UNIVERSITÀ DI PISA

Where do good ideas come from? (and how to transform them into reality)

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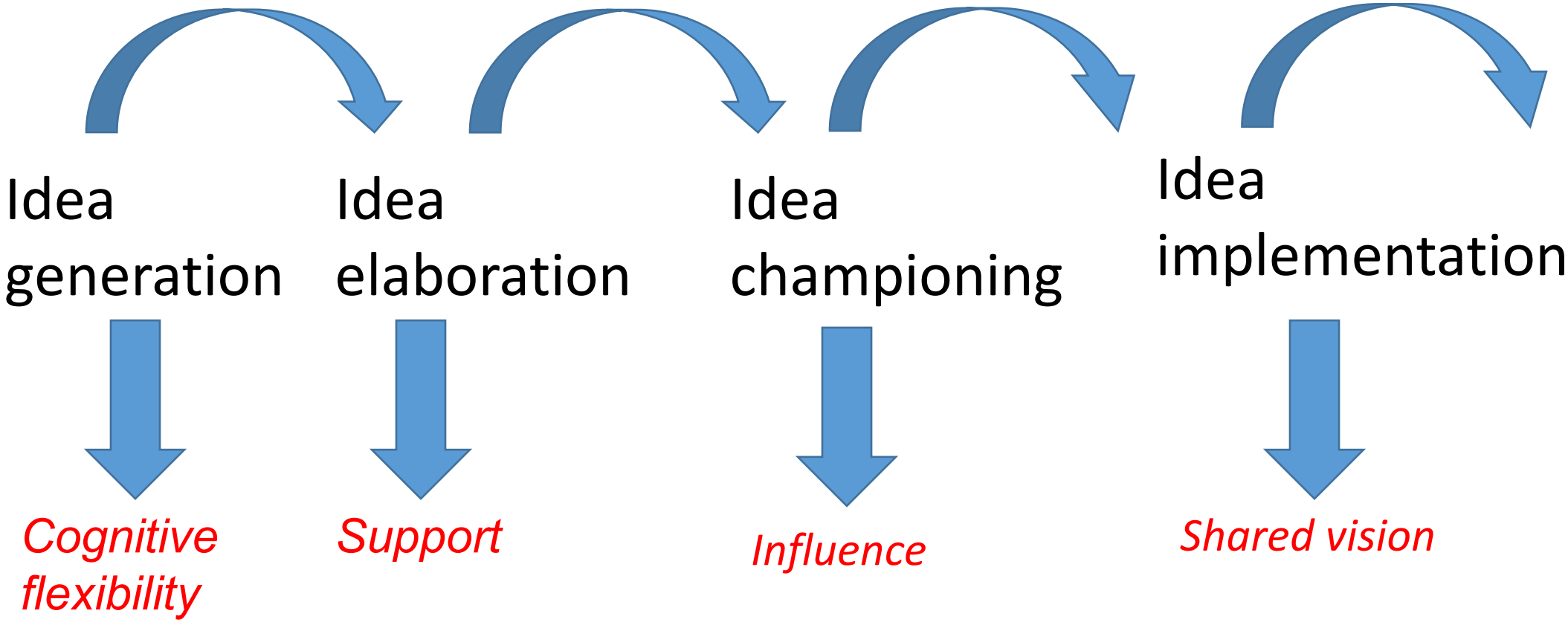
Creativity

Creativity is the production of **novel** and **useful** ideas in any domain

Innovation

Innovation is the successful implementation of creative ideas within an organization

Idea journey



What do we know about the idea journey?

- Your first idea is wrong. Be flexible, adaptive and resilient
- Produce many (many) ideas
- Look for collaboration
- Look for feedback soon
- Wait the right time
- Manage the risk portfolio

Your first idea is wrong

Your first idea is wrong.
So, as quickly as possible, implement a careful plan to learn which of your assumptions are flawed.

Rita McGrath, professor of Entrepreneurship

Firephone
170 mn $ investment, failed one year after launch

Amazon Auctions
Site in competition with e-Bay

Junglee
Site to compare prices, 170 mn $ investment

I have failed million of times

Jeff Bezos
Founder of Amazon

Indeed, Amazon failed at many things it tried, from auctions to venture capital, and its internal financial analysis showed that at its rate of spending, the company wouldn't be profitable for decades.

But Bezos, who had been on a relentless quest for growth, was able to do what most of us could never do: rewire Amazon and his own brain to begin a drive for efficiency that ultimately crushed the nonbelievers.

Bethany McLean (2013)

Be flexible, adaptive and resilient

Number of times the founders pitched investors before finally succeeding

Company	Number of investor pitches
Skype	40
Cisco	76
Pandora	300
Google	350

The collage experiment

Students were asked to give a short speech on their dream job. They were randomly assigned to a positive- or negative-feedback condition (e.g. smiles and vertical nods vs. frowns and horizontal shakes).

After the speech was over, the subjects were given glue, paper and colored felt to make a collage.

Those with negative-feedback created much better collages.

Sadness improved their focus and made them more likely to persist with the creative challenge.

Produce many many ideas

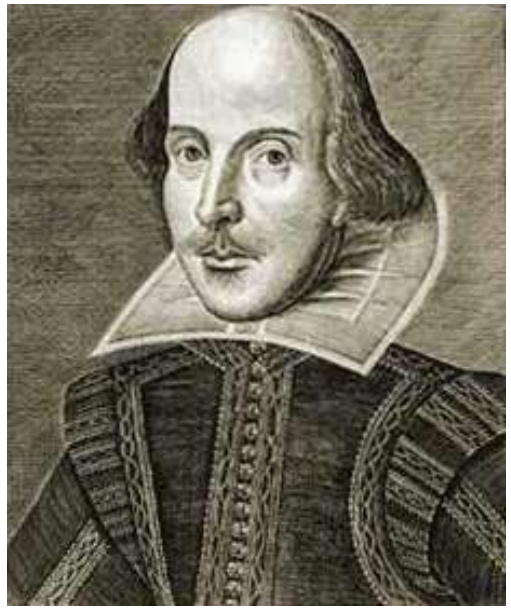
If you want to be original, the most important possible thing you could do, is to do a lot of work. Do a huge volume of work.
Ira Glass, producer of *This American Life*

The odds of producing an influential or successful idea are a positive function of the total number of ideas generated.
Dean Simonton, professor of Psychology

Original thinkers will come up with many ideas that are strange mutations, dead ends, and utter failures. The cost is worthwhile because they also generate a larger pool of ideas- especially novel ideas.
Robert Sutton, professor of Strategy

Nothing is more dangerous than an idea when it is the only one you have.
Emile Chartier, journalist, 1868-1951

The only way to have good ideas is to have many.
Albert Enstein

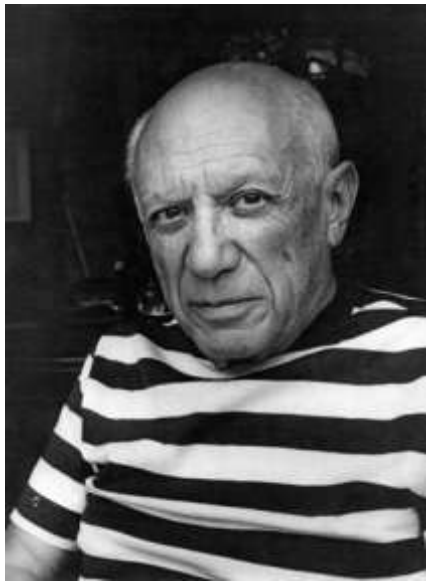


Shakespeare
37 plays
154 sonnets

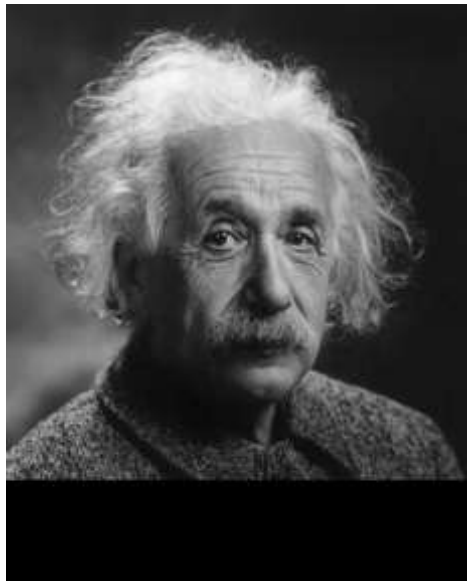
Beethoven
650 pieces

Mozart
600 pieces

Bach
 1,000 pieces



Picasso
1,800 paintings
1,200 sculptures
2,800 ceramics
12,000 drawings



Einstein
248 publications

You gotta kissa lot of frogs before you find a prince
Dean Kamen

Look for collaboration in your team

Innovation greatly benefits from the experience of friendship

- collaborative circles
- «Great Groups»

Innovation is a team enterprise, not a Lone Ranger business

Collaborative circles

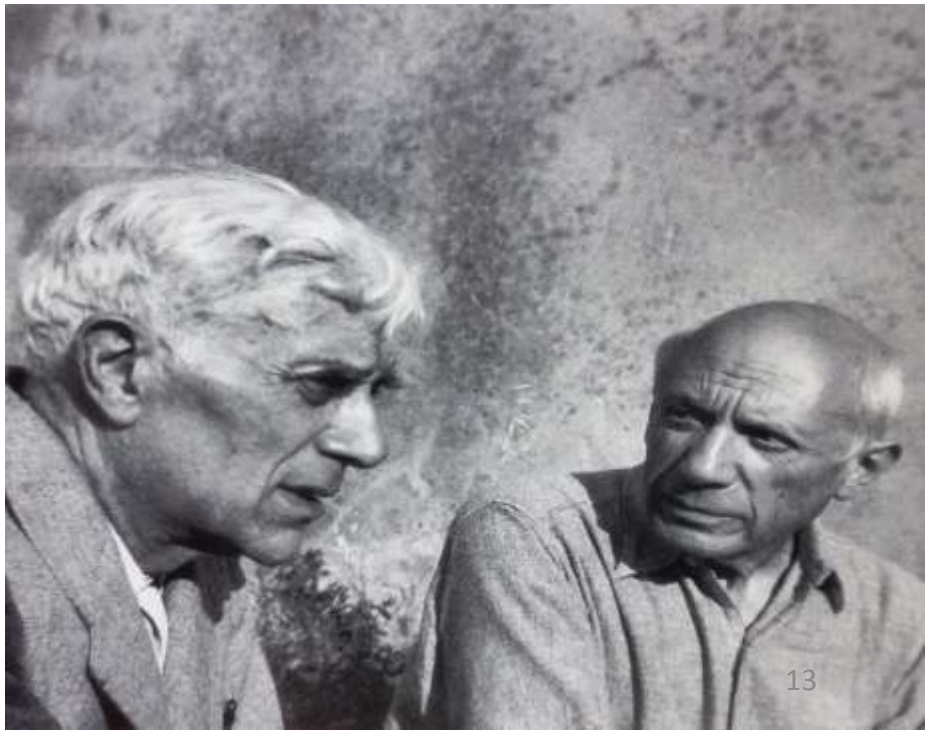
Innovation often flourishes from a personal friendship between the innovators.

Monet, Manet, Degas and Renoir
Freud and his friends
Social reformers Elizabeth Cady Stanton and Susan B. Anthony
Lewis, Tolkien and the Inklings
The Fugitive poets
Conrad and Maddox Ford

Picasso and Braque (1909-1914)

Almost every evening, either I went to Braque's studio or Braque came to mine. Each of us had to see what th other had done during the day. We criticized each other's work.
A canvas wasn't finished unless both of us felt it was.

Pablo Picasso

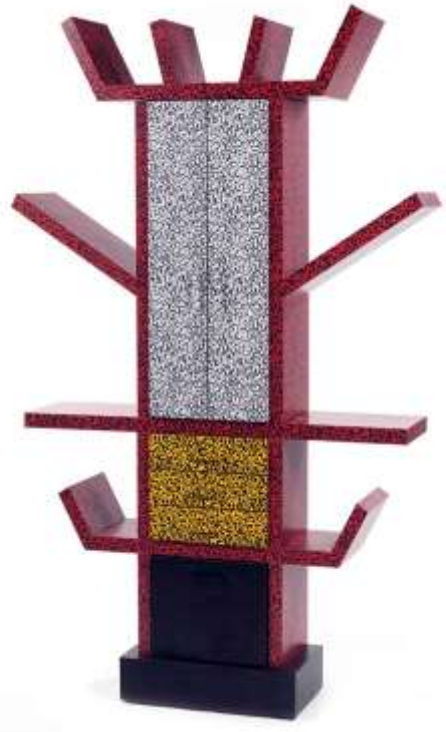


Collaborative circles/2

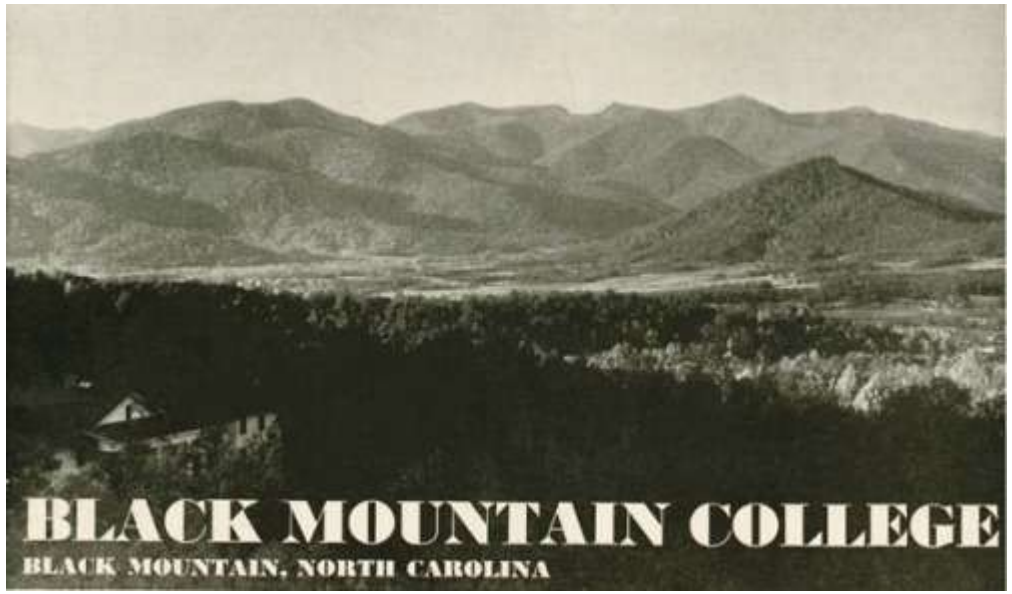
Memphis Milano (1981-1987)

- Collective of designers (Ettore Sottsass, Aldo Cibic, Marco Zanini, Michele De Lucchi, Matteo Thun and others)
- Reaction against minimalism and «good design»
- Post-modernism and kitsch
- Use of poor materials (polipropilene, glass)
- Large impact on industrial design and Made in Italy (Kartell, Artemide)

Michele De Lucchi, *First chair*



Ettore Sottsass, *Casablanca*



Great Groups

parc®
Palo Alto Research Center

People

- Superb people
- Intrinsically motivated

Leader

- Strong leader
- Leader and group create each other
- Leader attracts talented people who smell excitement
- Share information effectively
- Free people from trivial duties
- Protects the group

Collaboration

- People who want to work together
- Isolated from the external world but connected
- Equity in allocation of tasks
- Oriented towards the task- «action places» that deliver

Motivation

- Doing something vital
- Challenging task
- Always have an enemy
- Often have a dark side
- Optimistic

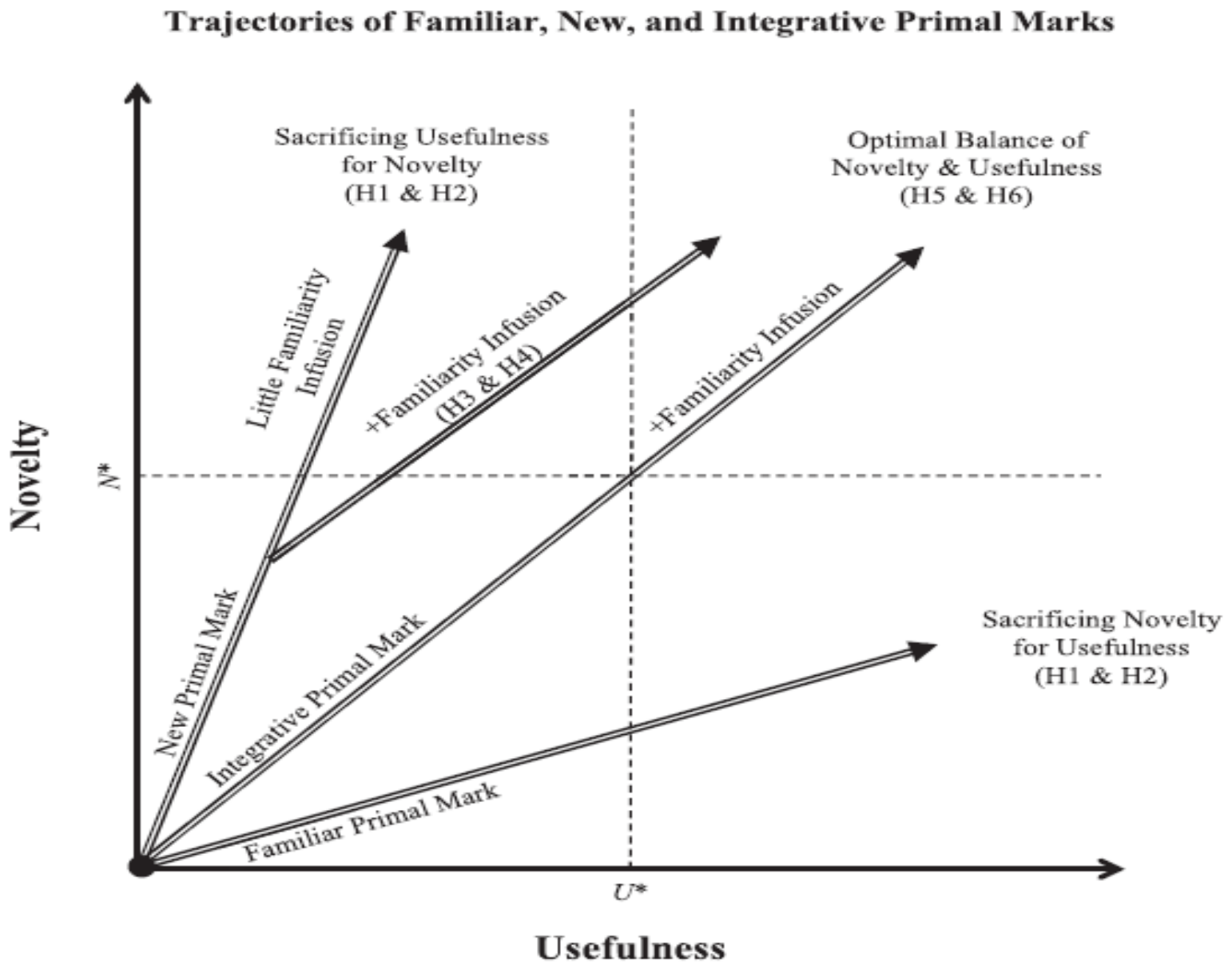
Look for feedback soon

One of the most recent commercial failures (Segway) was due to the inability of the company to listen to feedback.

