seeing, sorting, thinking and expressing

Drawing is a way to experiment quickly, it is a way to communicate

Judgment

Style

Composition

naturalistic or abstract

Shape and symbol as visual concepts,

Framing, Outline Expressive design

regulation/control

representing spatial relations

Depth

proportion and scale

defining shapes negative/positive space

texture

tone

value/ light and shade

Shadow

Perspective

cone of vision

depth of field

Foreshortening

Surface and reflection

Materials and contents

Sighting and reference (i.e. held pencil or ruler to measure perspective)

Drawing on the right side of the brain

Five Basic Perceptual Skills

- The perception of edges
  - Boundaries define things
- The perception of spaces
  - That which is bounded
- The perception of relationships
  - Connection, disconnection etc.
- The perception of lights and shadows
  - Centrally contrasts
- The perceptions of whole, or gestalt
  - The feel, balance, impression of the pieces together

Progression of Expression

- Start with Line
  - Sketch, iterate be disloyal and redo
- To Value
  - Add shading and detail, as you go you invest more time
- To Color
  - Like value, but a different mode, experiment with more and different detail
- To Painting
  - Adds physical depth, weight, and textural elements that are different, making each past iteration a more lasting part of the final product.

Drawing is

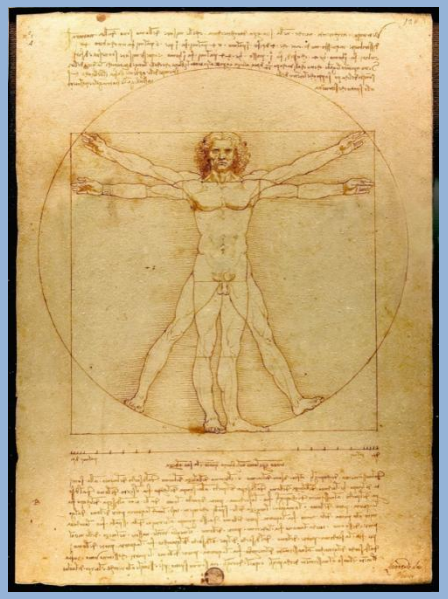
- Seeing
  - Seeing is awareness and selection of viewpoint
  - Seeing is careful selection of boundary, frame and limits or expansion of goals
  - Seeing is constructed of context, content, and conception
  - Seeing rests upon memory and consciousness you don't consider
- Visualizing
  - After seeing comes thinking about
  - Visualizing is educated choice of components to integrate
  - Realization of the outcome starts with imagination of a future, considering goals
  - Careful selection of the best means
  - Visualizing rests upon active memory and appraisal of the current situation
  - Visual acuity to function, scale, distance, contrast,

- Expressing
  - Making something to successfully communicate
  - Using technique to create the outcome you envisioned.
  - Expression is both representing what is or will be

Use Knowledge from outside

Picasso 1955, Depiction of Don Quixote, by use of iconic comparison it becomes clear that this is Don Quixote, not on his own but by comparison to the donkey riding Sancho Panza, and the windmills placed in the distance.

Davinci, Circa 1485, Vitruvian Man, a demonstration of "ideal" proportion according to the geometric principles of vetruvius and his own conceptions of balance. The use of the classic form is to emphasize the importance of relative proportion with the geometric shapes, he draws on a tradition of thinking about the ideal shape.



Think through multiple meanings

Vesalius, 1543,De Humani Corpus Fabrica, Classical artwork composition and analogy in setting were used to support the intention of accurate depiction

Lascaux Cave paintings, circa 13,000 BCE, depicts the hunt, believed to be part of a tradition known as “sympathetic magic” a visualization ritual in which by seeing a hunt successful it is made to be so

Military Sand Tables, are 3D drawings used to imagine a future military campaign, known to be used since at least 3500 BCE this one is from a 2011 Exercise, they are intended to aid in visualization and make a better outcome more likely.

