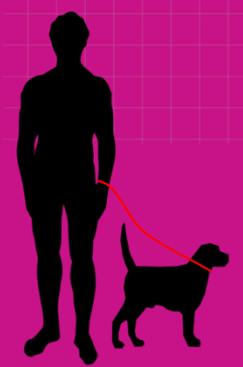


Humanities, Science, Scimat
Chapter 6

Arts

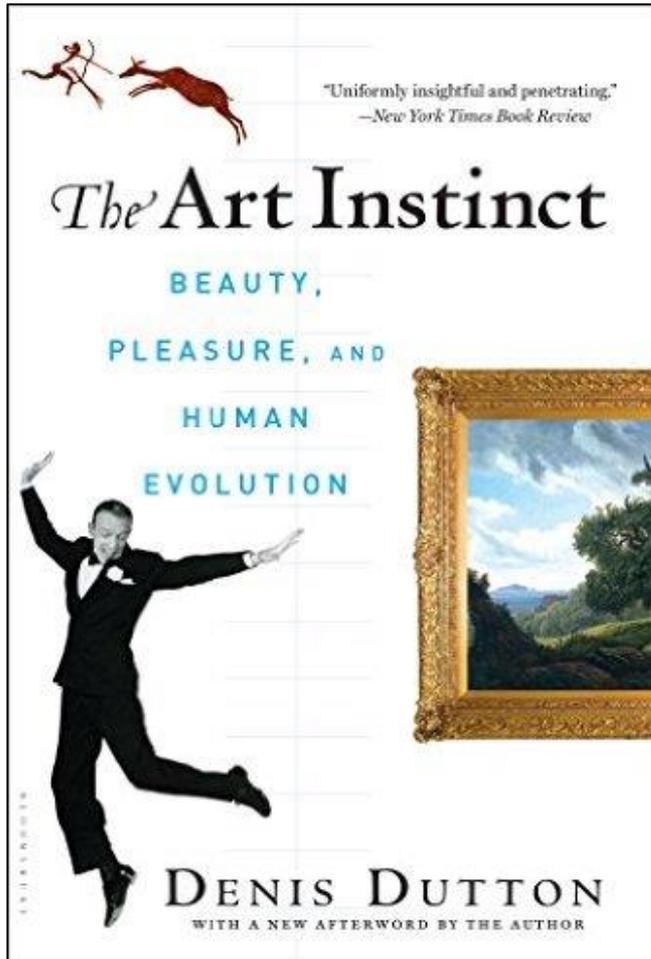


Lui Lam

Categories of Arts

- Visual arts (painting, drawing, sculpture, photo...)
- Film
- Literature
- Performing art (dance, drama, body/action art, linguistic...)
- Music
- Architecture
- Designing art
- New media arts (phonic, digital...)
- ...

Failed Attempt in Defining Art



2009

Dutton's 12 features of art

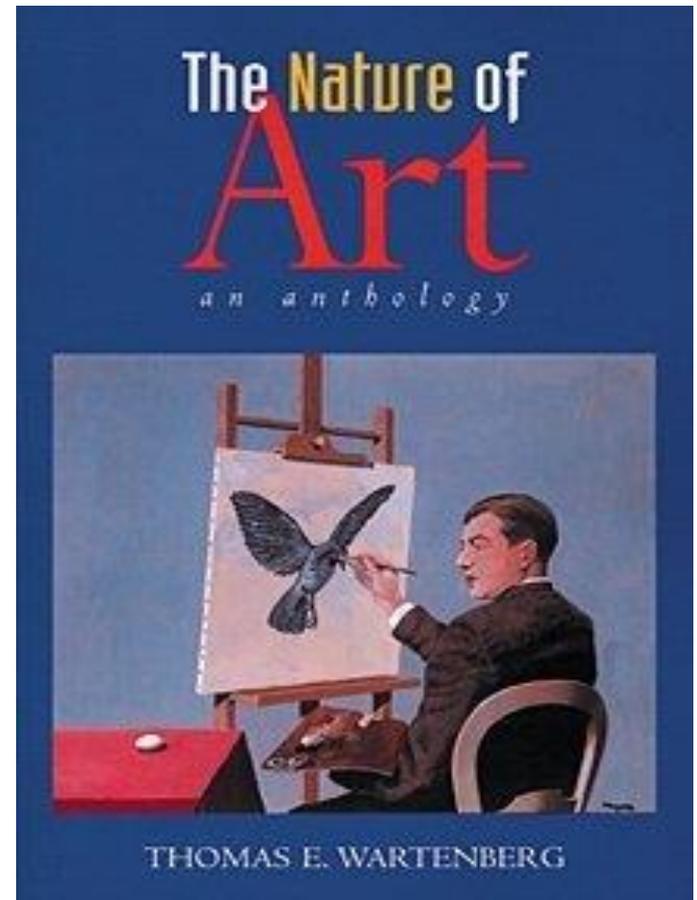
1. Direct pleasure
2. Skill and virtuosity
3. Style
4. Novelty and creativity
5. Criticism
6. Representation
7. Special focus
8. Expressive individuality
9. Emotional saturation
10. Intellectual challenge
11. Art traditions and institutions
12. Imaginative experience

Unfortunately, all these features are shared by the other creative discipline called physics, and hence are not unique to art.

Does Any One Know ?

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2001

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Painting/Sculpture: A Brief History

Simple



Complex



Simple

West



Chauvet Cave, France
~35,000 yr ago



Europe
17th century



The Yellow Curtain
Henri Matisse, France
1912

China



Shang
~3000 yr ago



17th century



Horse at Water
Hong Kong
Today

Wu Da-Yu 吳大羽

1903-1988



1922-1927 Study in France

1928 Head, oil painting dept., National Art Academy, Hangzhou

Students: Zhao Wujie, Wu Quanzhong, Zhu Dequen...



2015



Two Fundamental Questions

Yet, the **history of arts** (who did what) though interesting is **not** the most important in understanding arts. The two major questions are:

What is art ?

How did it begin ?

Arts

A Science Matter

The Scimat Approach

Science is humans' (earnest and honest) pursuit of knowledge about all things in Nature (which includes humans and all nonhuman material systems) **without** bringing in God or any supernatural.