Limitations of the product
- No substitution of cars
- Wrong market target
- Too large to be used to overcome trafic in town
- Substitution of bycicles- but too expensive
- No way to manage the parking
- No opportunity to hang bags to a hook

Enthusiastic support of Steve Jobs
- Intuition
- Overconfidence

The usefulness-novelty trade off



Look for your peers' evaluation

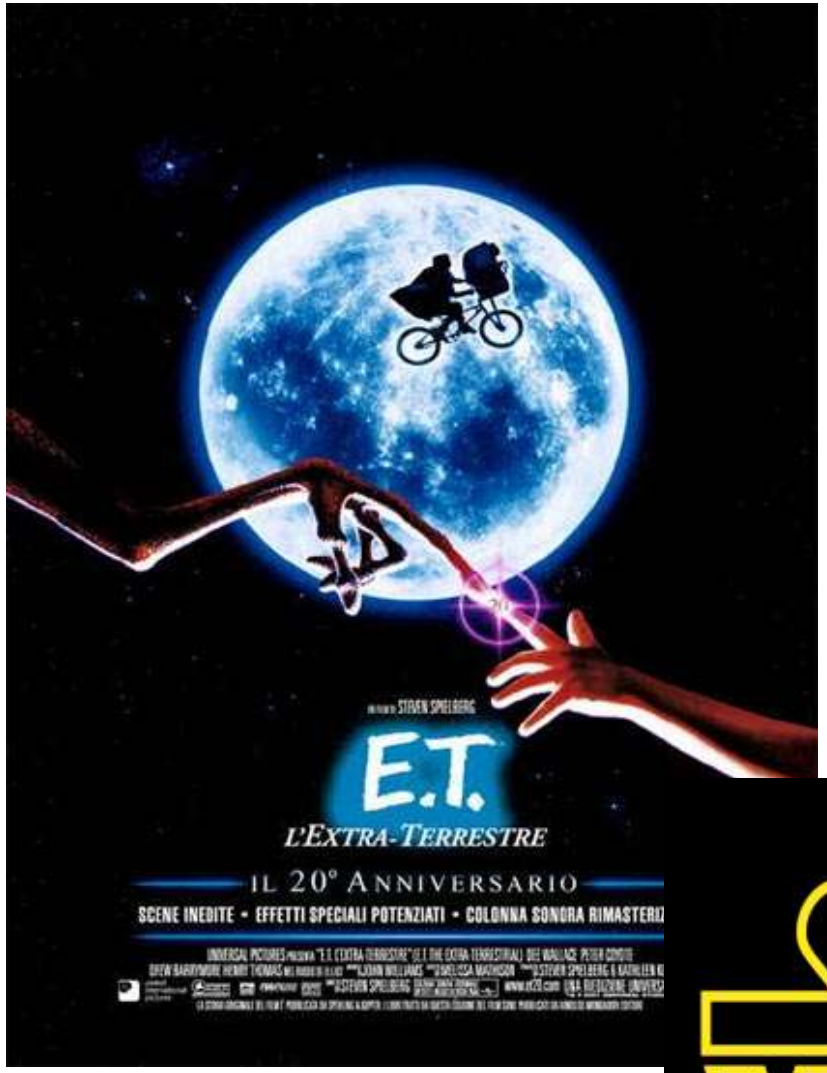
Experts are not necessarily the best source for evaluating novel ideas

- the more expertise and experience people gain, the more entrenched they become in a particular way of viewing the world
- the more successful people have been in the past, the worse they perform when they enter a new environment
- experience is a good source of judgment only in predictable environments

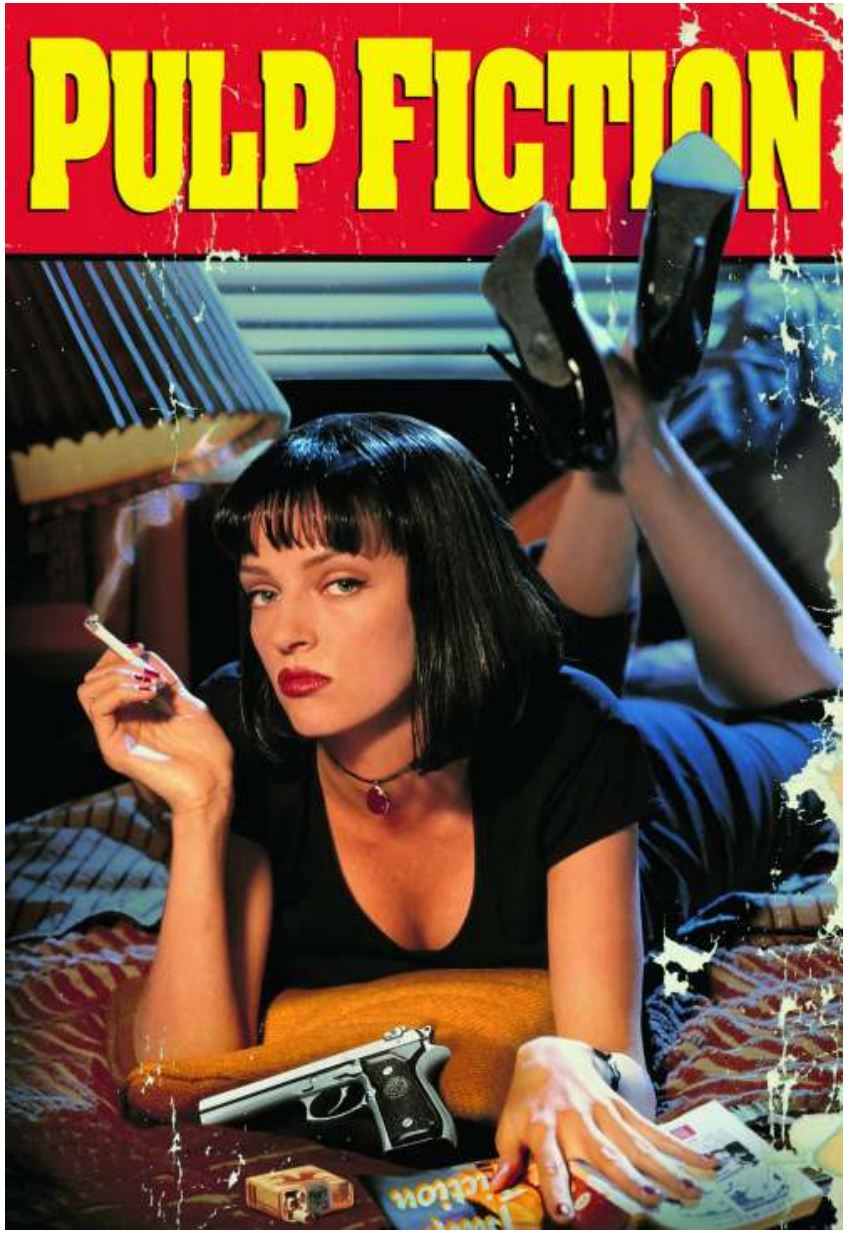
Managers are risk-averse

Audiences and **crowds** are somewhat better- but not necessarily- it depends on who are in the group

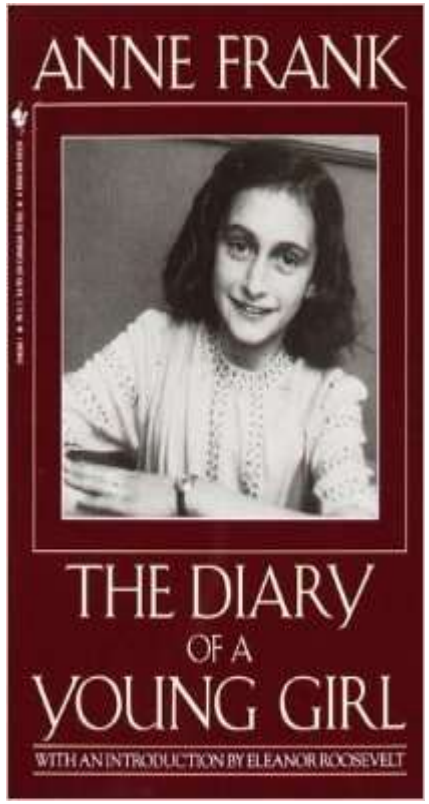
The best source of test for novel ideas are **peers**

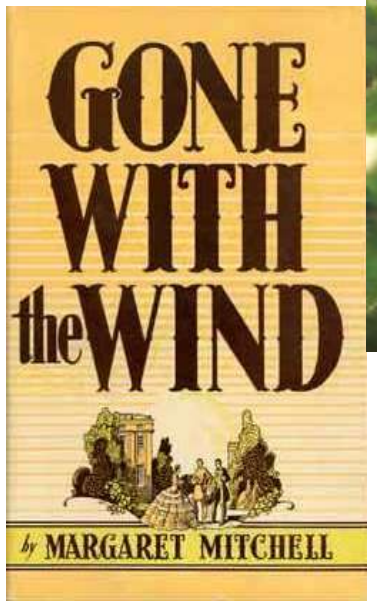


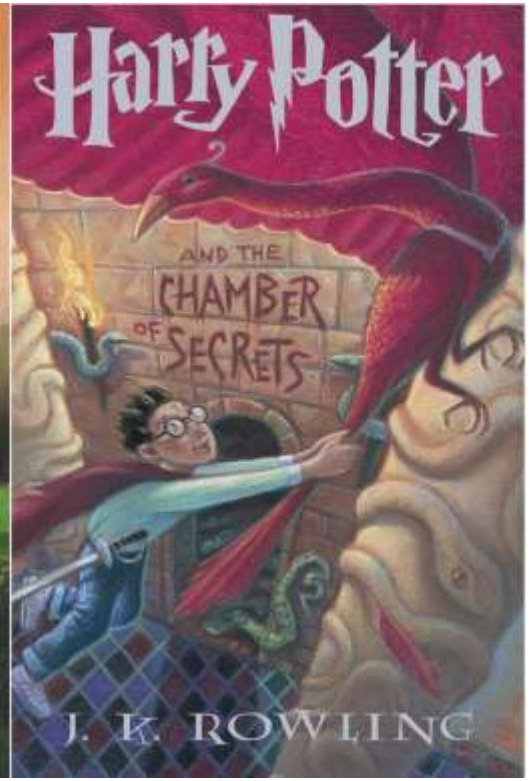
False negatives by studio executives

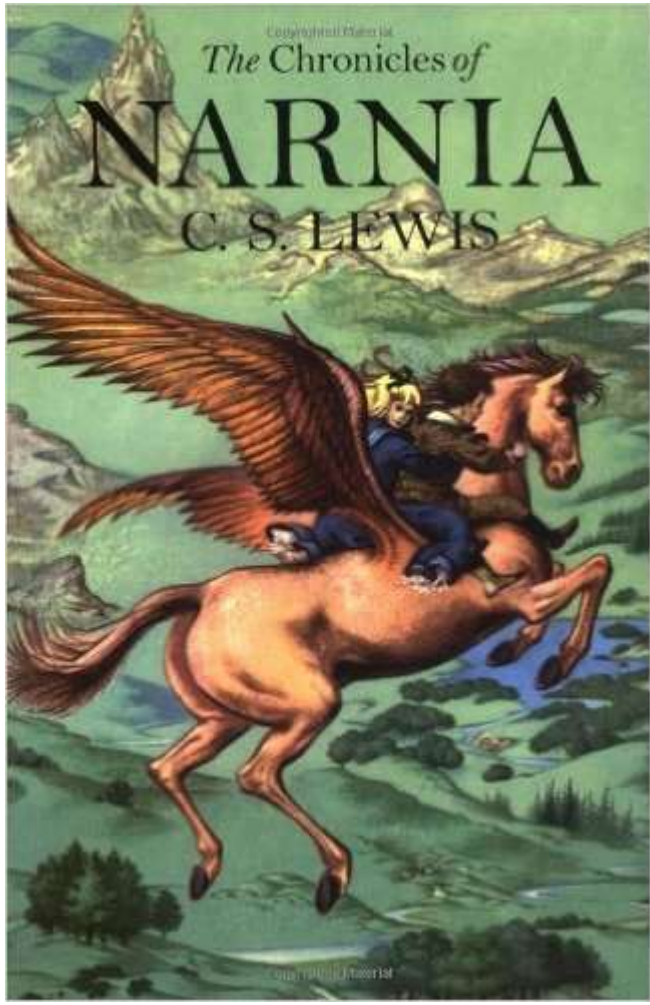


False negatives in publishing









The Circus study

- 150 videos of circus acts from **creators** around the world
- 339 **circus professionals** — including both creators and managers — watch 10 videos and try to predict how successful each video would be with the **audience**
- test of the predictions on a sample of 13,248 audience members

Creators

- poor forecasters of their own ideas
- overestimation of the success

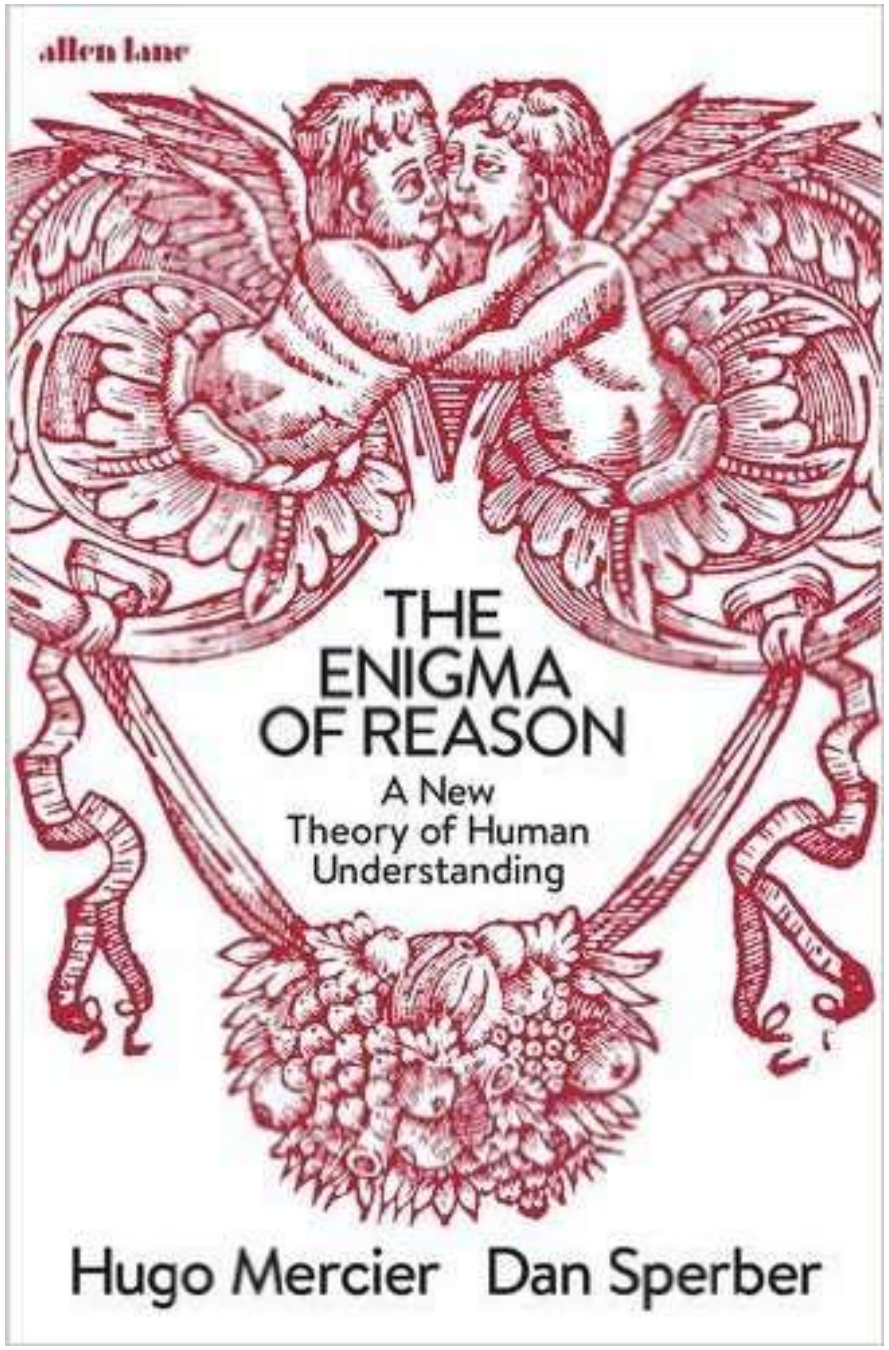
Managers

- poor forecasters
- underevaluation of novel ideas in favor of conventional performers

Who performed better in predicting the success of novel circus acts?

Creators evaluating their peers' creation

- recognition of the value of the novel idea
- understanding performances that deviate from conventional circus art



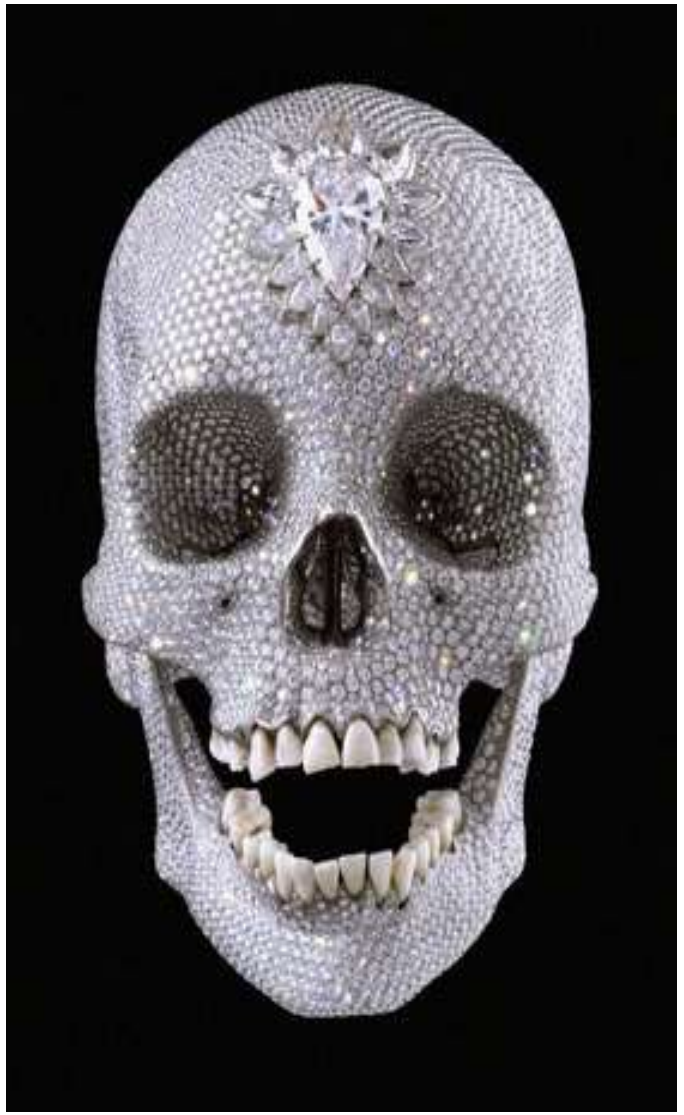
Human reason developed to support the need to interact with others in a complex social organization.

People use arguments to persuade others.

In persuasion people select the favourable arguments and discard contrary evidence

We are much better in evaluating others' ideas than evaluating our own ideas.

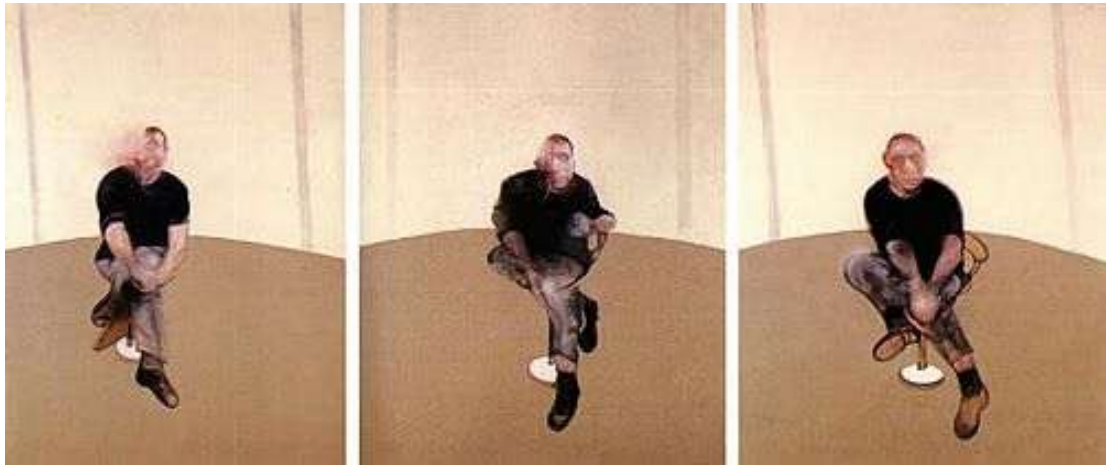
Damien Hirst, ***The physical impossibilities of death in the mind of someone living*** *(1991)*



Damien Hirst, **For the love of God** (2007)

Head VI (1949)

Francis Bacon



Study for a self-portrait. Tryptich 1985-86.