Design Composition is about values

Hsia Kuei, c. mid 13th cent., Pure and Remote Views of Hills and Streams, ch'anChinese Buddhist Landscape Ink Painting, a difficult medium of wet ink on thin paper is done to enforce quick action, intended culmination of practice with minimal forethough, the composition is intended to demonstrate the wholeness of nature emphasizing context over content elements.

It is also about purpose

Sydney Parkinson, 1770, painted scientific portraits of flora and fauna as Naturalist on Cpt. Cooks Voyage, note lack of context.

Values and Purpose are co-constituted

John Audubon,1827, owls, often painted specimens together and with natural elements like branches to demonstrate comparative size, postures and the way their talons gripped rather than isolating them from context he used artificial context.

Audobon needed detail because he wanted to make bird watching and the study of nature easier, to promote conservation.

A Final Note

- Seeing the world around you is always shaped by the ways that you think, the values and ideas you hold.
- Imagining the future isn't just about reaching a goal, it is about seeing how your ideas and values can be or can challenge what you see.
- Making small changes, imagining things as they are today is easy, but seeing how things can be different tommorow is the crux of innovation.

Some suggestions for more Readings

Some suggestions on design (Sections/selectons from)

- Nudge – Thaler and sunstein, paired with Latour, "The Sociology of a Door-Closer"
- Small is beautiful - Schumacher
- Articles on User Centered Design Process or *Design for society* – Nigel Whitely
- Where Stuff come from –Molloch
- The evolution of everyday things – Henry Petroski

Some suggestions from social sciences

- A chapter from Goffman's *Presentation of self in everyday life*
- A chapter on camouflaged technology use in advertising and design about vibrating massagers
- A chapter From seeing sociology
- A chapter from Collins and Pinch *the Golem* on unintended consequences of technological design & maybe a film on the design conflicts and politics of the electric car.

Seeing, Reading, Writing with Engaged and Critical inquiry

The material you use for reference was designed & before you accept it you should:

- Know who the author is, why they wrote or produced it, in what discipline or genre they are working
- Know where the material fits into a system of knowing, a body of literature, a collection of related designs.
- Always keep track of the citations, references, styles and modes that they use both to make something trustworthy to you, and to decide whether you can use it to

All communication is argument and explanation: drawn, spoken, written, built

- When you communicated, know when you are giving verified information, your position, someone else's position, questionable information, and what has made it verified or questionable.
- If you are communicating be ready to, or have included the reasons, and citations for your argument.
- Your reasons, ways of citation, explanations of credibility will function differently in different audiences/cultures and you must do it the right way.

George Orwell's rules of writing

A scrupulous writer, in every sentence that he writes, will ask himself at least four questions, thus:

- What am I trying to say?
- What words will express it?
- What image or idiom will make it clearer?
- Is this image fresh enough to have an effect?

And he will probably ask himself two more:

- Could I put it more shortly?
- Have I said anything that is avoidably ugly?

One can often be in doubt about the effect of a word or a phrase, and one needs rules that one can rely on when instinct fails. I think the following rules will cover most cases:

- Never use a metaphor, simile, or other figure of speech which you are used to seeing in print.
- Never use a long word where a short one will do.
- If it is possible to cut a word out, always cut it out.
- Never use the passive where you can use the active.
- Never use a foreign phrase, a scientific word, or a jargon word if you can think of an everyday English equivalent.
- Break any of these rules sooner than say anything outright barbarous.

From Orwell's essay"Politics and the English Language"

Being Critical isn't being mean it is being engagement

- Engagement is attention to detail, recognition of difference, excitement to question, and a desire to know. If someone doesn't like you being critical they are trying to trick you somehow.
- Engagement is sensitivity to design, and accepting or interacting with multiple layers and dimensions.
- Engagement is intellectual honesty about the limits of your knowledge and the empathetic assumption of honesty but incorrectness or incompleteness by others. In engaging you give them the opportunity to improve.