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 (photonic, digital…)

• …
Failed Attempt in Defining Art

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?
Painting/Sculpture: A Brief History

Simple  →  Complex  →  Simple

West

Chauvet Cave, France  
~35,000 yr ago

Europe  
17th century

China

Shang  
~3000 yr ago

17th century

The Yellow Curtain  
Henri Matisse, France  
1912

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…
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
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
In any scientific study, after

- observing and collecting data, and
- analyzing data

there are three levels/approaches to go further:

<table>
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<tr>
<th>Approach</th>
<th>Gas</th>
<th>Arts</th>
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</thead>
<tbody>
<tr>
<td>Empirical</td>
<td>Gas law</td>
<td>Done by some artists, art critics and historians; Physics—fractals</td>
</tr>
<tr>
<td>Phenomenological</td>
<td>Navier-Stokes equation</td>
<td>Done by some historians/ philosophers; Evolutionary theory (Darwin)</td>
</tr>
<tr>
<td>Bottom → up</td>
<td>Molecular picture</td>
<td>Biology—evolutionary theory (genes), cognitive science; Physics—statistical analysis, ...</td>
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See, e.g., J. Lehrer *Proust was a Neuroscientist* (2007)

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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.
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).

In physics: \[ F = E - TS \]
Origin of Arts
Dissanayake:

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

**Problem:**

No experimental proof

**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
### 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
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

Visual cortex
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.
Neurohumanities

Neuroarhthistory

Neuroaesthetics

Neuromusicology

Neurophilosophy

Neurotheology

2007

2009

2009
Su Dong-Po’s Bamboo

Su Dong-Po

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

Some bamboo leaves are detached from stem.

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

Wen Tong
(Song Dynasty)

Ink Bamboo
(131.6 cm x 105.4 cm)

All bamboo leaves are attached to stem.
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

“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"

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<thead>
<tr>
<th>Characteristics</th>
<th>Arts</th>
<th>“Science”</th>
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<tbody>
<tr>
<td>Both are part of science</td>
<td>Arts processes and studies are part of science.</td>
<td>“Science” (mostly about nonliving systems) is also part of science.</td>
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<tr>
<td>Different aims</td>
<td>Arts aim at receiver’s neurons.</td>
<td>“Science” aims to understand how nature works.</td>
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<tr>
<td>Receiver</td>
<td>Arts need a receiver to appreciate the artwork.</td>
<td>“Science” needs no receiver (but has to compare with Nature, the ultimate judge).</td>
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<tr>
<td>Different history</td>
<td>Arts started at least 35,000 (and could be a million) years ago.</td>
<td>“Science” started about 2,600 years ago since Thales (c. 624-c. 546 BC), after the invention of language and writing.</td>
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<tr>
<td>Relationship between arts and “science”</td>
<td>• Both involve creative process <em>(for different reasons)</em>—but same in many other human activities.</td>
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<td></td>
<td>• 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”.</td>
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<td>• Progress in “science” (and related technology) advances the development of arts; e.g., pigments $\rightarrow$ color painting, film/camera $\rightarrow$ photographic art, electricity $\rightarrow$ cinema, laser $\rightarrow$ photonic art, computer $\rightarrow$ digital art.</td>
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More
For example, in physics, a nontrivial result:

\[ R = \frac{V_0^2 \sin (2\theta)}{g} \]

The maximum range \( R \) 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
• 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.