Tryptic. May-June 1973 (1973)

Four successive stages on the exceptional artist's path to fame

1. Peer recognition
2. Critical recognition
3. Patronage by dealers and collectors
4. Public acclaim

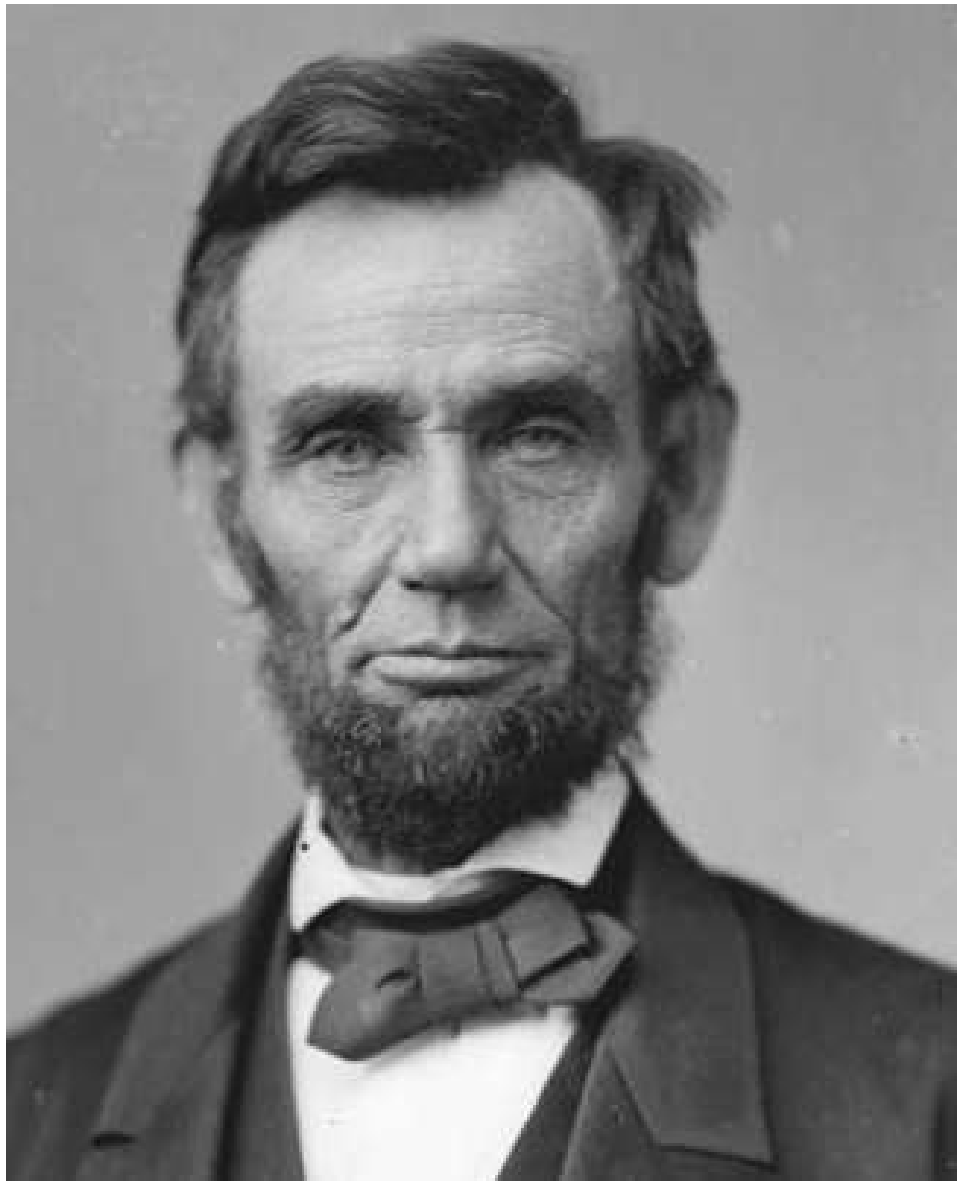
Sir Alan Bowness
Former Director of Tate Gallery

Wait the right time

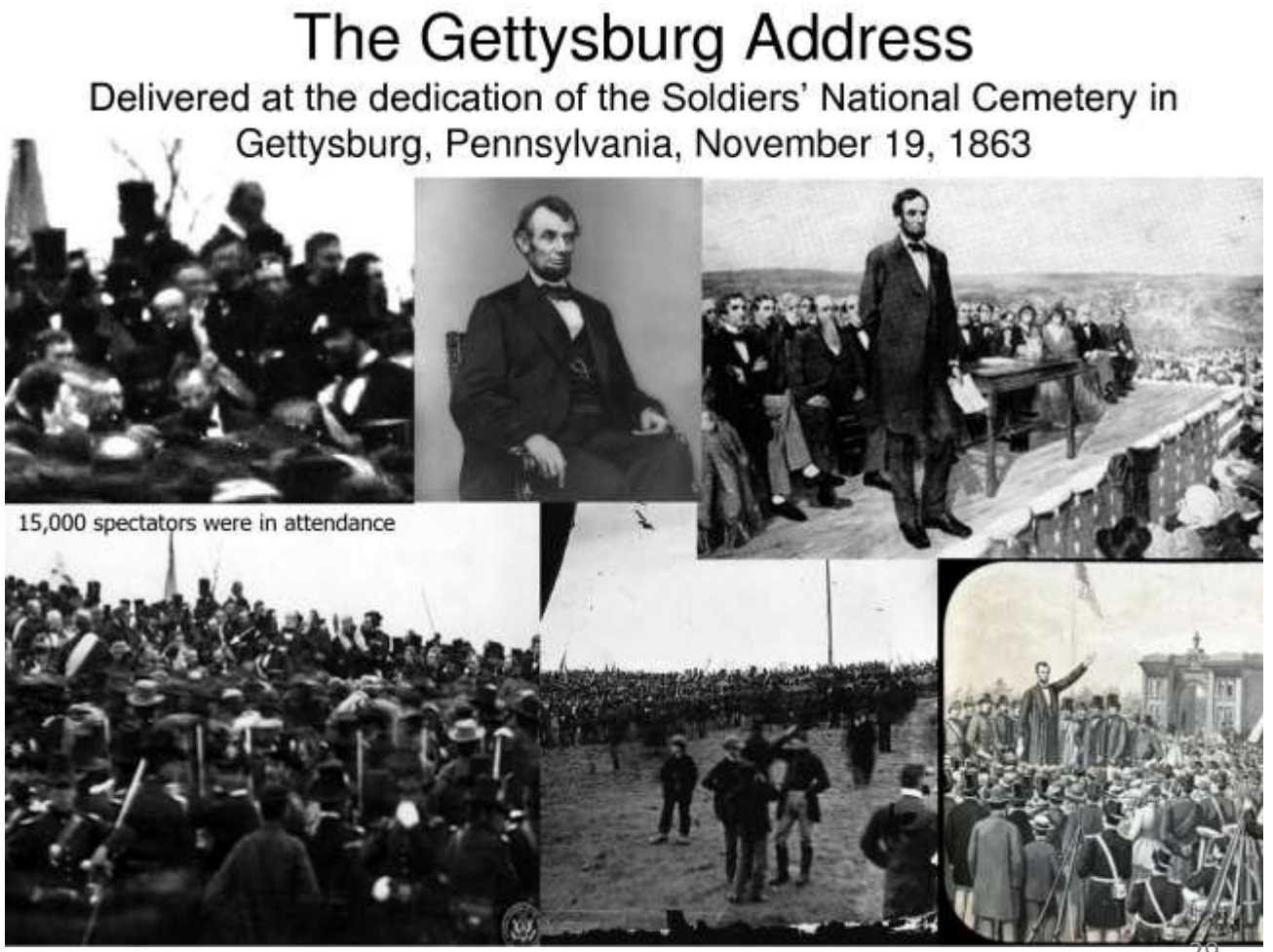
Innovators run the risk of being ahead of time.

Procrastination might be an appropriate strategy

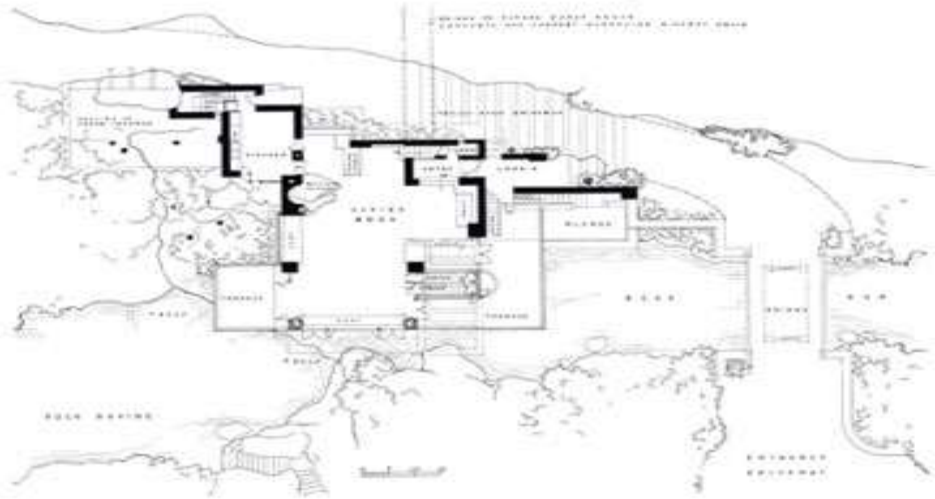
- keep in mind several alternatives until the last minute may help to select
- wait until you have the authority to put in place the innovation you have been thinking for a while



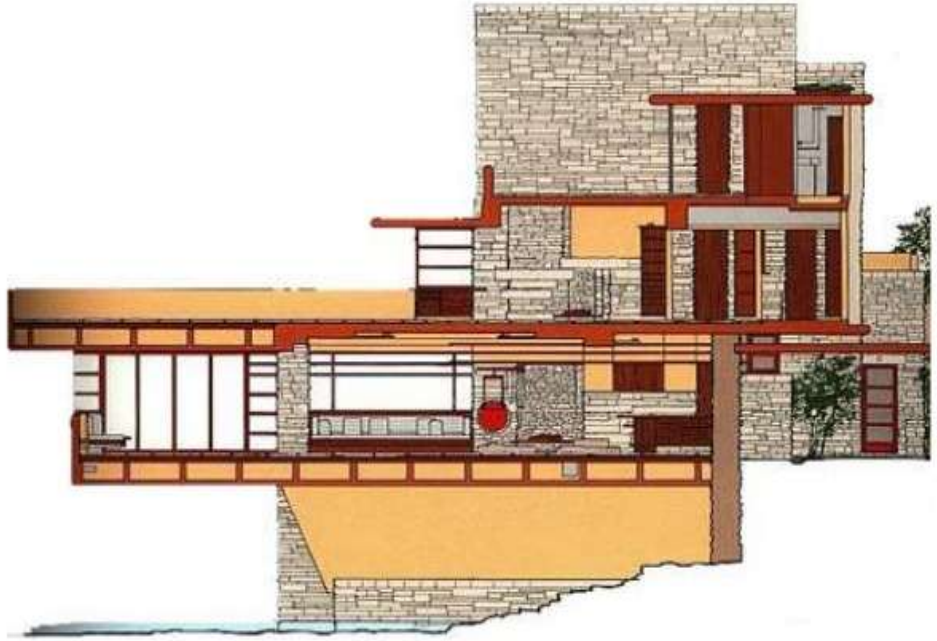
The most famous speech by President Lincoln was written the night before.



After having received the order for the Fallingwater House,
Frank Lloyd Wright procrastinated the work by more than one year.



SECTION OF FALLING WATER:



I have a dream

The most famous speech in XX century was composed the night before the Washington March.

The expression «I have a dream» was not in the written text.

Manage the risk portfolio

People become original in one part of their lives, while remaining quite conventional in others.

Study of > 5,000 US entrepreneurs, 1994-2008.
Entrepreneurs who kept their jobs at the early stage of the startup period were 33% *less likely* to fail.

«No person could possibly be original in one area unless he were possessed of the emotional and social stability that comes from fixed attitudes in all areas other than the one in which he is being original» (Edwin Land, founder of Polaroid).

What do we know about new ideas?
(or, is there some method in madness?)

Though this be madness, yet there is method in ’t.
Shakespeare, *Hamlet*, Act 2, Scene 2

What we know about creativity is a blend between detailed case histories, anecdotical evidence, some economic/mathematical modelling, lot of experimental psychology and cognitive science

Although we are still far from a «science of innovation», some element of method in the madness can be found.

Creativity

Expertise
- domain knowledge and skills

Cognition (creative thinking)
- divergent thinking

Conation (personality traits and motivational factors)
- risk taking
- openness to experience
- information seeking
- sensation seeking/ novelty seeking

Culture
- social acceptance of novelty
- anxiety generated by the mismatch between one's own preferences and others

Stages of creative thinking

Task identification (defining the creative problem at hand)

Preparation (gathering and activating knowledge that might be relevant to the task)

Response generation (developing possible ideas)

Response validation (elaborating and evaluating possible ideas until one is satisfactory)

Source: Amabile (1996)

Break the cognitive path dependency

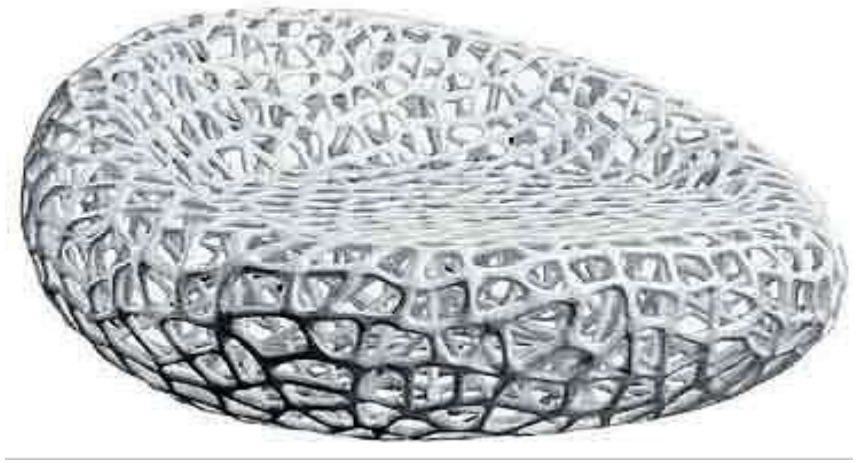
Creative thinking must overcome the natural tendency of human cognition to exploit existing knowledge in usual ways, or

fixedness

In the search for novel *and useful* ideas, there is a need to overcome

functional fixedness

or the tendency to atttibute to objects those functions that have been traditionally attributed to them («mental block against using an object in a new way that is required to solve a problem»: Duncker, 1945).




eye

Objects are cognitively associated to the uses they are commonly intended for

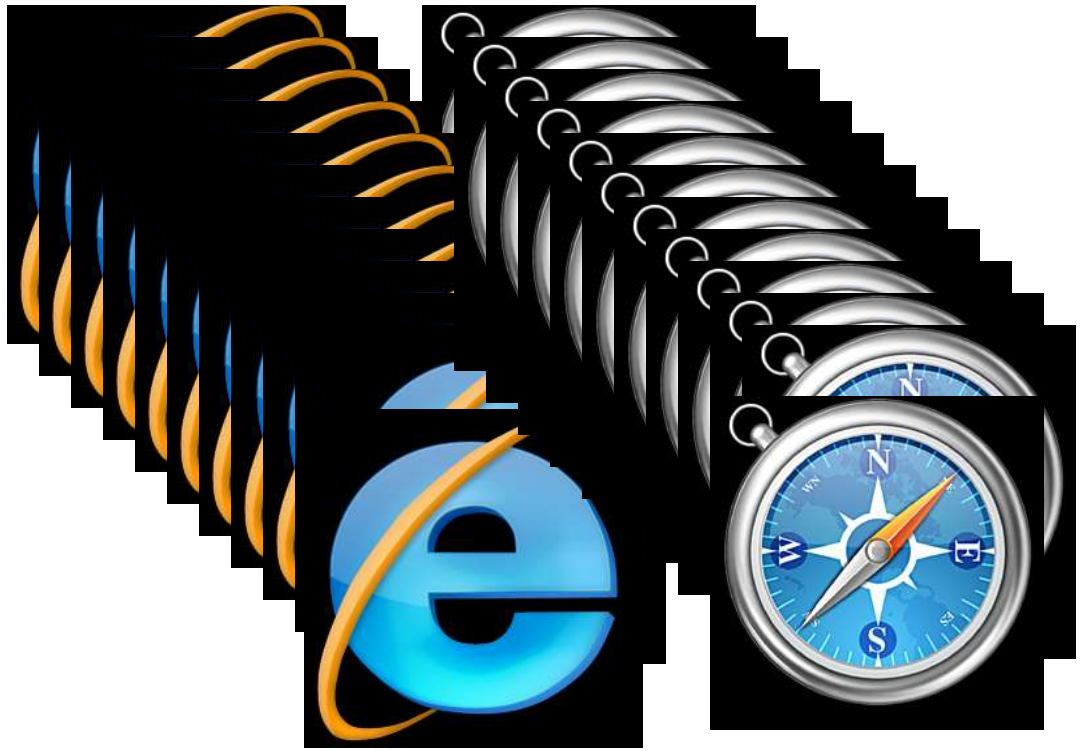
Is there a fundamental difference between these four browsers?

Not really.

Yet substantive research (>30,000 cases) showed that customer service agents using Firefox and Chrome (right) performed significantly better than those using Internet Explorer and Safari (left):

- higher sales
- customers happier
- call times shorter
- less likely to miss the work

Why?



Internet Explorer is built into Windows for PC users.

Safari is pre-installed in the Mac.

Almost 2/3 of the customer service agents used the default browser, without asking whether a better browser was available.

In order to use Firefox or Chrome you have to take some initiative and search for a better solution.
These people approached the work in the same way, looking for novel ways of addressing the problems of their customers.

They were able to overcome the «system of justification».

The Swiffer story

Procter & Gamble asked a market research company to study a way to eliminate the thin layer of dust that remains over the floor of houses.

When Continuum came up with the idea of Swiffer, it was initially rejected.

The committee that was overseeing the project was formed mainly by people from the detergent businesses.

P&G had asked a new detergent, at the end of the day.

Luckily enough (for P&G) the project was eventually approved. The Swiffer product lines account for more than 2bn $.

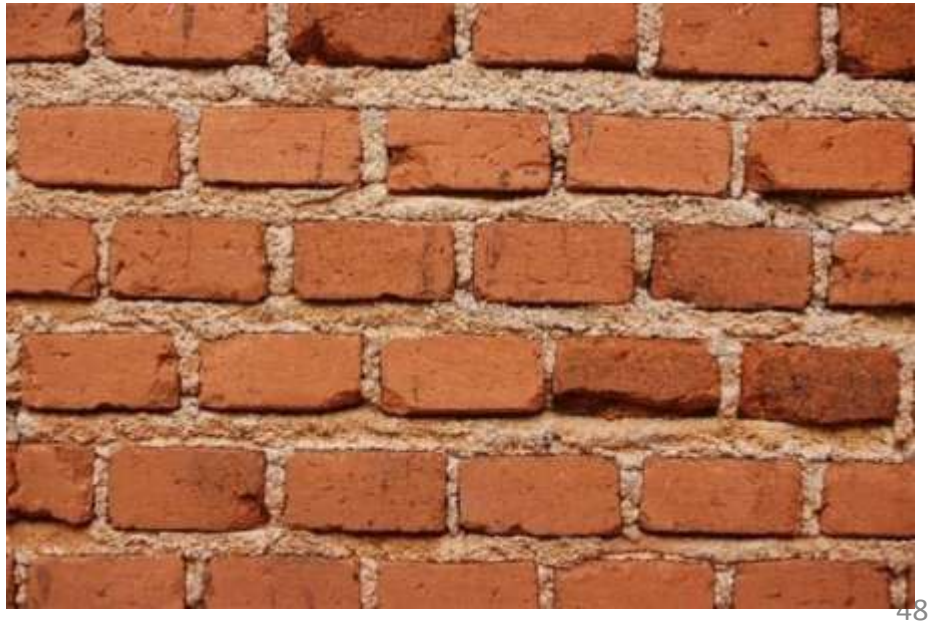

Swiffer
360°
DUSTERS


NEW
Swiffer
Dusters
5
Improved

Children are not subject to functional fixedness

What can we do with a brick (other than walls)?

Can we build a wall without using bricks?



Roman dodechaedron. Lyon, Gallo-Roman Museum

What is the function of this object?

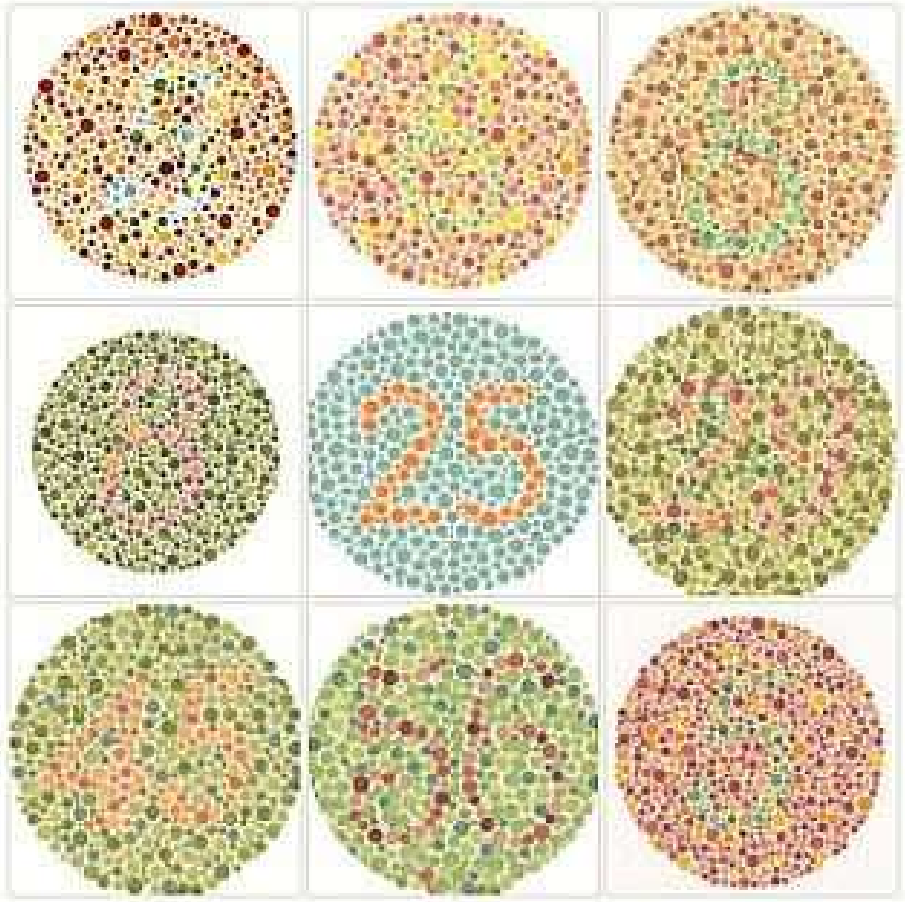
Roman dodechaedron III-II century b.C.

More than one hundred of these artifacts have been found across Great Britain, Belgium, Germany, France, Luxembourg, Netherlands, Austria, Switzerland, and Hungary.