- The artworks (the end product of arts) themselves are **not** part of science.
- But the artist's conscientious effort to achieve the effects she wants *and* the study of arts **are** part of science.
- For arts studies, use whatever methods and tools appropriate (e.g., evolutionary science, cognitive science, neuroscience, statistical physics, complex-system science).

Arts Studies

Three Research Levels in Arts Studies

In **any** scientific study, after

- observing and collecting data, and
- analyzing data

In **arts**, done mostly by artists, writers, musicians, movie directors and actors, ...

See, e.g., J. Lehrer *Proust was a Neuroscientist* (2007)

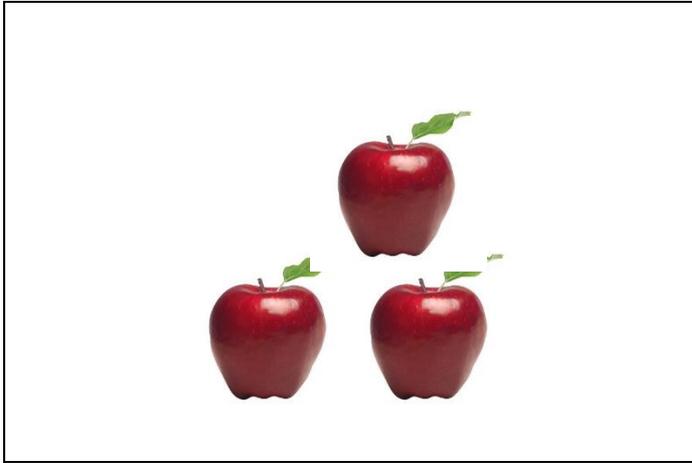
there are three levels/approaches to go further:

Approach	Gas	Arts
Empirical	Gas law	Done by some artists, art critics and historians; Physics—fractals
Phenomenological	Navier-Stokes equation	Done by some historians/ philosophers; Evolutionary theory (Darwin)
Bottom → up	Molecular picture (called “microscopic” method in physics)	Biology—evolutionary theory (genes), cognitive science; Physics—statistical analysis, ...

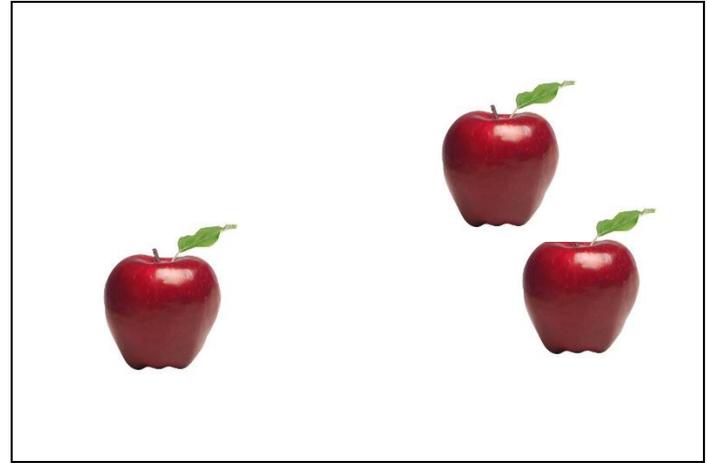
John Barrow, *The Artful Universe* (1995); *Physics World*, “Physics Meets Art and Literature”, Dec. 2002 (special issue).