Many theories and speculations have been put forward

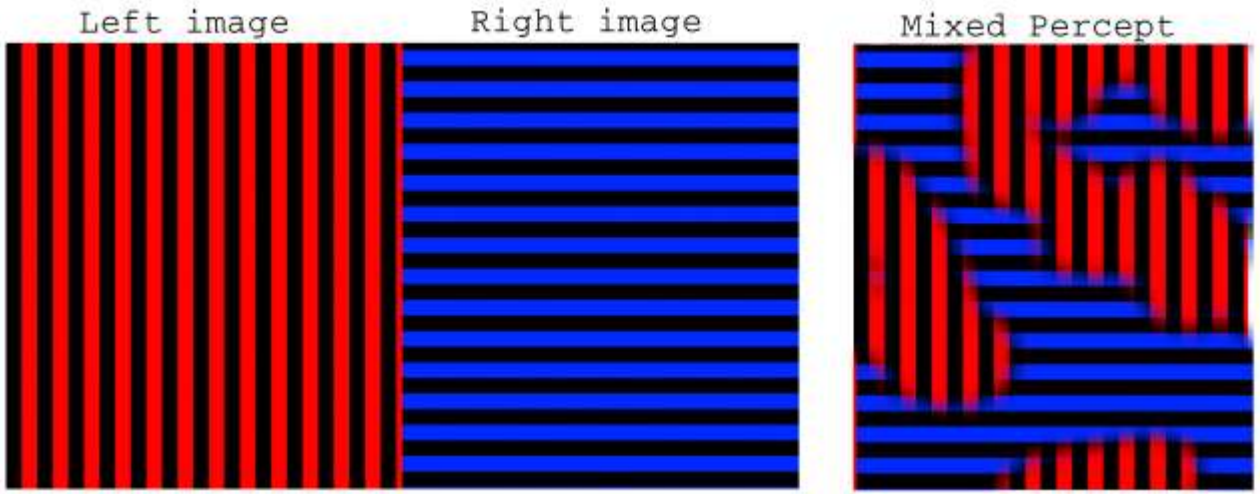
- candlestick holders (wax was found inside one example)
- dice
- survey instruments
- devices for determining the optimal sowing date for winter grain,
- gauges to calibrate water pipes
- a range measuring object on the battlefield (calculating the trajectories of projectiles)
- staff or scepter decorations
- a toy to throw and catch on a stick
- religious relics
- simply a geometric sculpture

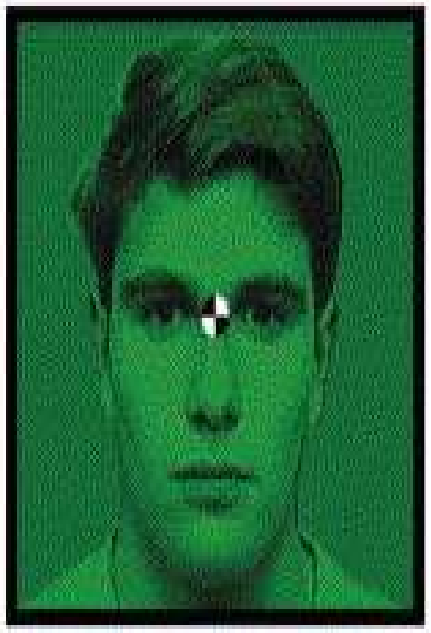
Creative people «see things differently»

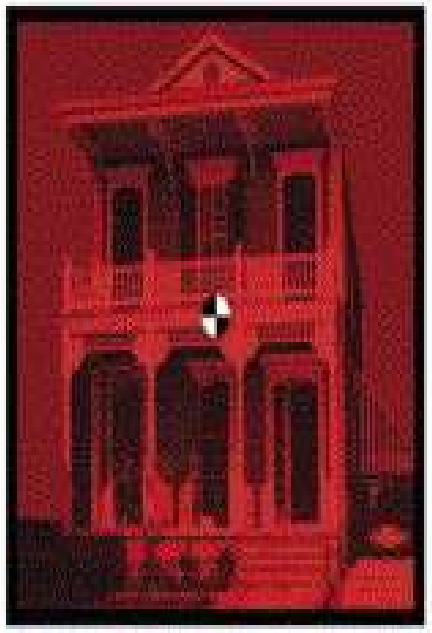


Innovation begins with an eye (IDEO)

Binocular rivalry







People tend to alternate between right-eye and left-eye representation

Sometimes people form a mixed percept image by merging the two images

Mixed percept has
- High variability between individuals
- Low variability within individuals (across time and tasks)

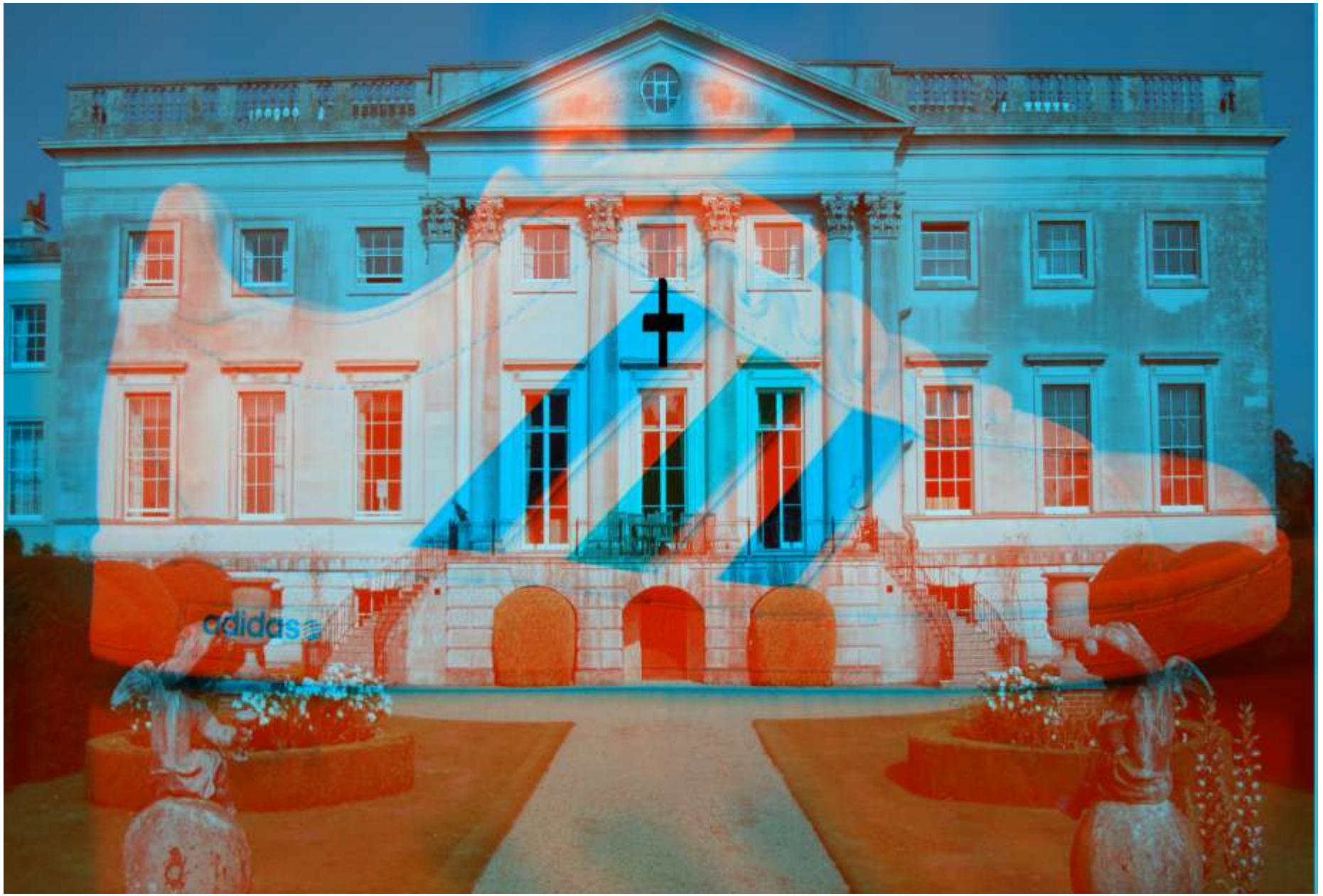
Openness to experience

One of the five constructs of the **«Big Five» personality measurement tool** largely adopted in psychology

- Flexible and inclusive cognition («Breadth, depth and permeability of consciousness»)
- Open people are more curious and creative
- Open people are more motivated to explore the world and engage with possibilities
- Open people process stimuli that others ignore
- Flexibility in binding of different representational elements in the brain
- Openness predicts performance on divergent thinking (identify multiple divergent uses for ordinary objects)
- Openness implies a reduction in latent inhibition

People high on the Openness scale form mixed percept images with more frequency than others: they «see things differently».

The effect is magnified by the external context (positive mood for mixed percept).



Training of rats to respond across three operanda

- a key
- a left lever
- a right lever

Response sequences were reinforced through the delivery of food.

Experimental control

- Some of the keys do not deliver food
- Rats rapidly learn to avoid these keys

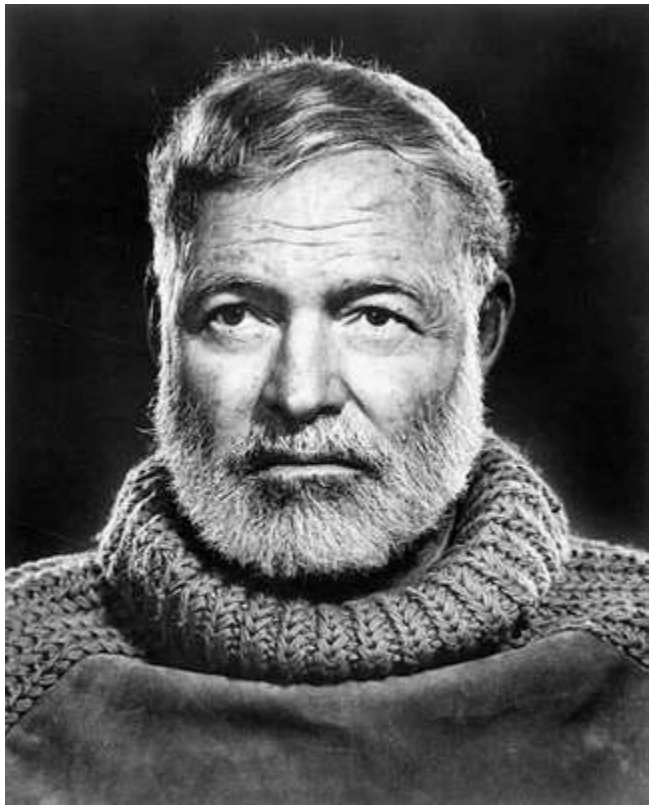
Extinction of resources

- Experimenter manipulate the conditions by eliminating resources in one of the keys
- When rats experience shortage of food, «occasionally try something different»
- Surprisingly, rats try the keys that previously were found ineffective
- Reduction in reward expectation increases variation in the form of behavior
- Animals engage in novel or unusual behavior in situations where they have learned that positive reinforcement is unlikely

Innovative behavior is triggered by **unsatisfactory performance**

Jackson Pollack

Sylvia Plath



Ernest Hemingway

Virginia Woolf

Animals engage in highly novel and variable behavior induced by low reinforcement expectation,
as it happens for depressed individuals.

Connection between human creativity and mood disorders

- Depressive disorder
- Bipolar disorder
- Manic-depressive disorder

They report feeling helpless and hopeless. Nothing good will happen regardless of their actions.

Offspring of psychiatric patients are twice as likely as normal individuals to work in creative professional fields.

How to generate many good (novel + useful) ideas?

(without necessarily get mood disorder)

Main patterns of creation

- Recombination
- Negation
- Analogy
- Abstraction

Recombination

Recombination involves the use and re-use of existing components for the creation of a new solution.

«Putting new things in old combinations or old things in new combinations» (Karl Weick)

Existing components are often available to everybody.
Yet only the innovator is able to identify the potential for their novel recombination.

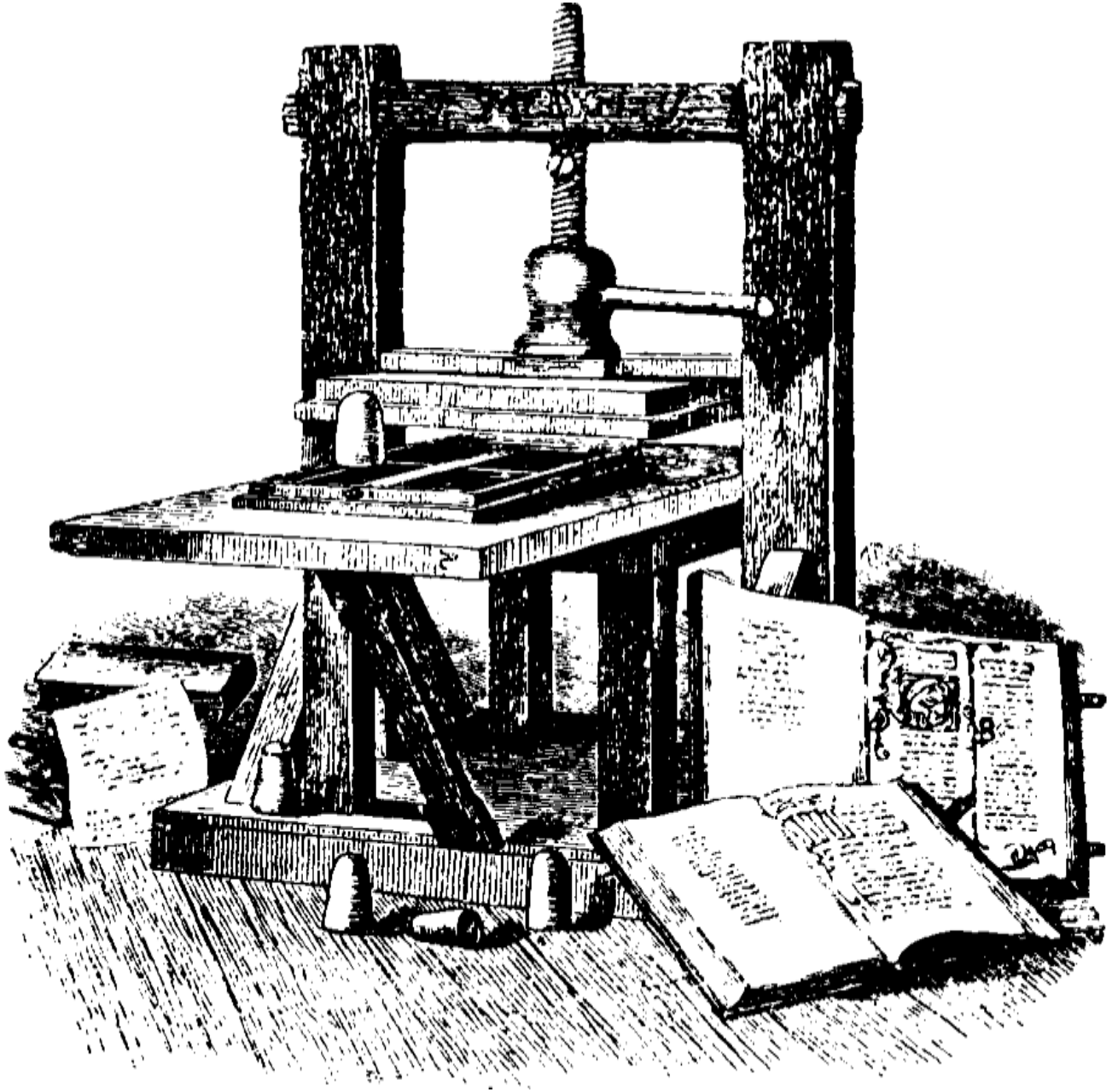
Innovators watch what everybody else watches, but see what nobody sees.


SONY
Google
10:08
htc
SAMSUNG
12:45

Johannes Gutenberg
Printing press (1436-1450)

Gutenberg was a goldsmith familiar with techniques of cutting punches for making coins from moulds.

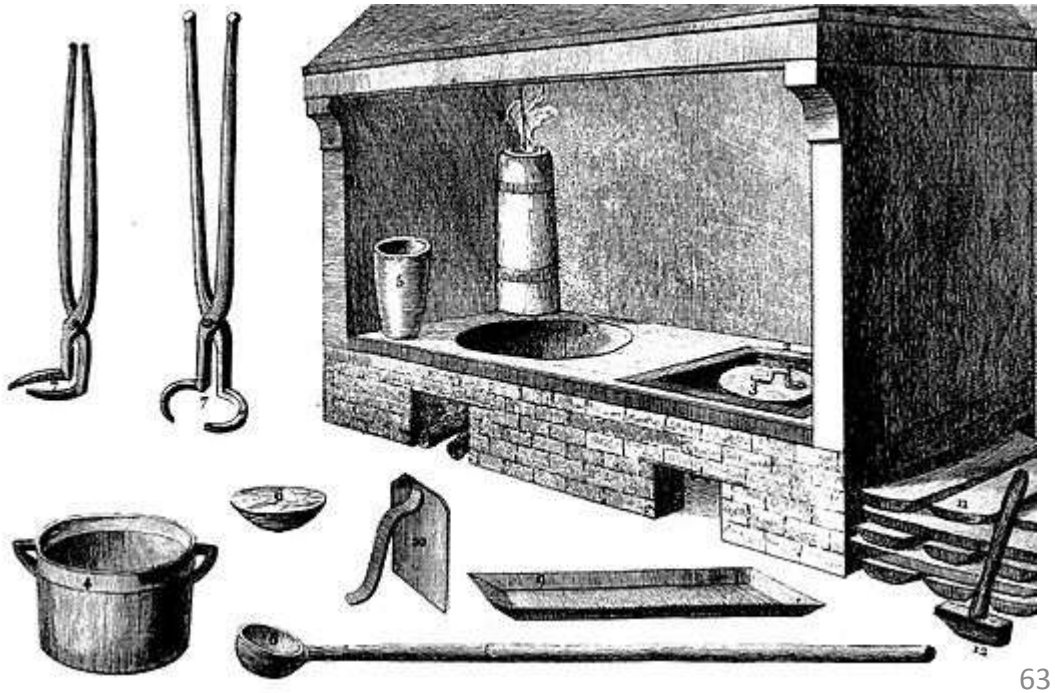
He then invented a way to cast letters from matrices. With this technique he opened the way to movable type printing.



Hand mould

A technique to cast letters from a matrix, in order to obtain single letters to be placed in a movable type press.

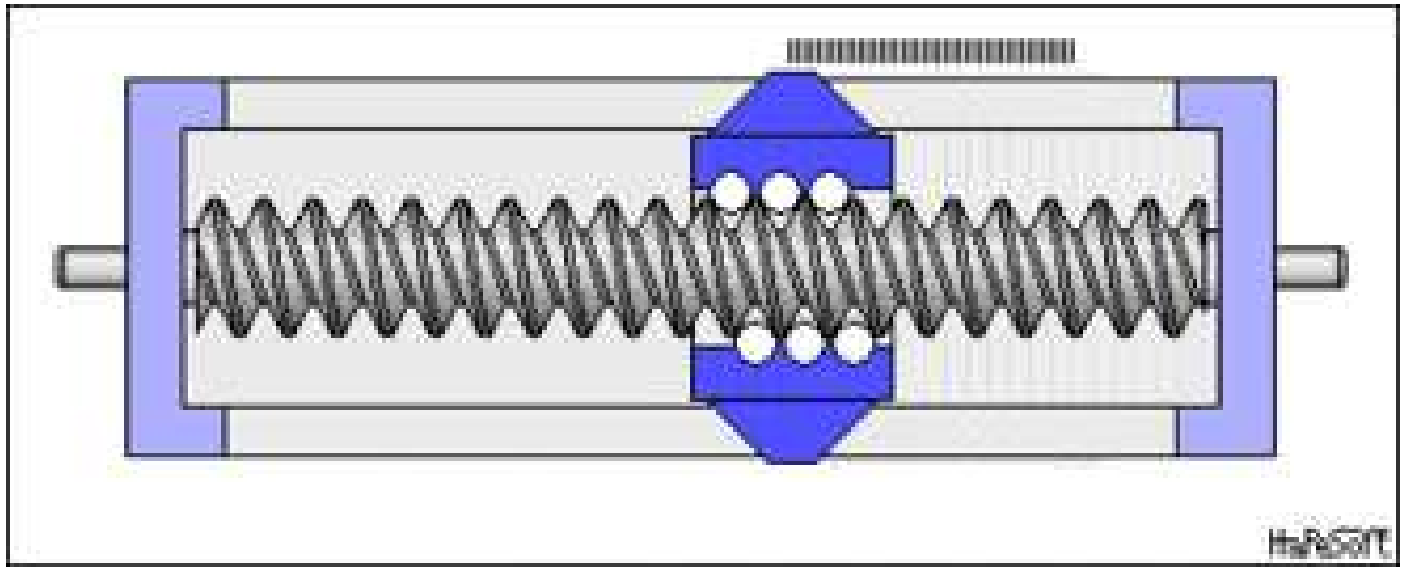
Types were created out of lead, tin and antimony.



Screw press

Gutenberg adapted a screw press machine in order to place pressure on the sheets of paper in a homogeneous way.

The screw press process was largely used in agriculture, e.e. winepress.



Industry 4.0 is not a new technology but

A **recombination**
driven by the applications
of existing technologies
whose cost has been falling significantly
while usability greatly improved over time

Enabling factors

- Fall in cost of sensors (e.g. RFID)
- Machine-to-machine communication
- Last generation mobile networks (4G, 5G)
- Increase in computation power (*cloud computing, fog computing*)
- Cyber-security
- Recent developments in Artificial Intelligence (*deep learning*, *machine learning*)

TECNOLOGIE PER L'INDUSTRIA 4.0

PRODUZIONE	LOGISTICA INTERNA	ACQUISTI	MANUTENZIONE	LOGISTICA ESTERNA	DISTRIBUZIONE E VENDITE	SERVIZI POST-VENDITA
robot cobot rfid/nfc microcontrollori sensori cloud processori plc	droni agv gps indoor rfid dispositivi di visualizzazione cloud auto-unloading	rfid sensori block chain auto-unloading	wearable devices sensori realtà aumentata tablet cloud	droni block chain rfid sensori cloud gps	sensori cloud microcontrollori data minig microprocessori	piattaforme web sistemi di diagnostica automatica
RISORSE	sensori	microprocessori		microcontrollori	attuatori	
RETE	wi-fi	bluetooth	3G 4G	rfid/nfc	5G lpwan	zigbee
CYBER SECURITY	firewall		sistemi di crittografica		block chain	
BIG DATA & ANALITICS	fog	data mining		intelligenza artificiale		cloud
SIMULAZIONE	agent based		system dynamics		discrete events	

Industria 4.0 Senza Slogan©

Is recombination a random process?

All this creative power of the mind amounts to no more than the faculty of compounding, transposing, augmenting, or diminishing the materials afforded us by the senses and experience.

When we think of a golden mountain, we only join two consistent ideas, *gold*, and *mountain*, with which we were formerly acquainted.

David Hume
An enquiry concerning human understanding

Is recombination a random process?/2

A natural experiment- **imaginary animals**

- existing in mythology since antiquity
- no constraints on imagination
- large diffusion in Middle Age («*Bestiario*»)
- topics of contemporary art (e.g. Picasso- Mynotaure) and literature (Borges)

Yet

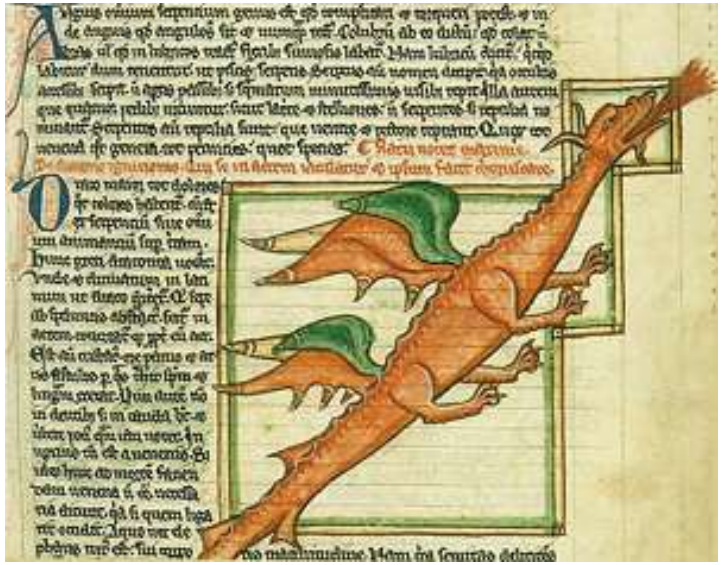
- the list of *all* imaginary animals is relatively *short*
- most imaginary animals combine the features of *only two*, maximum three, existing animals

If recombination were based on random matching of components of animals we would see a much larger collection of imaginary entities.

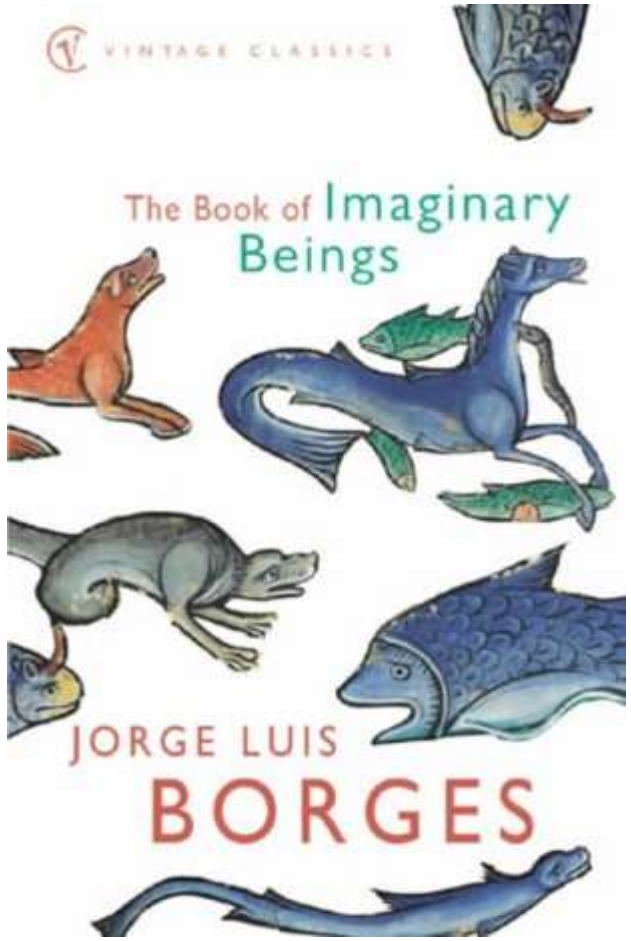
Mynotaure

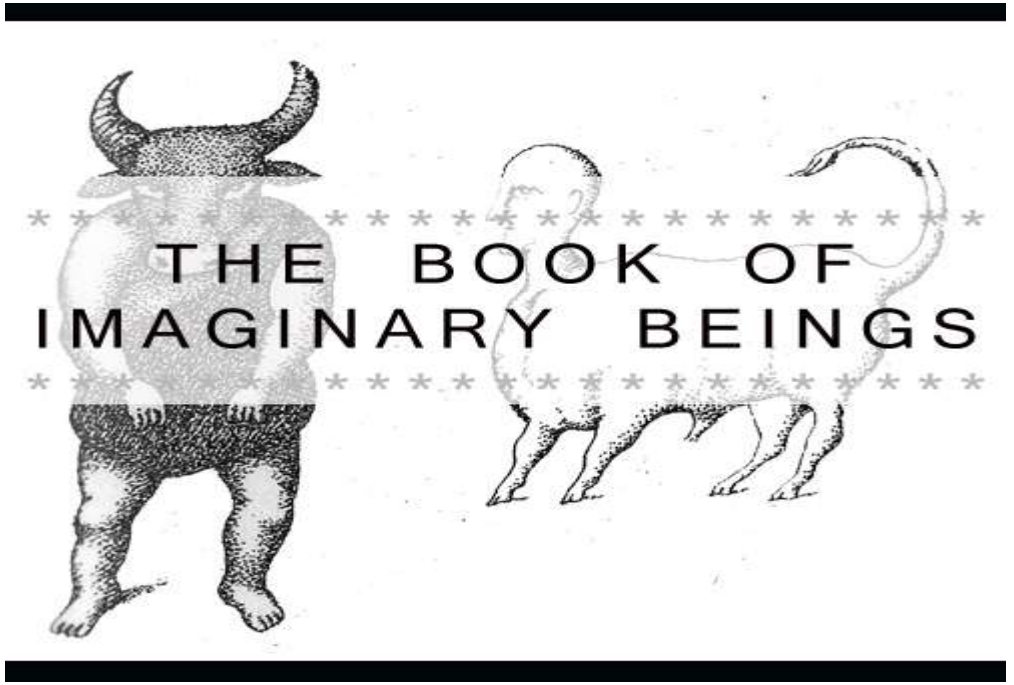
Chimera

Syrens

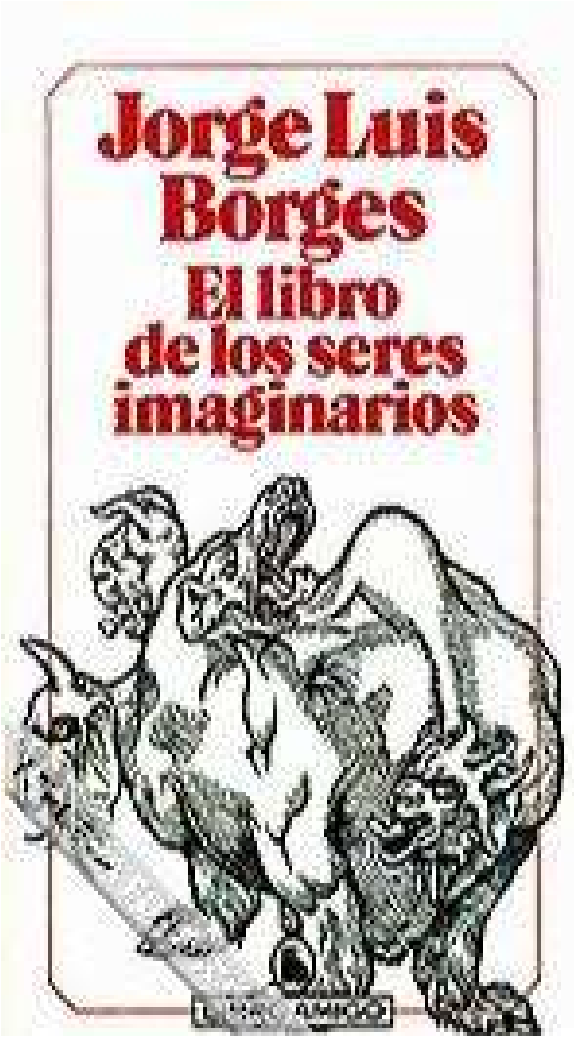


Even in Middle Age the variety of phantastic animals was not so great





1. those that belong to the Emperor,
2. embalmed ones,
3. those that are trained,
4. suckling pigs,
5. mermaids,
6. fabulous ones,
7. stray dogs,
8. those included in the present classification,
9. those that tremble as if they were mad,
10. innumerable ones,
11. those drawn with a very fine camelhair brush,
12. others,
13. those that have just broken a flower vase,
14. those that from a long way off look like flies.



Recombination is *not* a random process

Recombination does *not* involve a process of random assembly of single pieces- this would take a computational time exceeding the life of innovator (in some cases, exceeding the life of the universe…).

It is based on a **mental model** that allows the identification and selection of **those elements of the problem that offer the greatest potential for recombination.**

«Creative masters learn to find, evaluate, and explore more combinations than other people. They get better at guessing which combinations will be more interesting, so their odds improve. They also learn there are reusable combinations, or patterns, that can be used again and again to develop new ideas or modify existing ones».

Scott Berkun, *The myths of innovation*

Giacomo Tachis died on February 6, 2016.
He was hired as junior enologist by Niccolò Antinori in 1961

He created a number of worldwide famous wine labels

- Sassicaia
- Solaia
- Tignanello

In Tuscany

- Terre Brune
- Turriga

In Sardinia.

Among his recombinant innovations

- Break with the Chianti traditional disciplinare (Cabernet)
- Malolactic fermentation
- Barriques

Marchese Mario Incisa della Rocchetta, from an old family tradition in wine production, started to grow French vines in Piedmont.

His dream was to achieve the levels of quality of the French Bordeaux wines.

After marrying Clarice della Gherardesca he became the owner of land in San Guido, Bolgheri, in Tuscany.

He then realized that the stony land was similar to the one in Graves, in the Bordeaux regions. He then started to plant Cabernet Sauvignon in Tuscany.

The Sassicaia wine was born.

The Sassicaia story

Initially the results were modest. He started to sell the wine in the late 1960s.
Among the obstacles

- In Tuscany there was a long tradition of autoctone vines (Sangiovese) so that a French type was considered unreliable
- The Bolgheri area had no tradition in wine production
- The French ones were small plants, which required a complete change in the grape growing process
- Workers were reluctant to change the mode of grape harvesting
- The wine was fermented in barriques (metal vat), which required a completely different process than wooden barrels.

Incisa della Rocchetta was supported by Giacomo Tachis, from the Antinory company.
They started to organize closed-door meetings with friends, who could comment and give suggestions, and also criticize. Year after year, there were small improvements, until something big happened.

In 1978, the British expert Hugh Johnson organized a blind test with the top 33
Cabernet of the world for the leading magazine *Decanter*. Sassicaia was number one.

From that date it became one of the world's most celebrated wine.

Negation

Negation is an innovation pattern in which a crucial component of a solution is reversed or suppressed. In this way the novel solution is distant from the existing ones.

Facing the dramatic crisis of the circus show, the Cirque du Soleil eliminated the single most important asset of circus companies- living animals.
Cirque du Soleil is a circus without the circus.

Not all negations are innovations.
The successful innovator is able to **identify exactly those dimensions of the existing solutions whose negation is the most productive**.
The identification of this dimension turns out to be extremely difficult.

How can we prevent all traffic accidents that results from human error?
Answer: **to remove the driver from the equation**.

How can we design a table that could be made and sold, at a profit, for five euros?

Audi R10 TDI

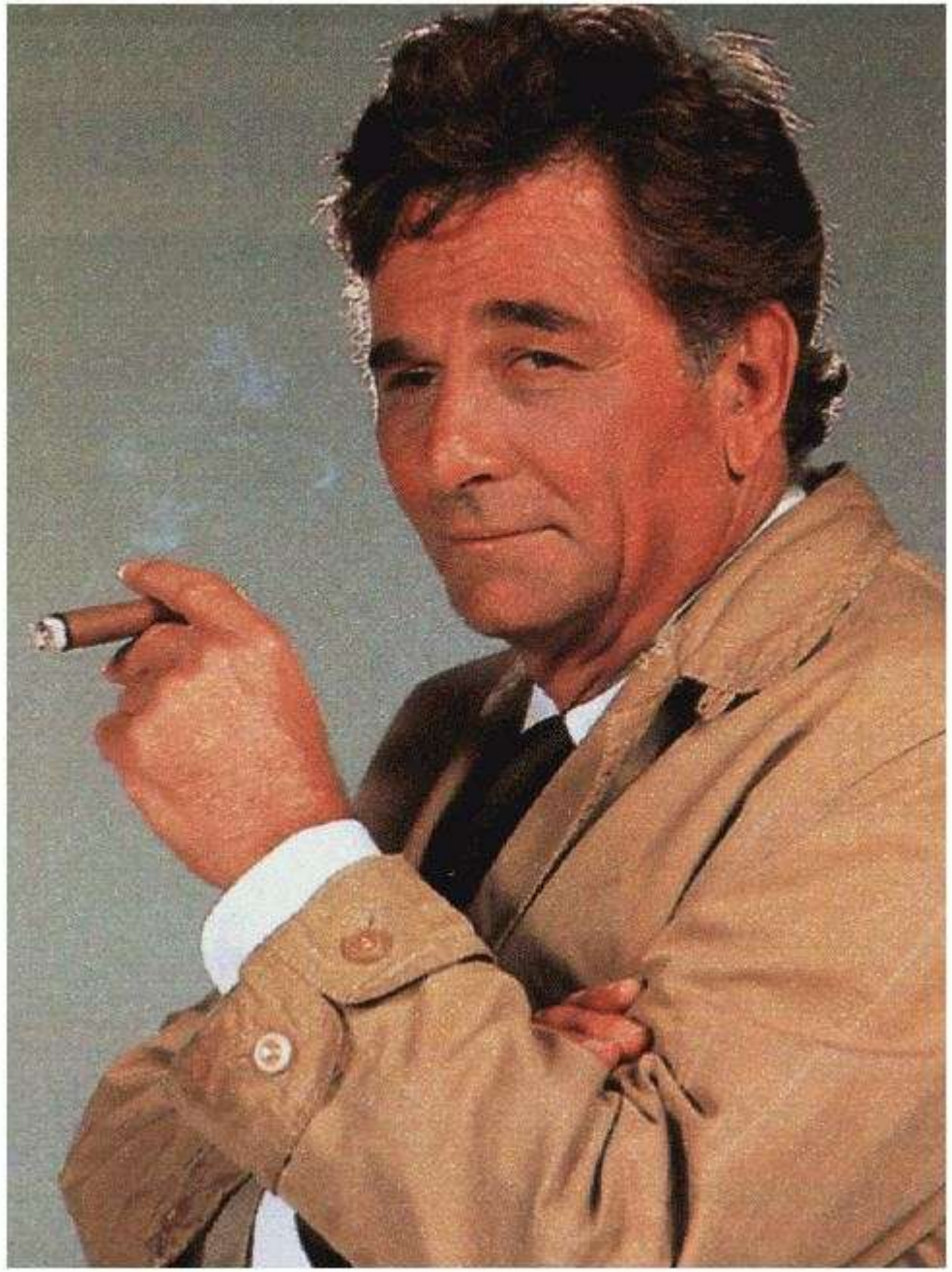
How we could win Le Mans if our car could go no faster than anyone else's ?

Answer: **fuel efficiency**.

By reducing the number of pit stops the Audi R10 TDI won Le Mans in 2006 and in the subsequent three years.

Paradoxical frames

- Create a sense of conflict and discomfort
- This tension can be a valuable trigger to getting people to think in new ways
- Reduce the likelihood that people will fall back with conservative lines of thought
- Force participants to re-interrogate the relationships between key elements
- Suggest «and» thinking rather than «either/or» thinking
- Support the ability to be open to ambiguity and contradictions



Detective Colombo

- He enters the scene of the movie quite late (in some cases 20 minutes after the start)
- The murder is shown at the very beginning
- The murderer is immediately evident to the public, since the scene in which he/she is acting is place at the beginning

- The suspense of the movie is entirely shifted on the intellectual ability of Colombo to place the murderer in contradiction

- Colombo looks shabby, absent-minded
- He wears an old raincoat and drives an old European car
- He speaks of his wife, but she never appears
- He takes notes in a creased notebook

Negation has been a powerful pattern of innovation in contemporary art.

Starting with the Impressionist revolution in France, and with the fin-de-siécle creative environment of Wien,
artists have explored the consequences of *negating* some of the most entrenched conventions of art.

Albrecht Dürer
Leprotto (1502)
Wien, Albertina Museum

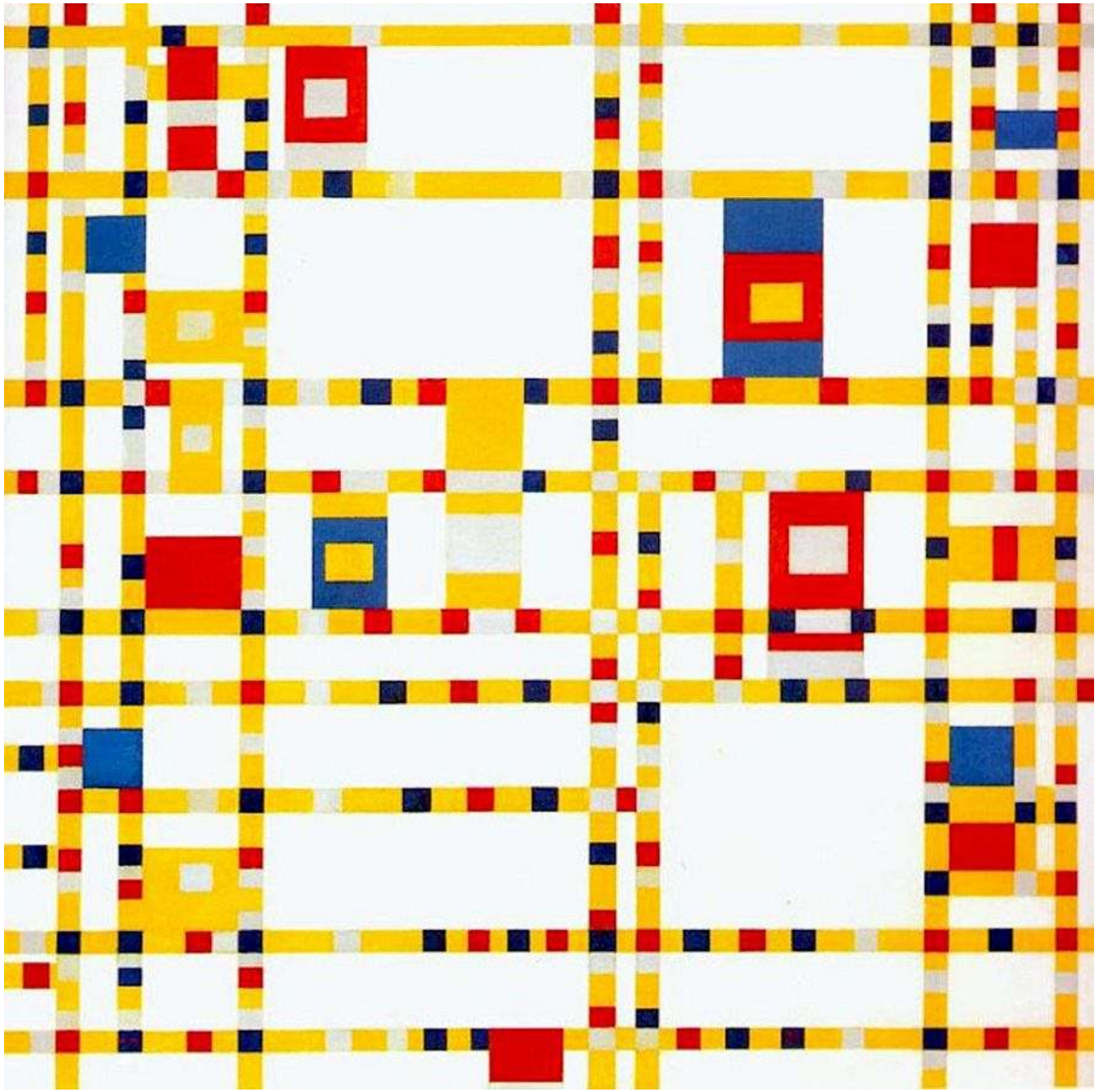
Realism of the image

I asked myself… whether one might not simply reduce or ‘distort’ objects, but do away with them altogether.