Empirical Level

1: How to Arrange Three Objects



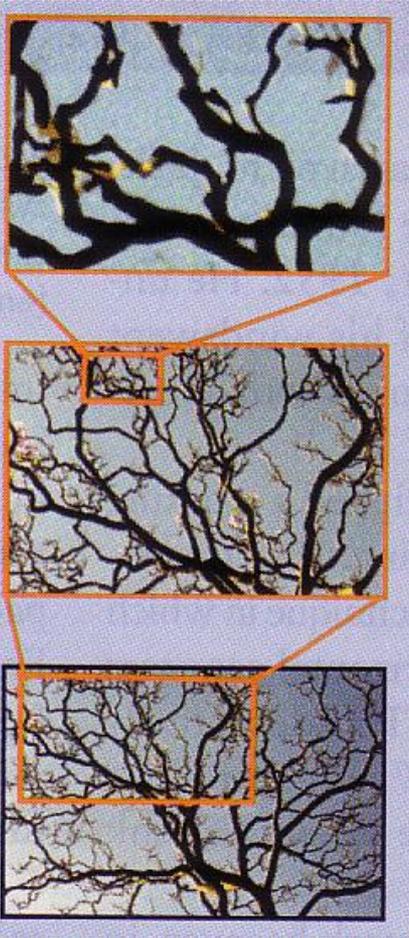
Not recommended



Recommended

2: Fractal Painting

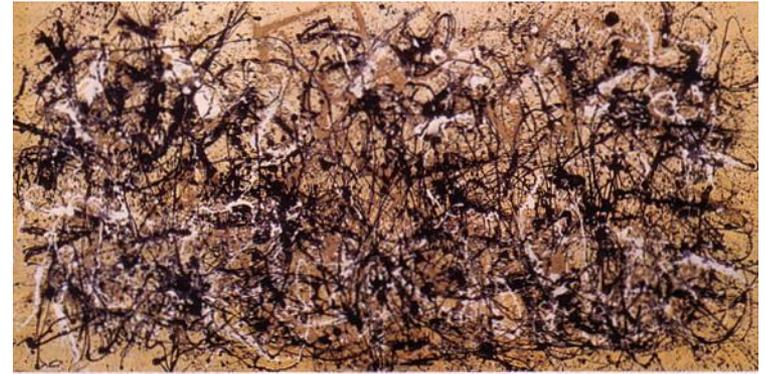
Fractal
a self-similar object



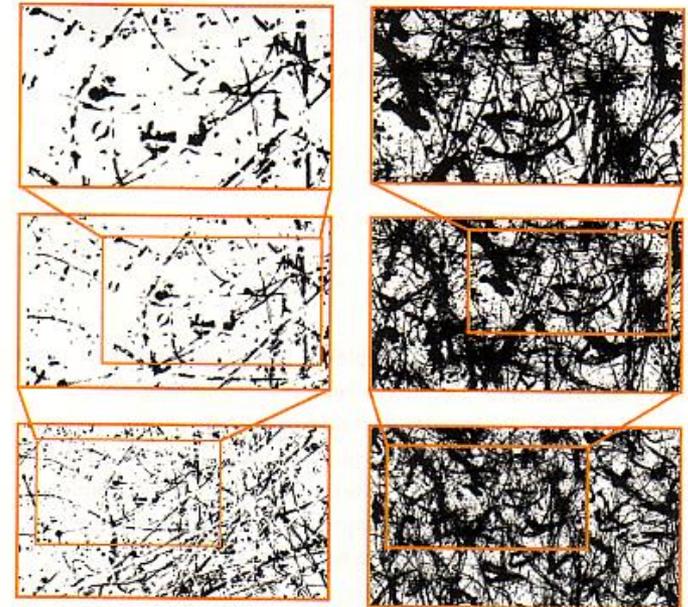
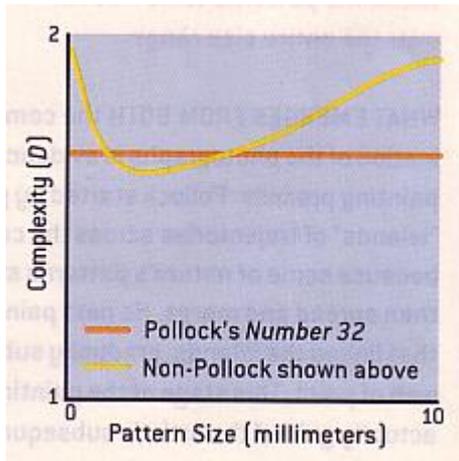
Jackson Pollock
(1912-1956)



Pollock's is fractal; imitations of his are not.
That is why Pollock's painting looks better.



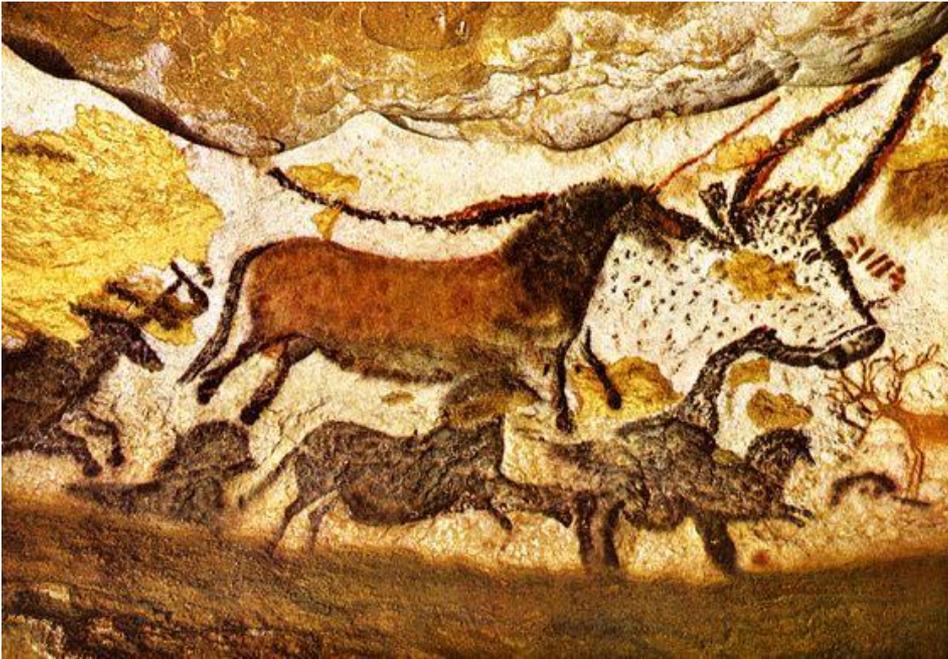
Autumn Rhythm, 1950, oil on canvas, 266.7 cm by 525.8 cm



Non-Pollock drip painting

Pollock's Number 32, 1950

3: Understanding Prehistoric Cave Art



Lascaux cave (c. 15,000 years ago)

André Leroi-Gourhan
(1911-1986)

All signs and animals are sex symbols, either female or male (e.g., bison for female, horse for male), reflecting the basic belief:

The world is divided into two types, two kinds of things, two genders (akin to the Chinese's Yin-Yang philosophy)—opposing and complementing each other (giving rise to everything else, in the Chinese case).

Male	Female	
M	F	M-F

In physics: Energy Entropy

Free energy $F = E - TS$

Origin of Arts

The Old Perspective

Nature (Evolution)

vs

Nurture (Culture)

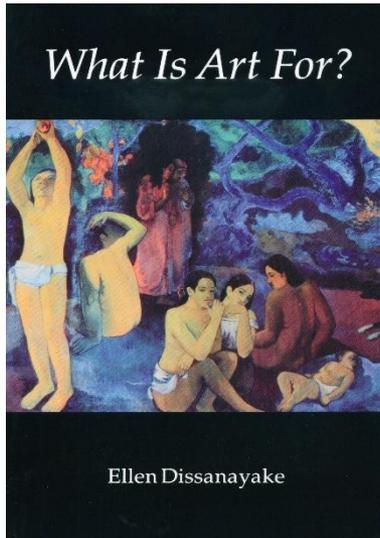
Dissanayake:

Arts is a human behavior which is evolutionarily (genetically) adaptive.

Problem:

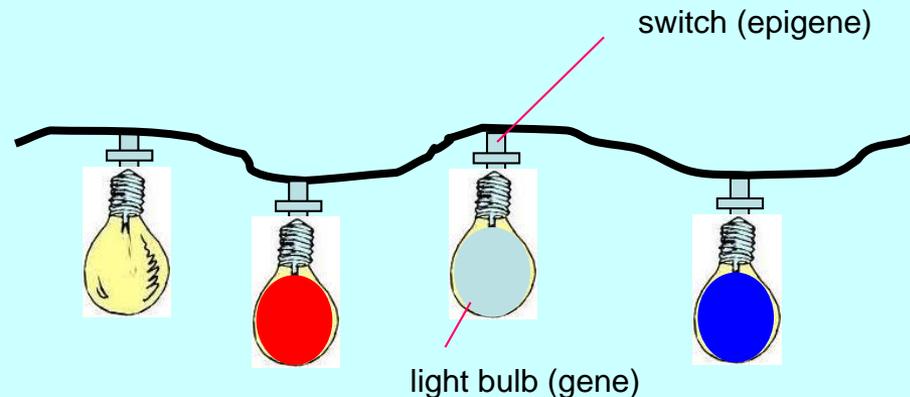
No experimental proof

Arts are sustained by culture



1988

New Understanding of evolution (last 10 years):
A combination of Darwin and Lamarck

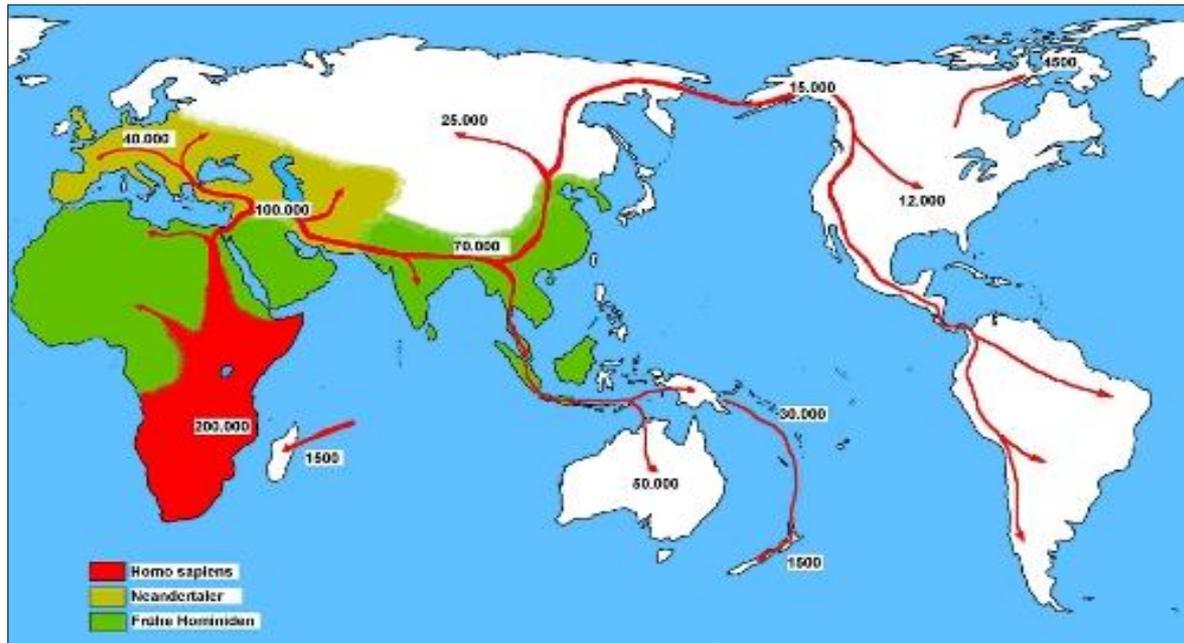
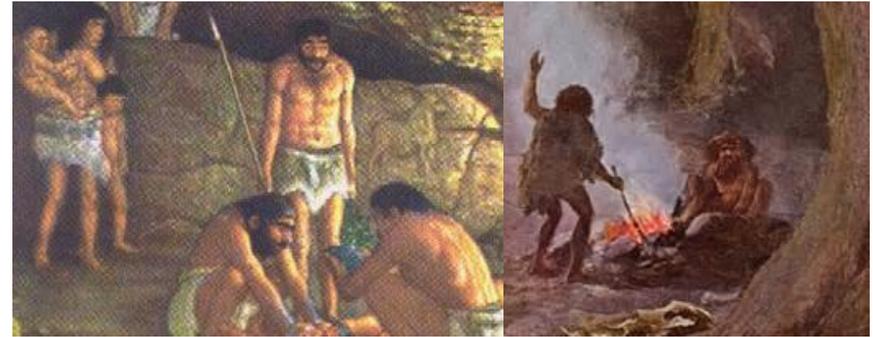


Learned behavior could be passed on to next generation, too, by epigenes

A New Perspective

Human History

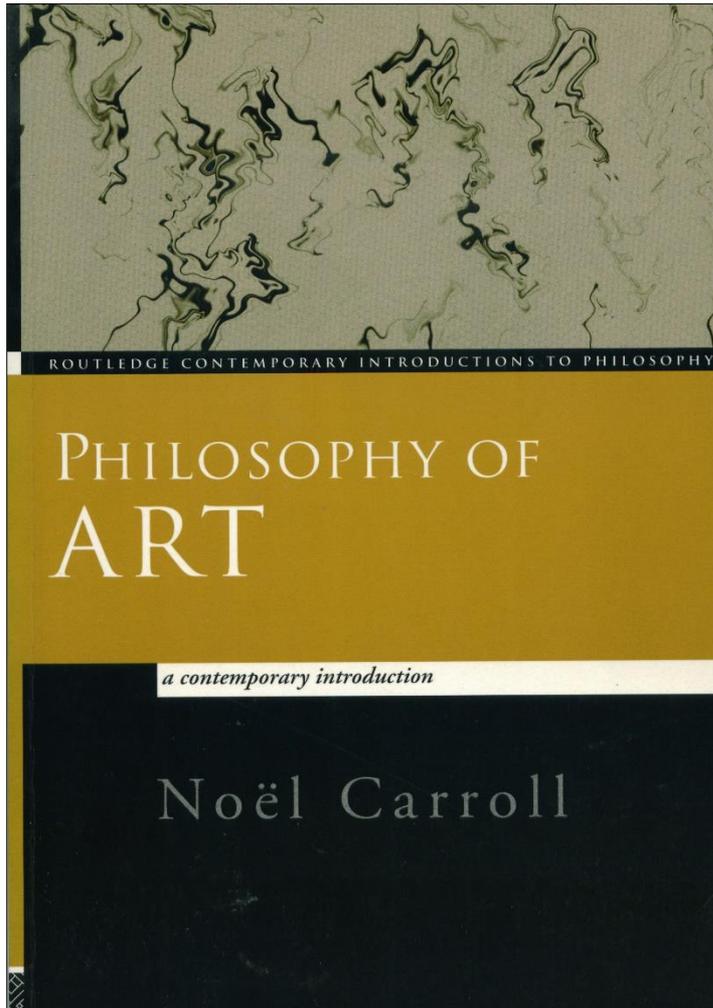
- 1.6 million years ago, first use of **fire**; more complex stone tools created.
- 400,000 years ago, earliest evidence of cooking.
- 195,000 years ago, modern humans (*Homo sapiens*) appear.
- 60,000 years ago, second wave of migration out of Africa.