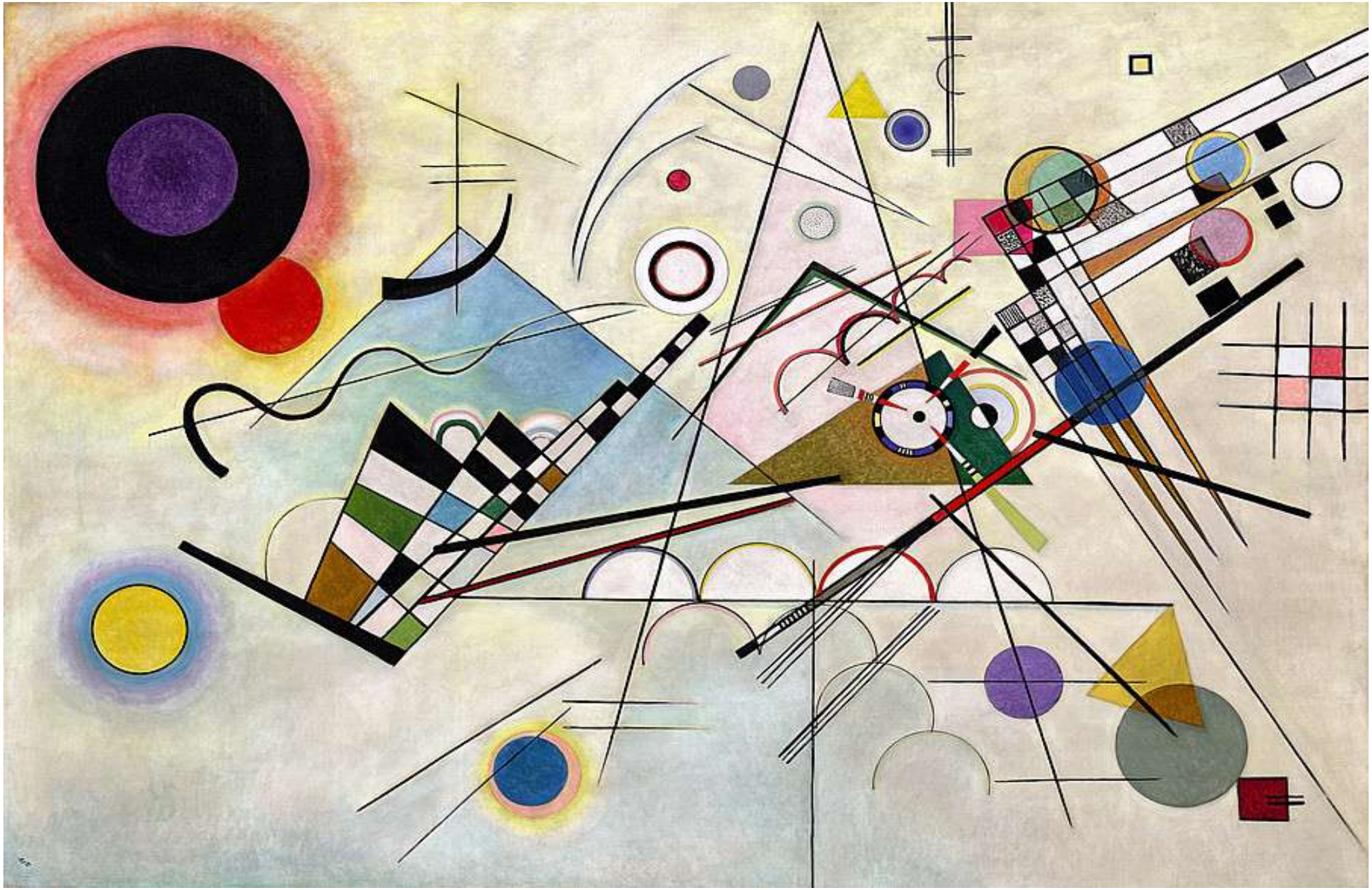
Vassily Kandinsky

Suprematism would create symbols directly from abstract elements, «the formation of signs instead of the repetition of nature, flowing from our creative brain».

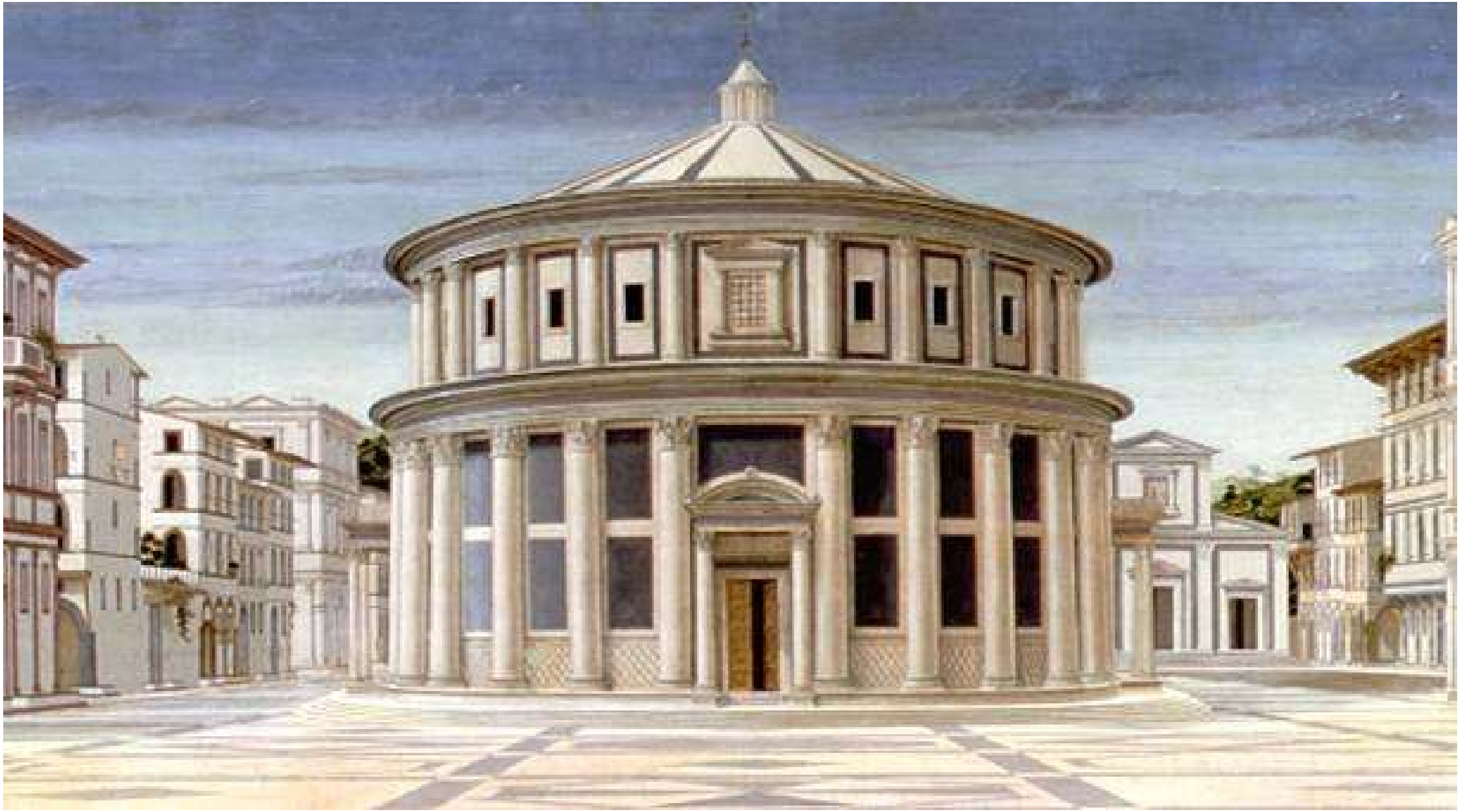
Kazimir Malevich



Pietr Mondrian
Broadway Boogie-Woogie (1942-1943)
New York, Museum of Modern Art

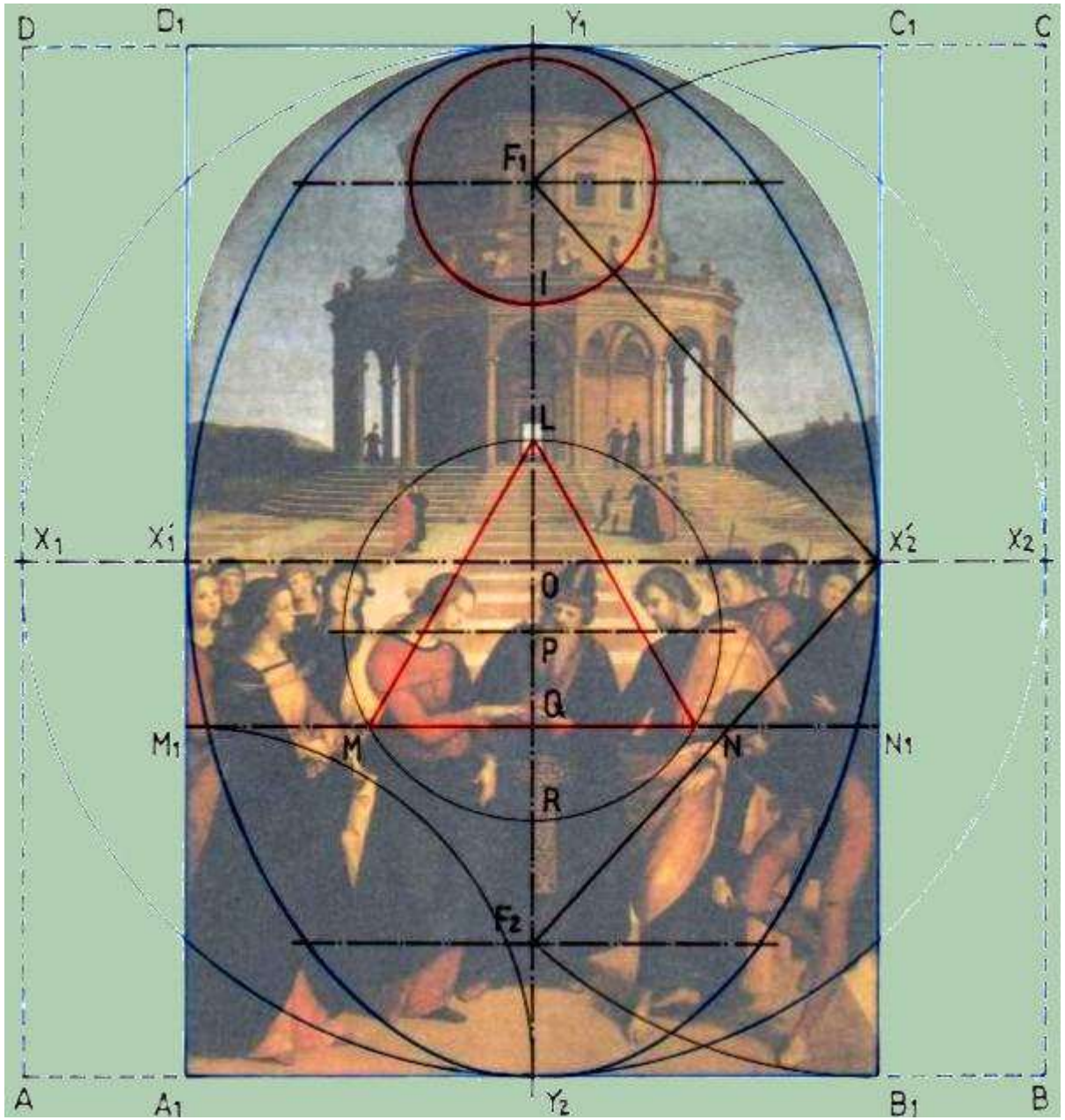


Vassily Kandinsky
Composition VIII
(1923)
New York,
Guggenheim
Museum



Anonymous. *Perspective on a city* (1475-1480). Urbino, Galleria Nazionale delle Marche.

Raffaello Sanzio
Lo sposalizio della Vergine (1504)
Milano, Pinacoteca di Brera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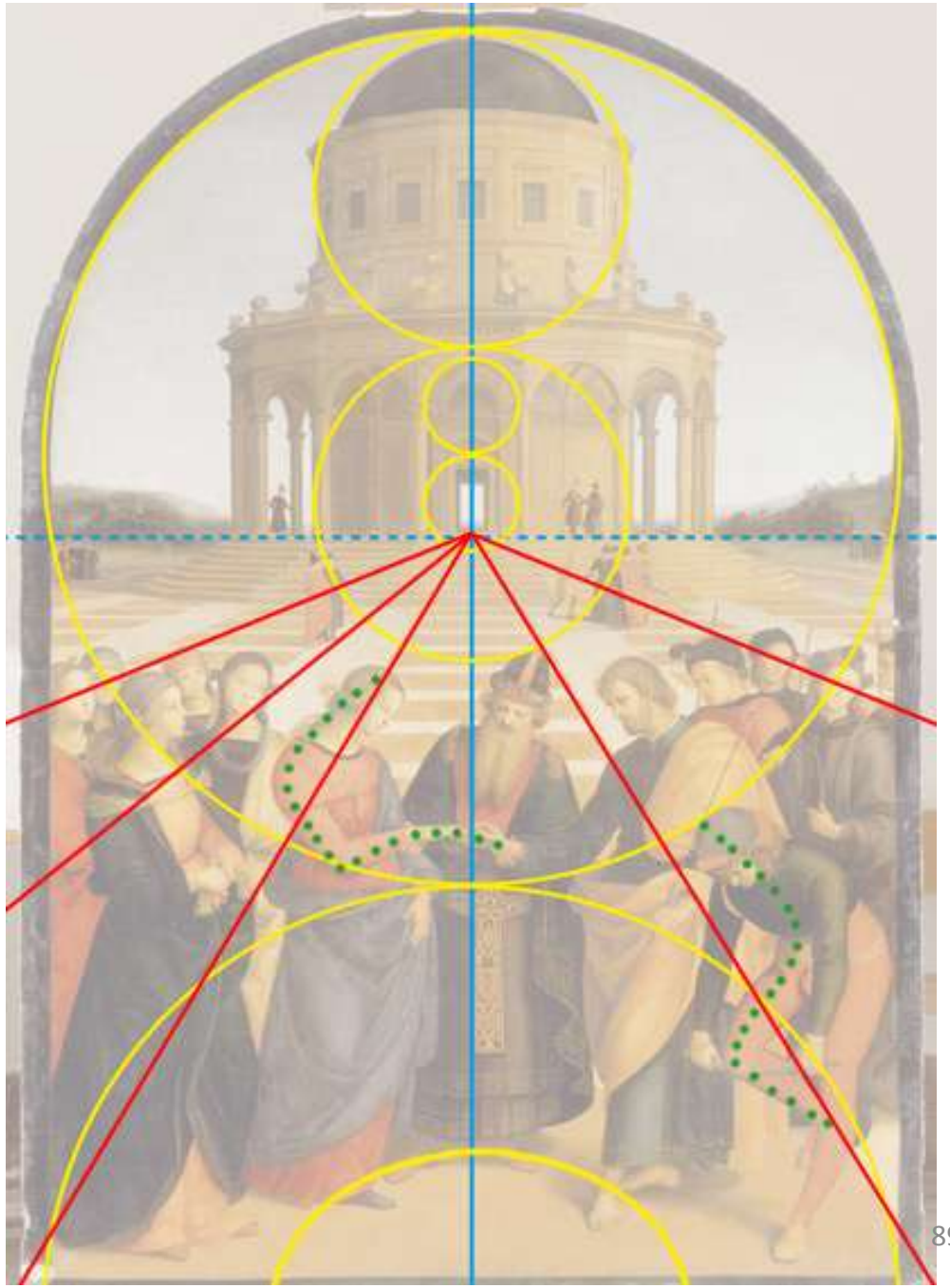
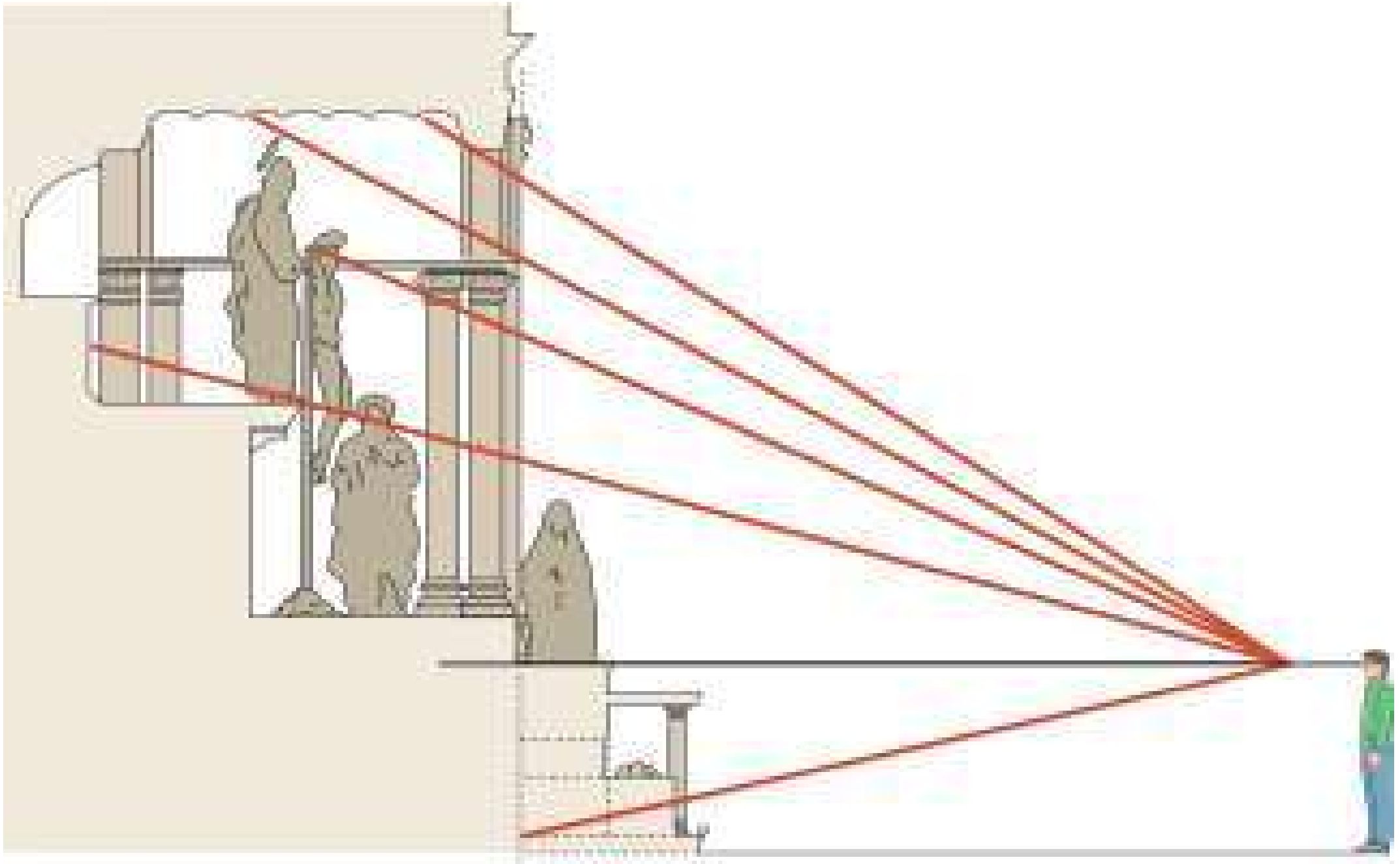


Masaccio
Trinità (1427-1428)
Firenze, Santa Maria Novella



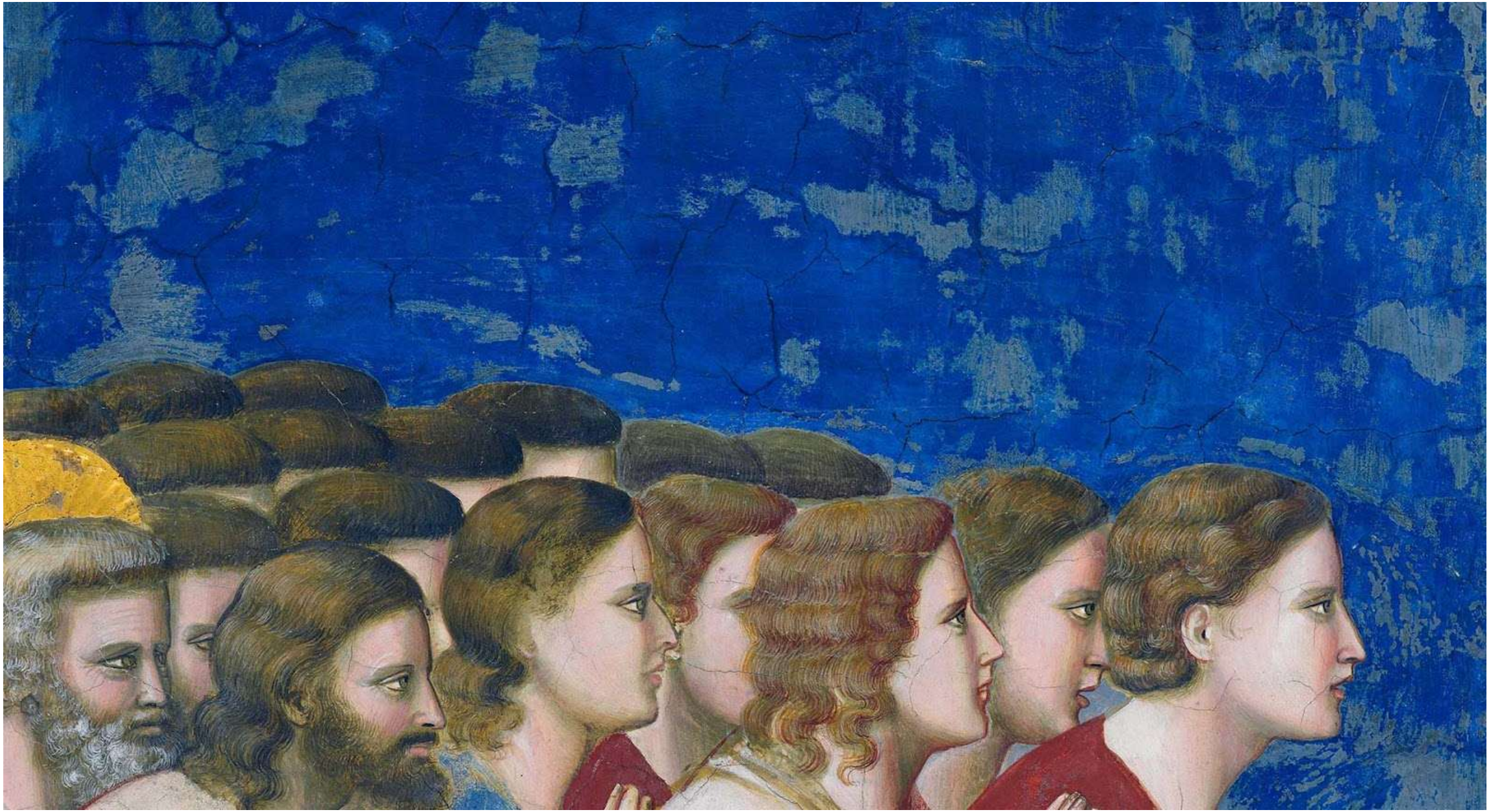
Central perspective

It is as if someone spent his life drawing profiles and believed that man was one-eyed.

George Braque

George Braque
Violino e candela (1910)
New York, Museum of Modern Art

Picasso
Les demoiselles d'Avignon
(1907)
New York, Museum of Modern Art



Giotto*, Ascensione al cielo* (particolare) (1303-1304). Padova, Cappella degli Scrovegni

Representational nature of color

Here are the ideas of that time: Construction by colored surfaces.
Search for intensity of color, subject matter being unimportant.
Reaction against the diffusion of local tone in light. Light is not suppressed, but is expressed by a harmony of intensely colored surfaces.

By removing oneself from the literal representation of movement one attains greater beauty and grandeur.

Henri Matisse

Matisse realized «that one could work with expressive colors that are not necessarily descriptive colors» (Jack Flam)

Henri Matisse, *Icaro (Figure VIII da «Jazz»)* (1946). Paris, Centre Pompidou

Henri Matisse, *La Gerbe* (1953). Los Angeles, Hemmer Museum.

Michelangelo
Schiavo barbuto (Prigione)
(1523-1534)
Firenze, Galleria dell’Accademia

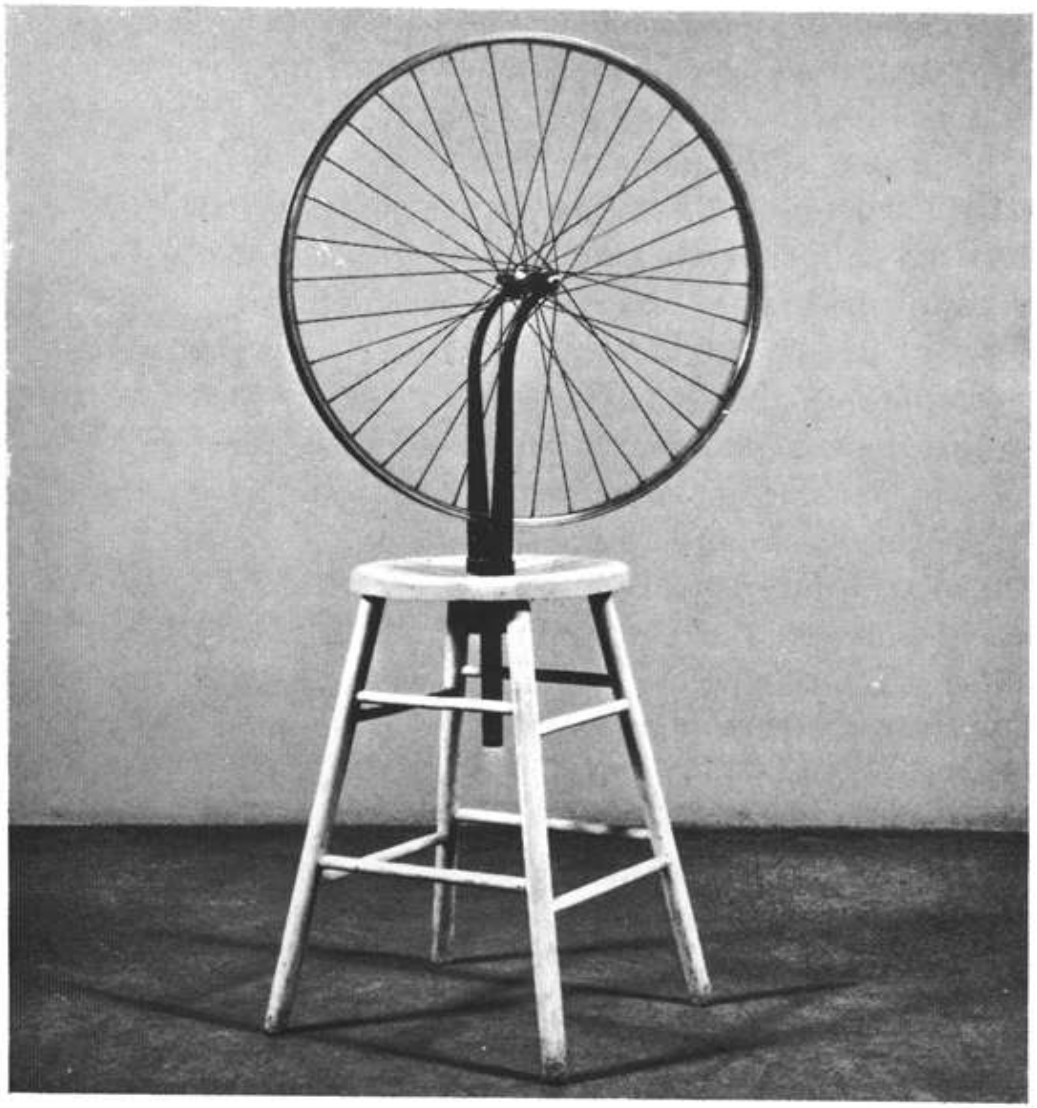
Michelangelo
Atlante (Prigione) (1523-1534). Firenze, Galleria dell’Accademia

Work of art

Can one make works which are not works of ‘art’?

The readymade can be seen as a sort of irony, because it says here it is, a thing that I call art, I didn’t even make it myself. As we know art etymologically speaking means to ‘make’, ‘hand make’, and there, instead of making, I take it readymade. So it was a form of denying the possibility of defining art.

Marcel Duchamp



Georges Duchamp, *Roue de bicyclette* (1913). New York, The Museum of Modern Art

Man Ray
Cadeau (1921)
The Vera and Arturo Schwarz Collection of Dada and Surrealist Art

George Duchamp
Fountain (1917)
The Vera and Arturo Schwarz Collection
of Dada and Surrealist Art

Piero della Francesca
Federico da Montefeltro (1465*)*
Firenze, Uffizi

Shape of the painting and orientation in space

My paintings do not have a center.

When I am in my painting, I am not aware of what I'm doing.

The easel picture is a dying form, and the tendency of modern feeling is towards the wall picture or mural.

Jackson Pollock

Jackson Pollock, *Convergence* (1952). New York, The Pollock-Krasner Foundation/Artists Rights Society (ARS).

Jackson Pollock and the dripping technique

Sandro Botticelli
Nascita di Venere (particolare) (1484)
Firenze, Uffizi

Reproduction

The reason I am painting this way is that I want to be a machine.

I think somebody should be able to do all my paintings for me.

Why do people think artists are special? It’s just another job.

Andy Warhol

Andy Warhol
Marilyn (1967)
New York, The Andy Warhol Foundation


VOTE
MCGOVERN

Negation heuristics in XX century art

Image	Realism	Abstraction
Perspective	Central	Multiple
Colour	Descriptive	Expressive
Work of art	Manual work of the artist	Ready-made
Shape	Table	Mural Dripping
Reproduction	Original or unique work	Mechanical reproduction

Other examples of negation heuristics in contemporary art

Theater

- Unity of action, of time and space (Aristotle, *Poetics*)
- After the translation of *Poetics* in latin in XVI century,

the three aristotelian units were assumed as a canon of beauty

- Ibsen (*Peer Gynt*)
- Beckett (*Waiting for Godot*), Ionescu (*La cantatrice chauve*)

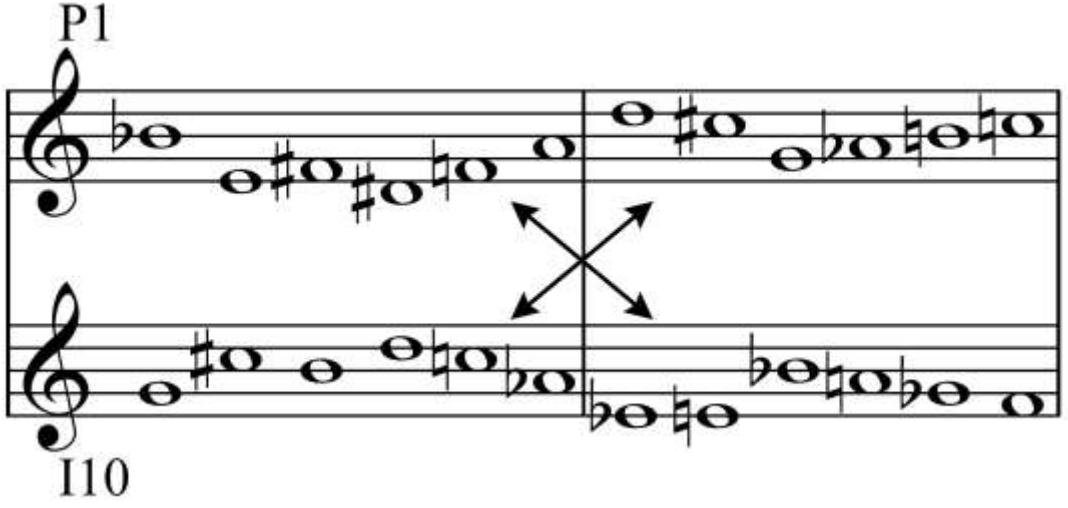
La cantatrice chauve (1950)

En attendant Godot (1952)

Peer Gynt (1867)

"I have made a discovery which will ensure the supremacy of German music for the next hundred years“ (Arnold Schönberg)

A-tonality
Twelve tone composition:
“the twelve pitches of the octave are regarded as equal, and no one note or tonality is given the emphasis it occupied in classical harmony”.



Egon Schiele, *Arnold Schönberg* (1917)

Analogy

With the analogy we bring a solution found in a given context into a completely different one. In the new context the solution will be original, often radically new.

The arrival of patients in the surgery room in a hospital may be seen as the arrival of containers in a harbour-
then principles from logistics can be applied to reduce waiting times and to increase the utilization rate of the infrastructure.

Analogical thinking requires the identification of a deep pattern underlying the surface differences.

Finding a right analogy is a surprisingly difficult cognitive task.

What do they have in common?

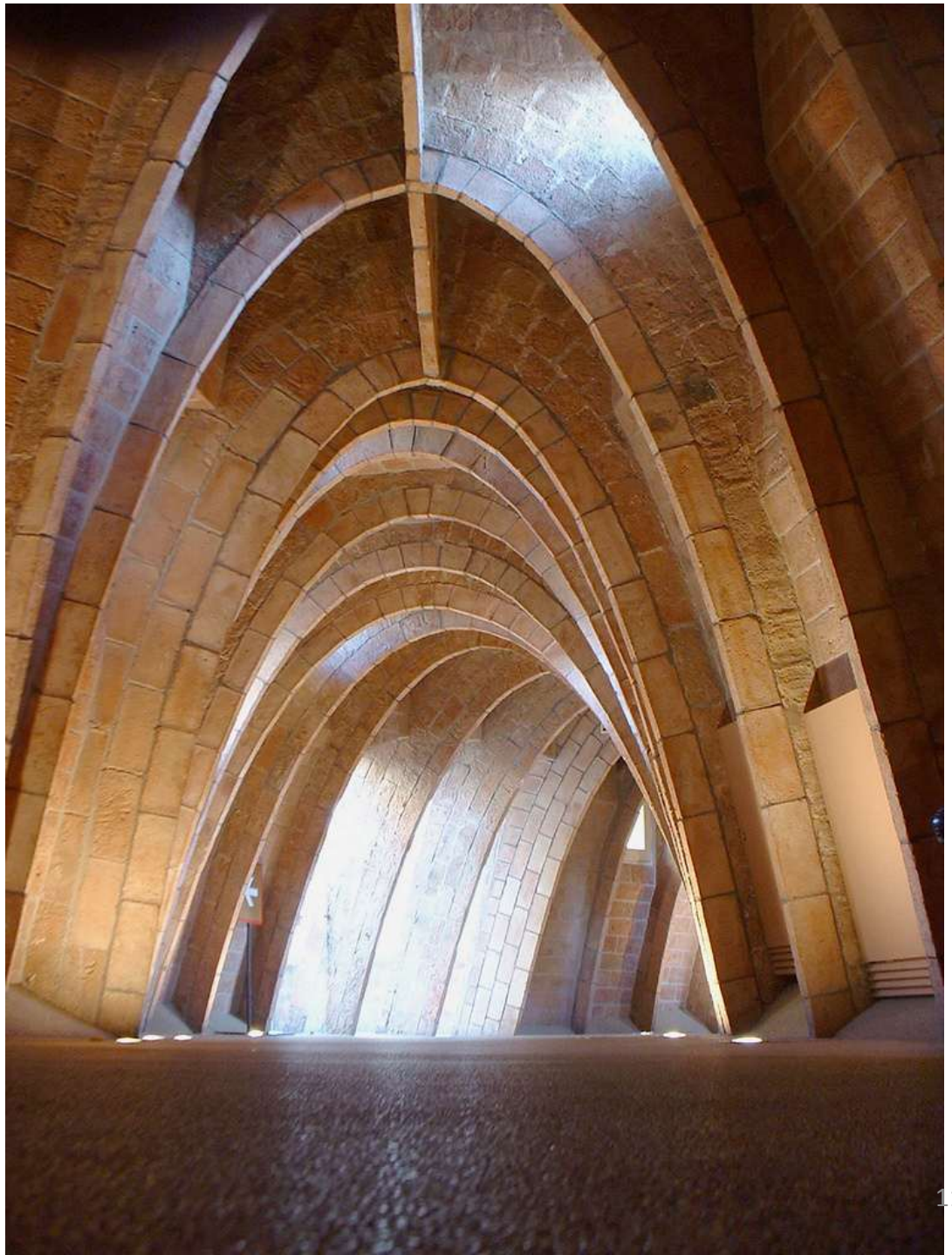
The Japanese engineer Eiji Nakatsu had to study in the 1990s how to reduce the acoustic pollution produced by high speed trains.

In entering the narrow tunnels between Osaka and Hakata the trains produced vibrations and noise.
He realized the noise was produced by a sudden change in the resistance of the air.

Nakatsu had previously studied the aerodynamics of birds. He asked whether there were birds that experienced a sudden change in the resistance.

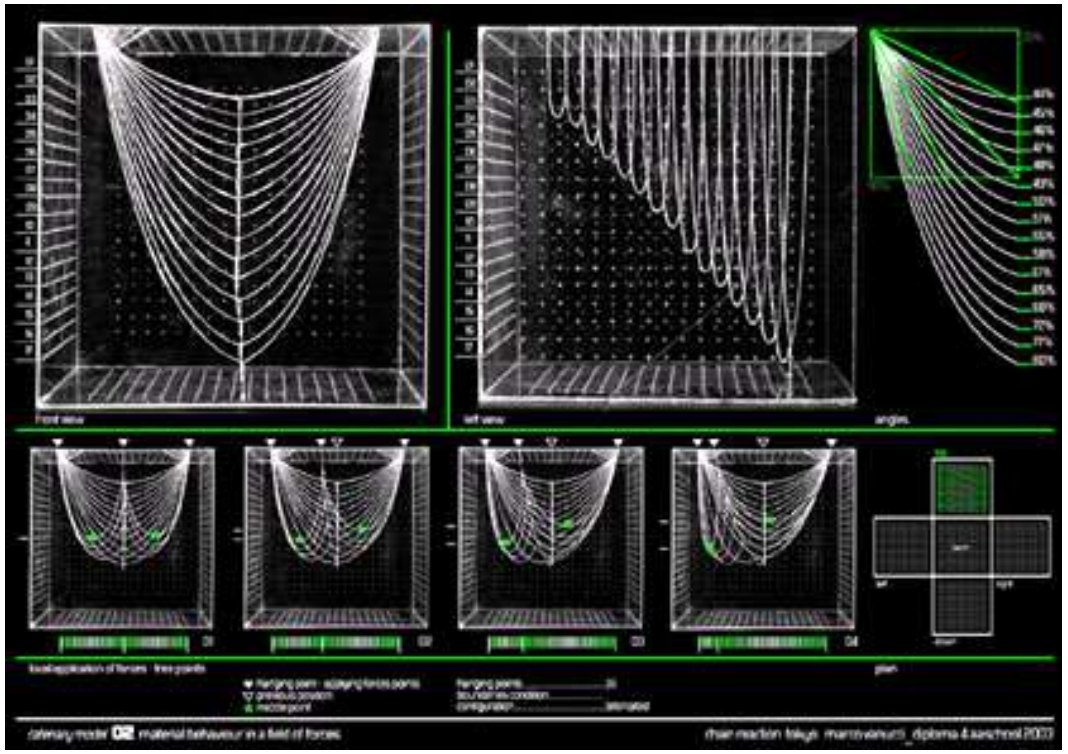
It turned out that the kingfisher moved from low resistance (air) to high resistance (water) without producing a splash.

The Shinkansen trains were equipped with a 15mt beak, which reduced air pression by 30%.



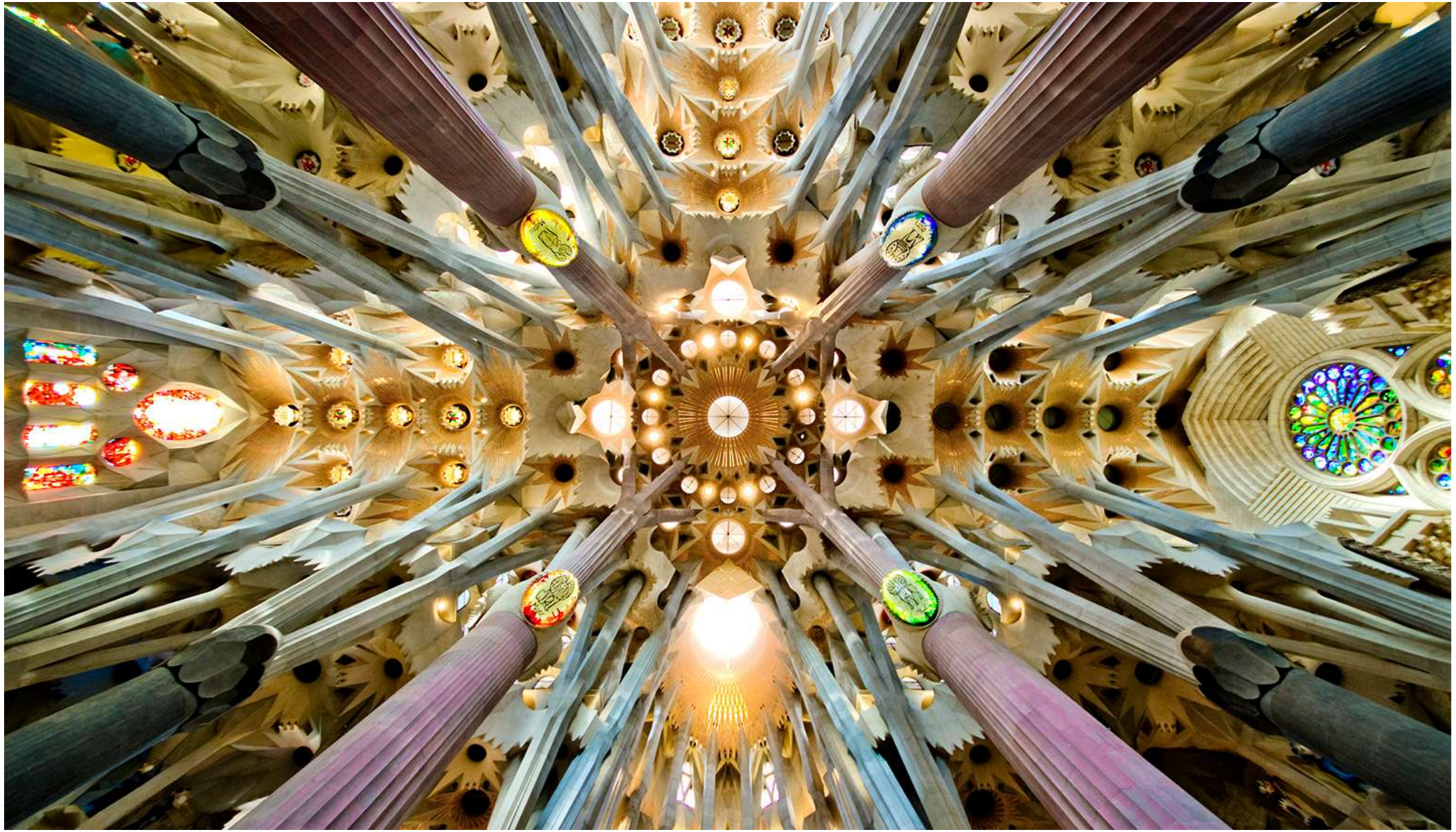
Antoni Gaudì, *Casa Mila (La Pedrera),*
Barcelona

Geometric properties of the catenaria arch

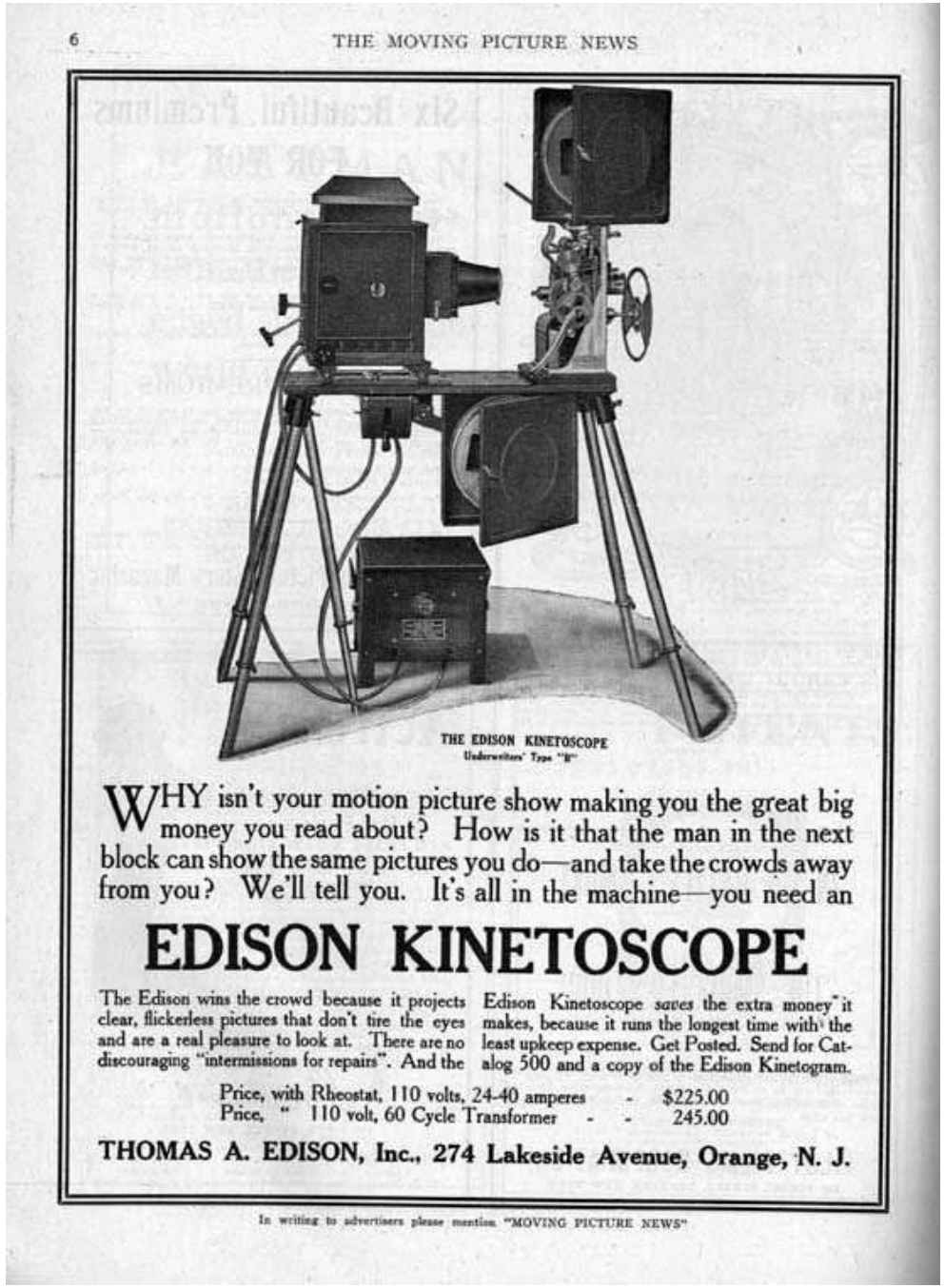


Source: Architettura.it

La Pedrera, Espai Gaudì



Antoni Gaudì, Archivault of the *Sagrada Familia*, Barcelona.