- “Mimesis” (to mime, imitate, gesture, rehearse of skill) was there 2 million years ago.
- Three days of heavy rains. What would they do? They **created arts to kill time**.
- Arts was the first **safe** job in human history!
- **Applied arts** could start 1 million years ago; **pure arts**, later, when community large enough to support professional artists, about 10,000 years ago.

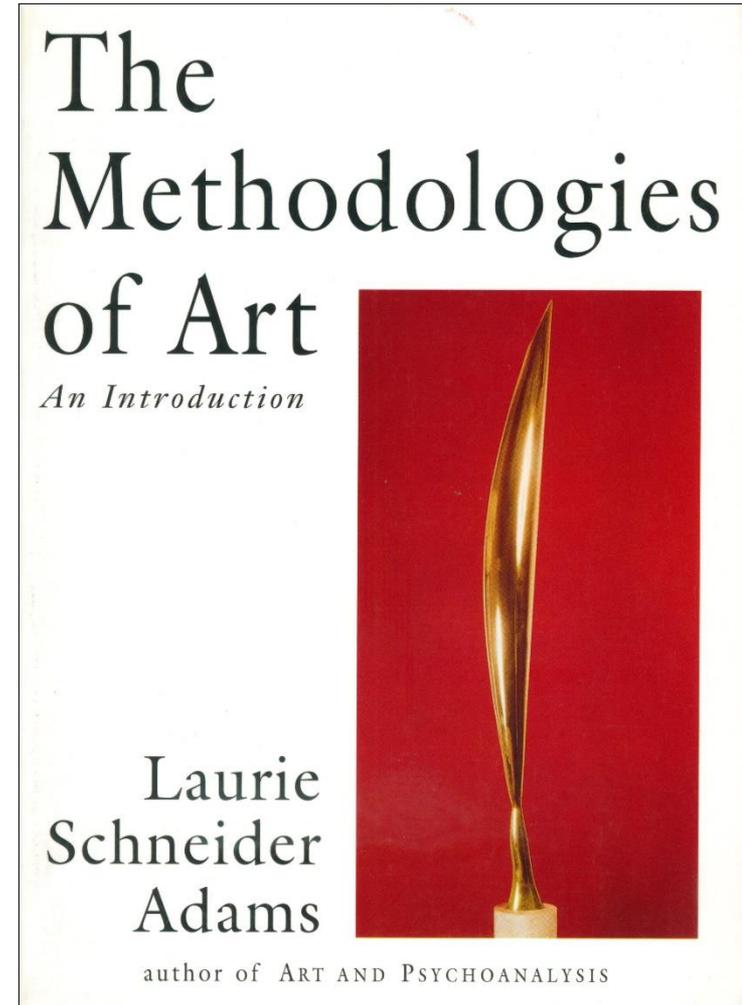
Nature of Arts

Collection of Failed Attempts



1999

A collection of failed attempts at defining art.



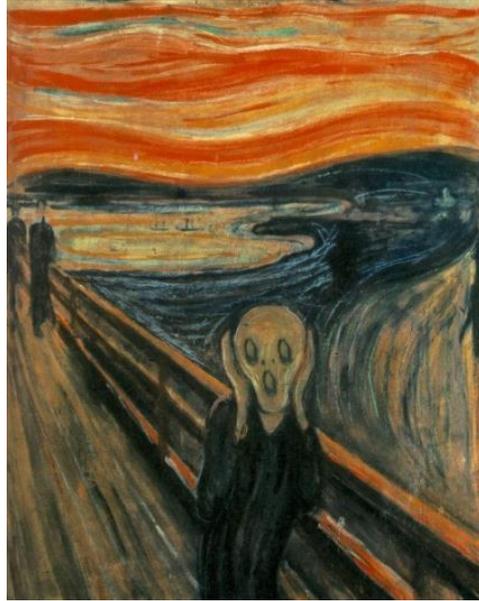
1996

A collection of failed attempts at interpreting art

The Puzzle of Arts



Jean-Auguste Dominique Ingres
The Spring (1820-1856)

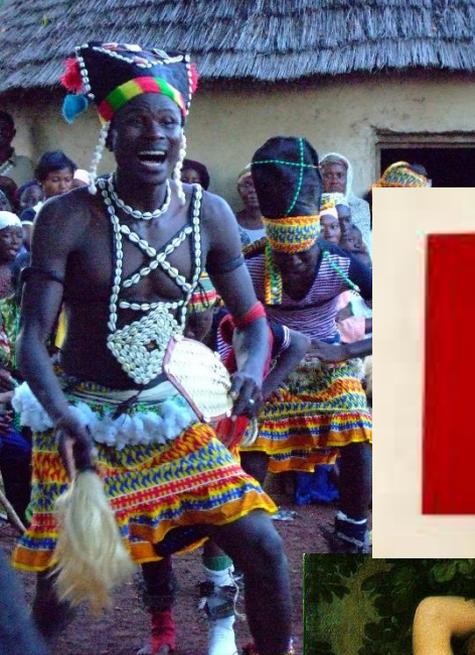


Edvard Munch
The Scream (1893-1910)



Marcel Duchamp
Fountain (1917)

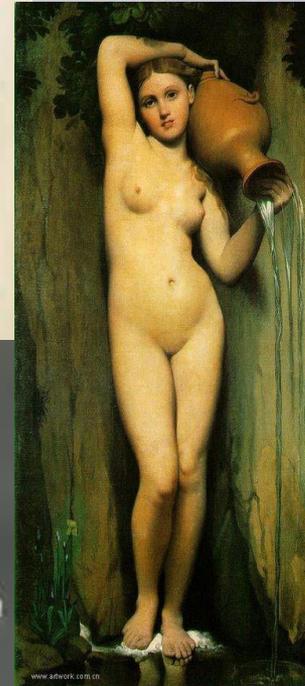
- Arts are **not** always about **beauty** but could be about (all kinds of) **emotions**, too.
- It is also about the description and interpretation of everything else in Nature.
—just like in physics, say.
- And it could be about “nothing”.
- It is somehow constrained by human nature, too.