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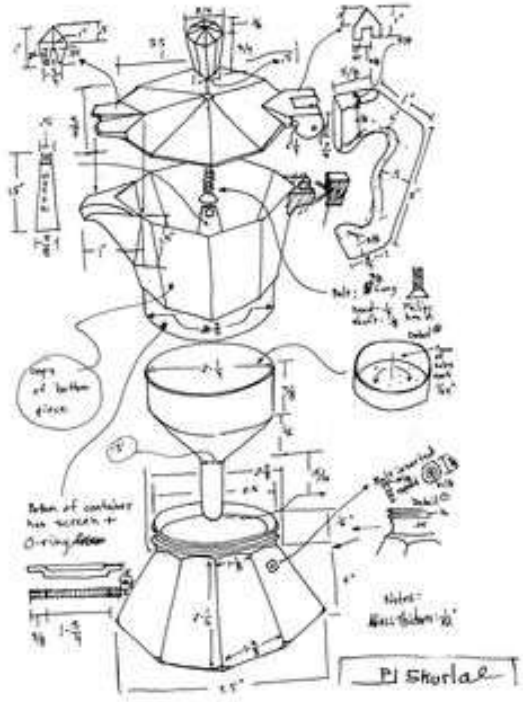
Napoletana machine coffee XIX century (still in use)

Two main issues

- Risk of burning the skin in the turning of the machine upside down
- Excess consumption of coffee powder



Alfonso Bialetti

Owner of a foundry in Piedmont, after a worker experience in France.

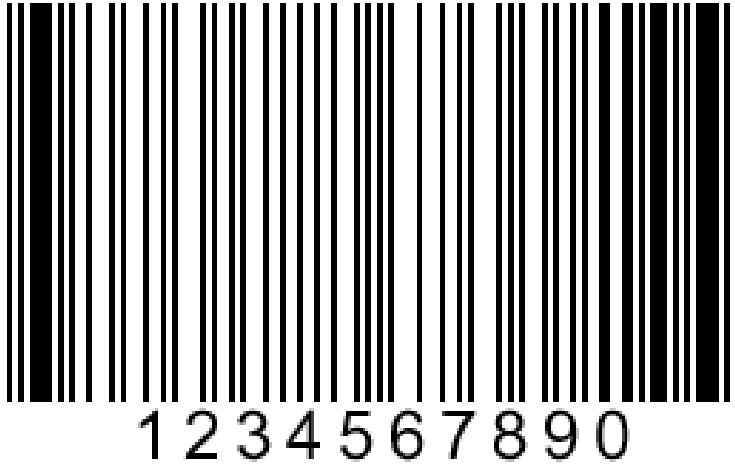
He observed women washing the clothes in the Orta Lake, using a washhtub with a hole in the bottom. Below the washtub a container included ash and soap.

After the contact with water, the mix of ash and soap boiled, producing foam and moving upward in the washtub.

Bialetti asked whether the same principle could be applied to the percolation of coffee.

He adopted an aluminium casting, with an appearance close to silver.

Aluminium porosity allowed the machine to absorb the flavour of the coffee powder.



Bar code

Issues in product coding
- Lack of standards
- Errors in manual coding of products
- Huge volumes

1952
Patent registered by two students, Norma Woodland and Bernard Silver

Main idea
- Identification of products via a unique mapping of a sequence of vertical white and black lines
- Similar to a Morse code

Alan Huberman, head of a chain of department store, persuaded a coalition of department stores to create a standardization commission

UPC, Universal Product Code
Improvement of 1952 patent by IBM.
1974 first purchase using the bar code (Wrigley chewing-gum).

Maltese Falcon

Sailing Yacht by Perini Navi (2006)

… where did sailings disappear?

Before entering the yacht production, Fabio Perini was a world leader in paper converting equipment.
Fast and reliable rolling is a crucial performance of equipment.

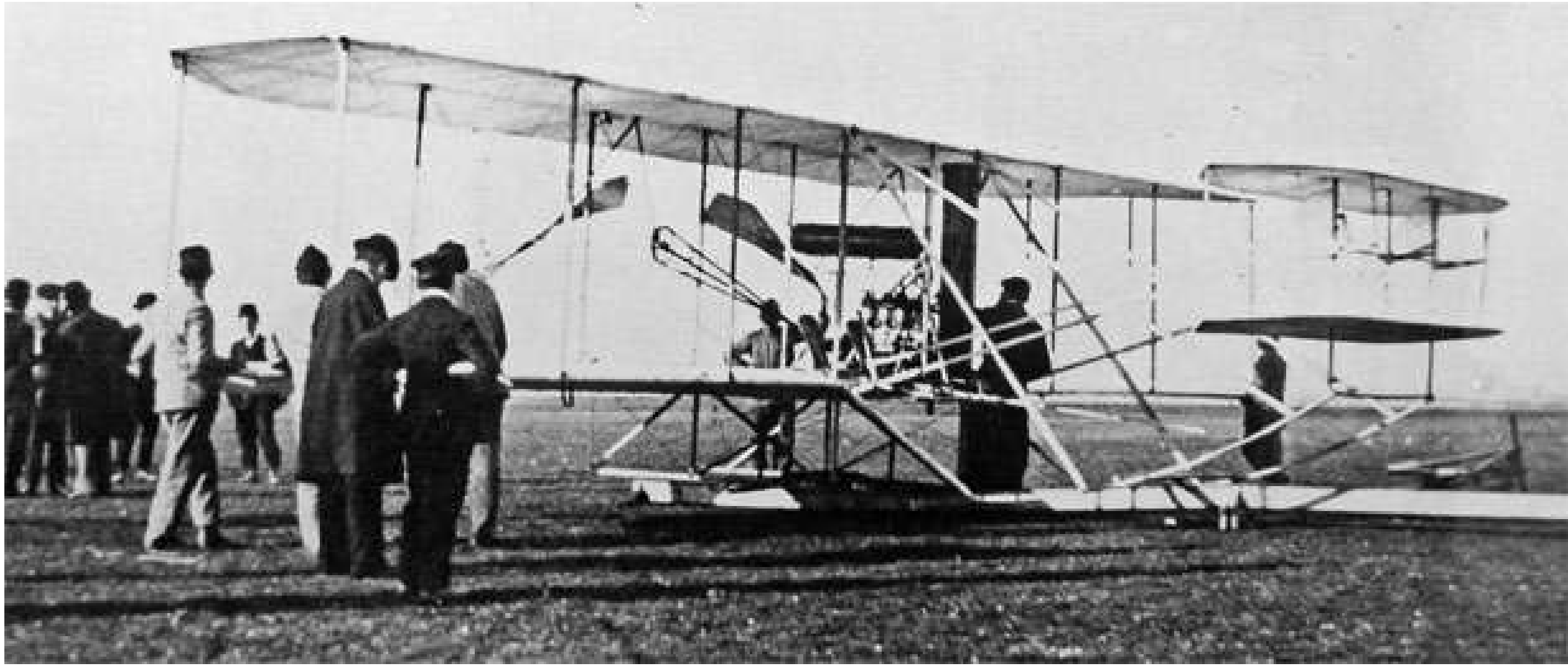
From rolling paper coils to rolling sailings.

Abstraction

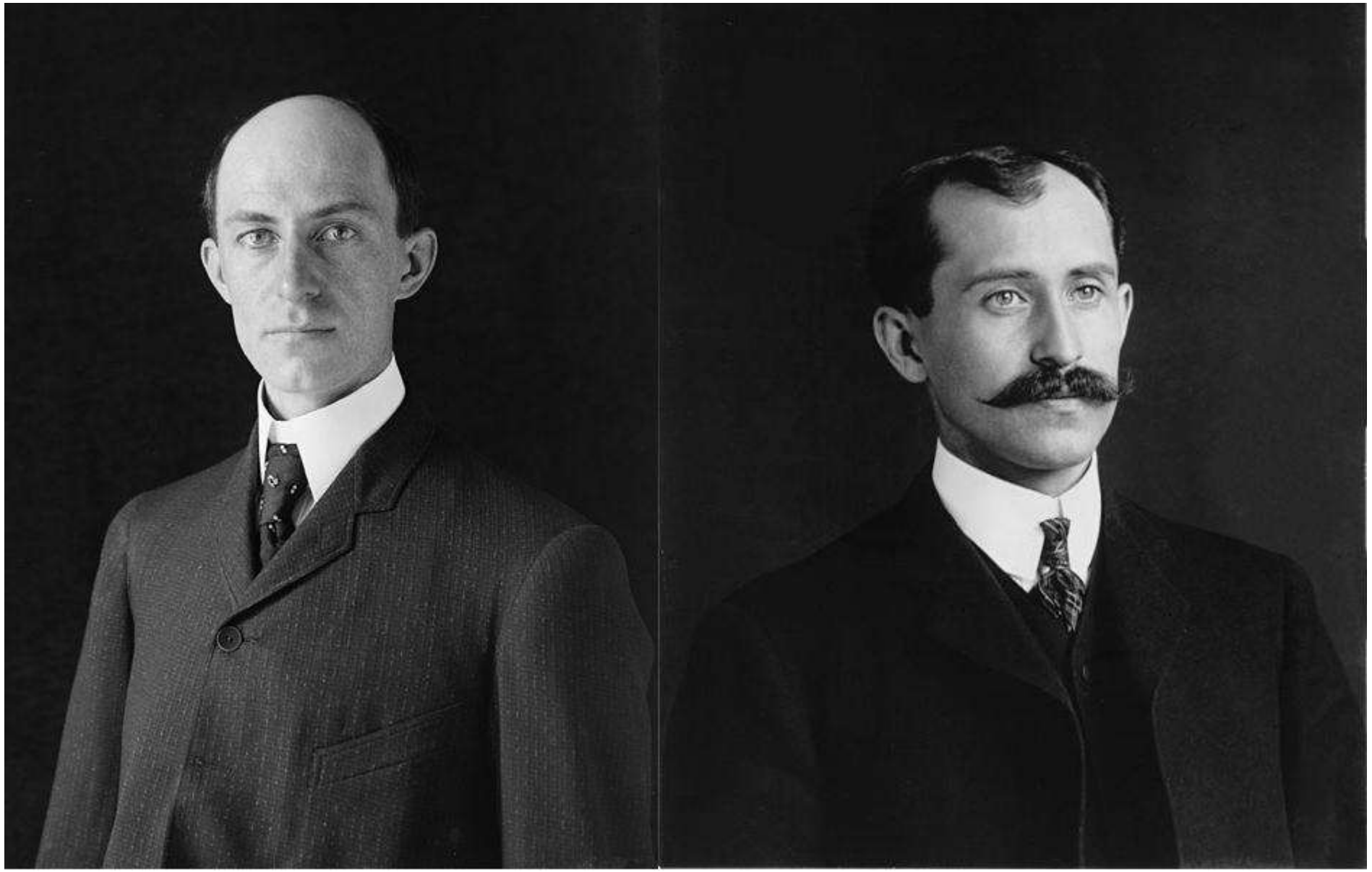
Abstraction involves the search for the general conditions for a solution to take place

It does not search solutions close to existing ones.

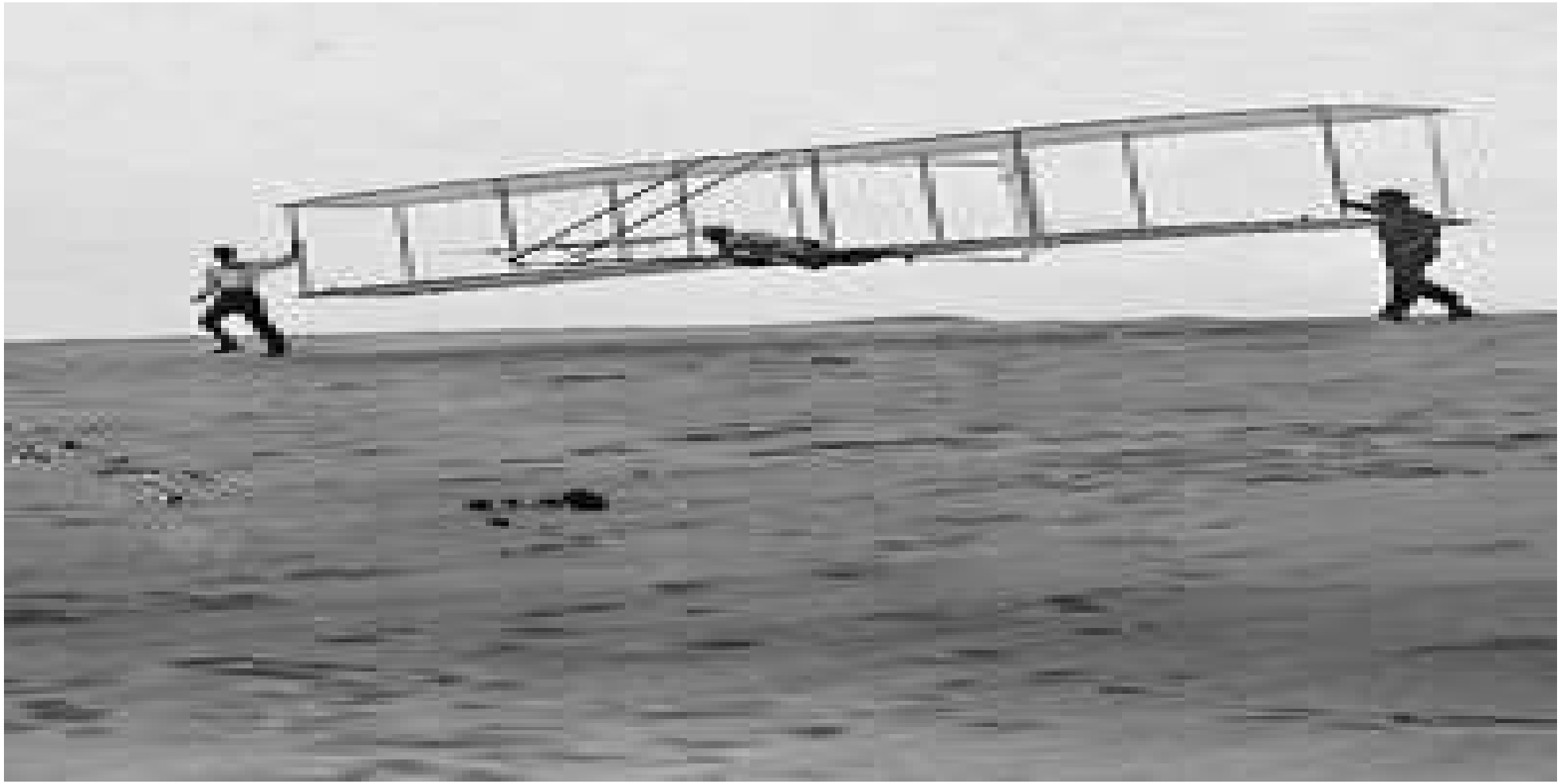
It forces the innovator to build up a general and abstract representation of the problem, investigating the conditions for any possible solution to come to life.



First flight of Wright Brothers, Kitty Hawk, North Carolina, 17 December 1903



Wilbur and Orville Wright



The glider produced in 1902.
The shape of the wings was modified repeatedly after tests in a newly created small widn tunnel.
In this year the Wright Brothers carried out between 700 and 1000 flights.

The Flyer was a modified glider

The modifications were
- a petrol engine for the propulsion
- a system to control the flight by manoeuvering a tail

The Wright Brothers were the first to build up an abstract representation of the conditions for controled flight, by decomposing the problem into
- structure
- propulsion
- control

F-117 Nighthawk (1981-2008)

Stealth aircraft

- Reduce reflection/emission of radio, infrared, visible light, radio-frequency spectrum and audio
- Minimal Radar Cross Section (RCS)
- This makes the aircraft intrinsically unstable along all three axes, which requires constant flight correction through fly-by-wire systems

How was the design of stealth aircraft possible?

Denys Overholser, a mathematician, was working in the Skunk Works team of Lockeed during the 1970s.
He decided to adopt a mathematical model developed by a Russian scientist, Petr Ufimtsev, which in origin had no relation to aerodynamic design.
The mathematical model predicted that the radar waves could have been radiated away from the aircraft if the geometry were based on flat panels (facets), similar to the faces of diamonds.
However, this design would have made the aircraft unstable.

The Skunk Works team designed a model called “the Hopeless Diamond”.
It turned out to be invisible to radar.

Rich and Janos, *Skunk works*, Little Brown & Co., 1994

Putting several patterns together

This is the product that will satisfy those young people who want to listen to music all day.
They'll take it everywhere with them, and then they won't care about record functions.

Akio Morita, 1979

Abstraction- what is the abstract configuration of a product that will allow «to listen to music all day»?

Negation- no recording function

Recombination- a playback function (disc player) to be combined with a portability function (battery) and to a hearing function (headphone)

What do artists and innovators have in common?
Are there common bases for creativity in art, science, and technology?

My answer is as follows.
Artists and innovators are similar in that they «see» something others do not see.

- Artists see in the multidimensional space of **forms**
- Innovators see in the multidimensional space of **functions**

The function space describes
- **possibility conditions** (what cannot be done)
- **design principles** (what can be done)
- **system of use** (why it should be done)

A team of researchers at Michigan State University compared Nobel Prize winners from 1901 to 2005 with typical scientists in the same period. In the control group the scientific expertise at the time was similar to that of the Nobel winners.

If the scientist is a practitioner in these artistic activities…	… the odds that he/she receives the Nobel Prize are larger..
Music (playing an instrument, composing, conducting)	2 times
Arts (drawing, painting, printmaking, sculpting)	7 times
Crafts (woodworking, mechanics, electronics, glassblowing)	7,5 times
Writing (poetry, plays, novels, short stories, essays, popular books)	12 times
Performing (amateur actor, dancer, magician)	22 times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D. Mazzei	Pretotyping: Designing connected devices
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AVVISO DI SEMINARIO

Martedì, 30 Maggio
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What are emerging technologies?

Abstract
The seminar will explore the concept of 'emerging technologies' and examine a range of methodological approaches to generate strategic intelligence about technological emergence, which, in turn, can to support decision- and policy-making. There is a considerable interest around emerging technologies given the potential impact these technologies are capable of exerting on the economy and society. Emerging technologies have been subject of several policy and funding initiatives (e.g. the EU "Future & Emerging Technologies (FET)" initiative) as well as at the core of industrial strategies of countries (e.g. the UK "Eight Great Technologies" industrial strategy). Considerable research efforts (especially in scientometrics) have been also made on the development of methodological approaches for the early detection and analysis of emerging technologies. Nonetheless, within these policy and research efforts, emerging technologies are either loosely defined or often no definition at all is adopted. The seminar will propose a definition of emerging technologies based on five attributes: radical novelty, relatively fast growth, coherence, prominent impact, and uncertainty and ambiguity. These attributes will be used to elaborate a framework that can support the operationalisation (early detection and analysis) of emerging technologies based on publication and patent data.
The seminar will conclude with an integrative synthesis of the use of scientometric overlay mapping techniques to generate strategic intelligence on technological emergence for analysts and decision makers.

Daniele Rotolo, Ph.D.

Daniele Rotolo is a Lecturer in Science Technology and Innovation Policy at SPRU, University of Sussex. From 2014 to 2016, Daniele was EU Marie Curie Researcher at SPRU and the School of Public Policy, Georgia Institute of Technology. Daniele holds a PhD (European Doctorate) in Innovation Management from Scuola Interpolitecnica (Italy), a joint PhD program among the Technical University of Bari, Technical University of Milan, and Technical University of Turin. During his PhD, Daniele was a visiting researcher at University College London and Stern Business School, New York University. Daniele's most recent work has focused on the conceptualisation and operationalisation of emerging technologies, inter-organisational network dynamics, scientometric mapping, and barriers to interdisciplinary research.

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