Two Types of Arts

Applied Arts

Pure Arts



Pure Arts: A New Perspective

Five criteria of pure arts that last:

1. Aim at receiver's neurons
2. Kill time
3. Kill time gently and harmlessly
4. Passivity (physically speaking)
5. Human creation or intervention

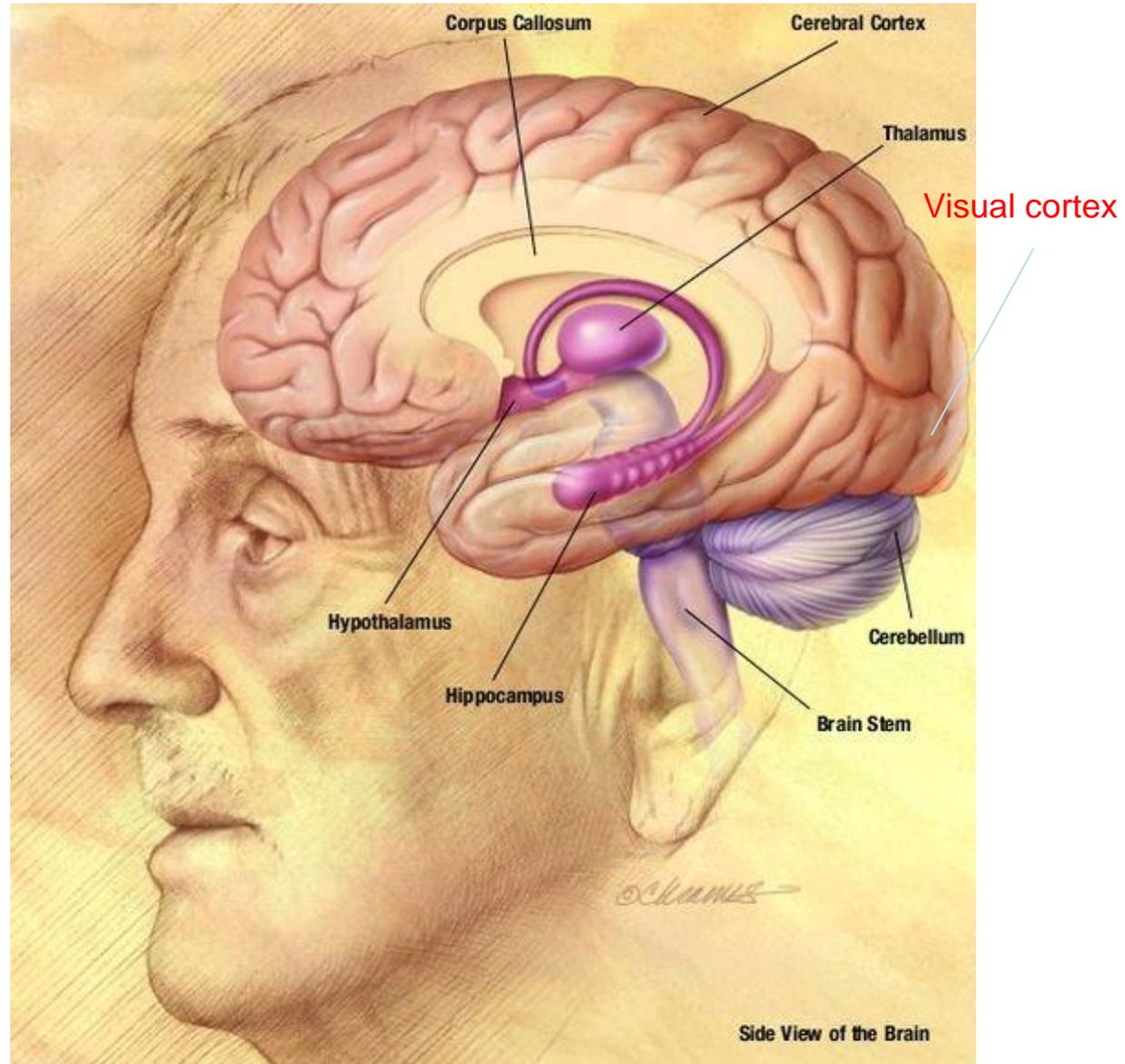
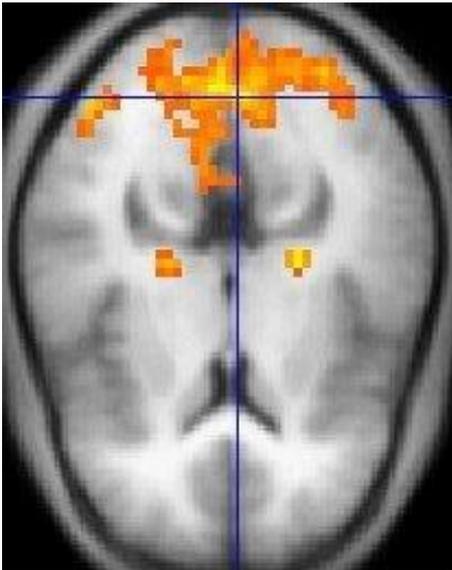
Content and form of pure arts are secondary,
to support Criteria 2-4 only!

Arts and Cognitive Science

Cognitive Science

Functional magnetic resonance imaging

fMRI, 1990



Seeing

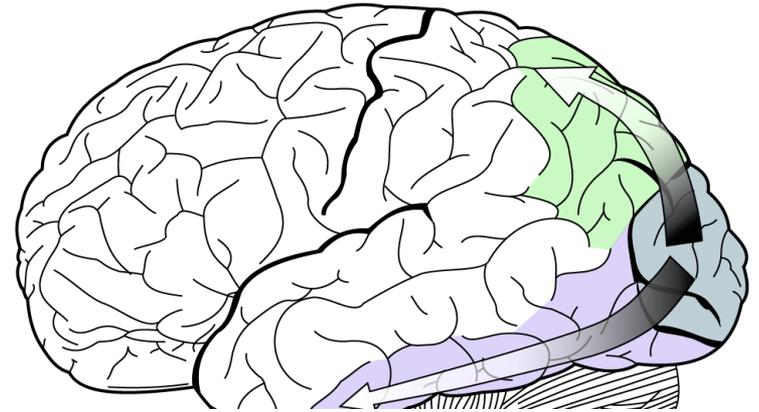
Light enters the eye; input signals go two pathways:

- **fast path**, sending blurry picture to the prefrontal cortex;
- **slow path**, through the visual cortex, which analyses and refines the lines of light.

The two parts work together and form the end picture.

Visual Cortex

- consists of the primary visual cortex (**V1**) and extrastriate visual cortical areas (such as **V2**, **V3**, **V4**, and **V5**).
- **V1** transmits information to **two primary pathways**, called the **dorsal stream** and the **ventral stream**:
 - The **dorsal stream** begins with V1, goes through V2, then to the dorsomedial area and V5 and to the posterior parietal cortex. It is called the "**Where Pathway**" or "**How Pathway**", associated with motion, representation of **object locations**, and control of the eyes and arms.
 - The **ventral stream** begins with V1, goes through V2, then V4, and to the inferior temporal cortex. It is called the "**What Pathway**", associated with **form recognition** and **object representation**, and with storage of long-term memory.



The **dorsal stream** (green) and **ventral stream** (purple) are shown. They originate from primary visual cortex.

Neurohumanities

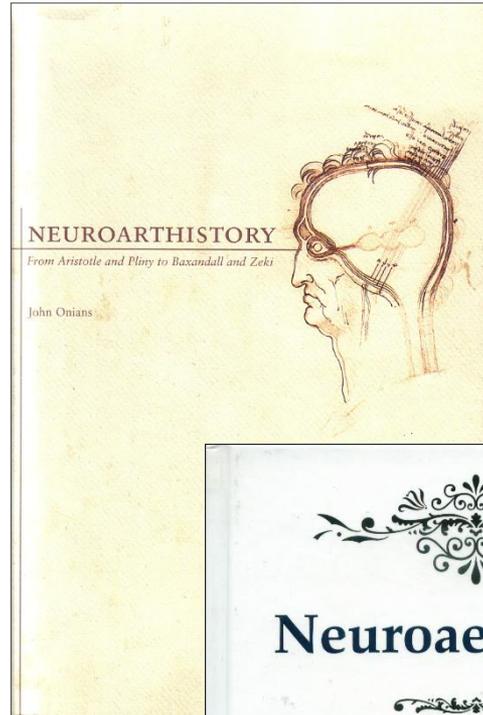
Neuroarthistory

Neuroaesthetics

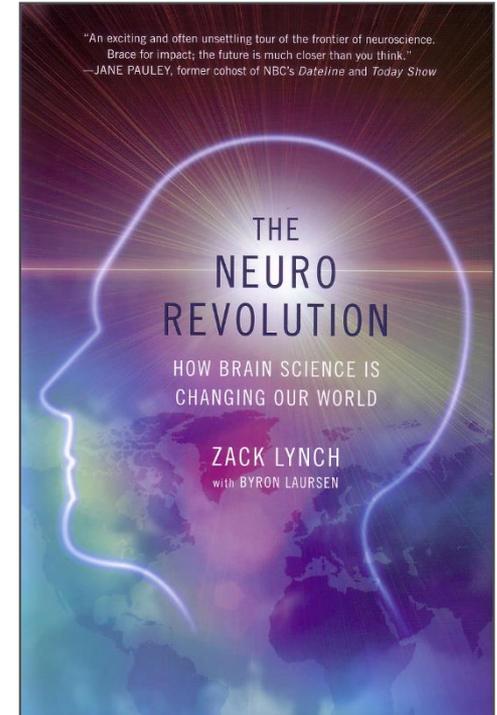
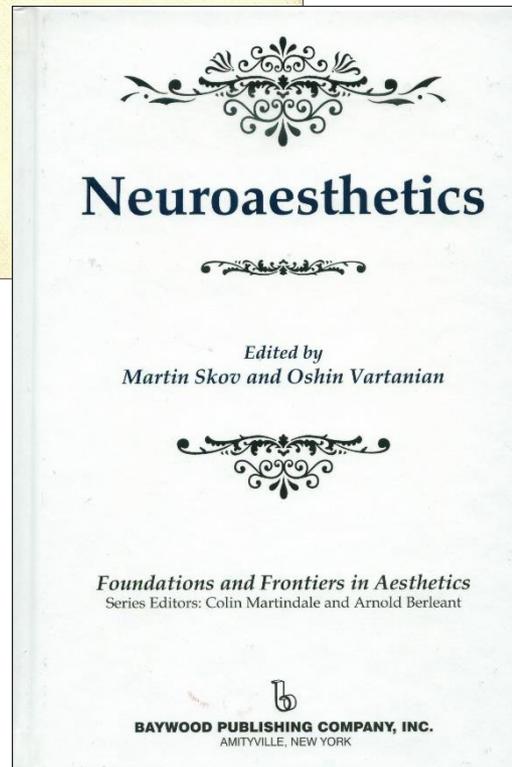
Neuromusicology

Neurophilosophy

Neurotheology



2007



2009

2009

Su Dong-Po's Bamboo

Su Dong-Po

(1036-1101, Song Dynasty)
Poet, painter and mandarin



Bamboos and Stones
(106 cm x 28 cm, partially shown)

Some bamboo leaves are **detached** from stem.



Wen Tong
(Song Dynasty)

Ink Bamboo
(131.6 cm x 105.4 cm)

All bamboo leaves are **attached** to stem.

Paul Cézanne's Apple

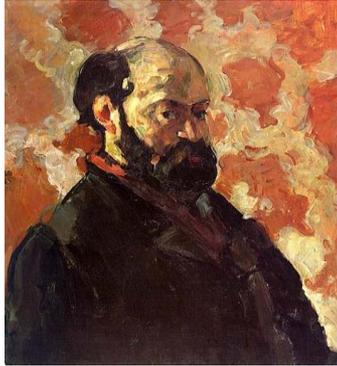
Paul Cézanne

(1839-1906)
Father of modern art

1837 Daguerre invents photography
1860 Snapshot photography developed
1873 First color photos appear
1874 Impressionists hold first group show

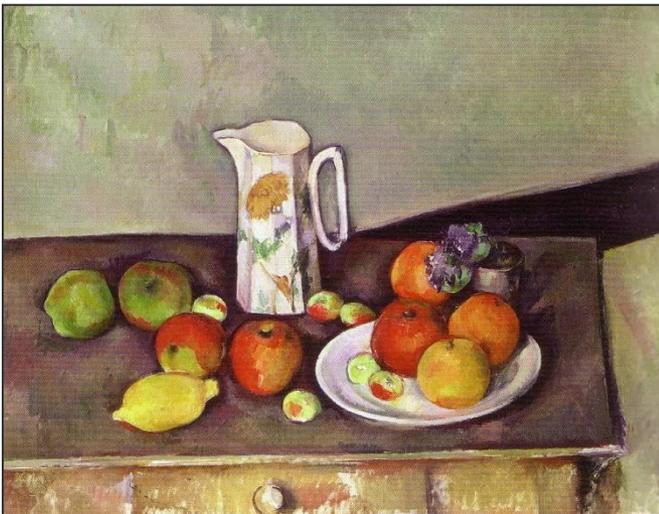


c. 1861



c. 1875

“With an apple I will astonish Paris.”



Still Life with Milk Jug and Fruit
(c. 1886-90)



Mount Sainte-Victoire Seen from Lauves (1904-1905)

- The mind is not a camera.
- The brain works on the input data and completes the picture !
- That is why Su's and Cézanne's paintings work.
- Su and Cézanne (living 800 years apart in 2 continents) both aim at depicting **essence** of the subject (not the appearance or the artist's impression) well ahead of their time—a reflection of the slow evolution of human brain/nature.

Arts and Science

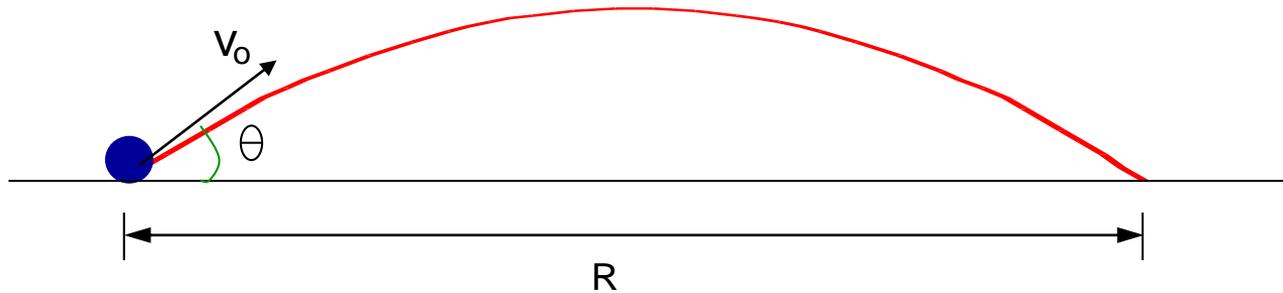
Arts and “(natural) Science”

Characteristics	Arts	“Science”
Both are part of science	Arts processes and studies are part of science.	“Science” (mostly about nonliving systems) is also part of science.
Different aims	Arts aim at receiver’s neurons.	“Science” aims to understand how nature works.
Receiver	Arts need a receiver to appreciate the artwork.	“Science” needs no receiver (but has to compare with Nature, the ultimate judge).
Different history	Arts started at least 35,000 (and could be a million) years ago.	“Science” started about 2,600 years ago since Thales (c. 624-c. 546 BC), after the invention of language and writing.
Relationship between arts and “science”	<ul style="list-style-type: none"> • Both involve creative process (for different reasons)—but same in many other human activities. • Arts are humans’ creation, reflecting on the world of human and nonhuman systems; the principles governing this world are the same principles (e.g., symmetry, spontaneous symmetry breaking, fractal, chaos, active walk) studied by “scientists”. • Progress in “science” (and related technology) advances the development of arts; e.g., pigments → color painting, film/camera → photographic art, electricity → cinema, laser → photonic art, computer → digital art. 	

More

Need Nontrivial Results

For example, in [physics](#), a nontrivial result:



Range $R = \frac{v_0^2 \sin(2\theta)}{g}$ \longrightarrow max. R requires $\theta = 45^\circ$

In the recent movie *Aliens in the Attic* (2009), the boy has to throw a dart to hit the alien but can't reach his target in first trial, then he remembers what he learns in physics and throws it at $\theta = 45^\circ$. Bingo! The world is saved!

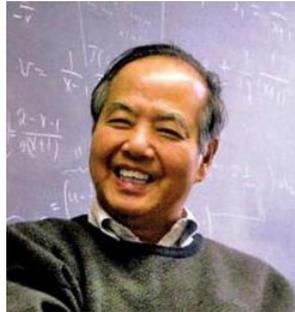
Nontrivial results from arts studies are needed to get artists' attention !

The Importance of Arts



Cai Yuanpei (蔡元培) :

Science and Art to culture, is like the two wings of a bird, the two wheels of a cart.



Tsung-Dao Lee (李政道) :

Science and Art are like the two sides of a coin; the coin is culture.

They are wrong !

Lui Lam (林磊) :

Arts and “Science” are two (of three) major pillars of any modern civilization !

When the Uninitiated Make the Decision



Conclusion

- Arts appeared at least 1 million years ago.
- Arts could be divided into applied arts and pure arts, just like in any discipline.
- Pure arts is to kill time gently, harmlessly and passively; the different means/contents (which changed with time) are vehicles to achieve this aim.
- Arts and “science” both are
 - creative processes
 - differ very much from each other in their aims and history
 - both reflect Nature
 - arts are constrained by human nature.
- Progress of “science” did influence significantly the development of arts, but **not** vice versa.