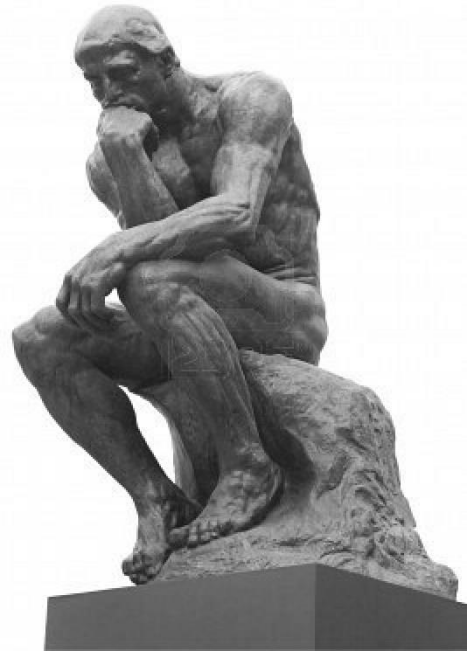
Complex Beauty

KAIST 문화기술대학원

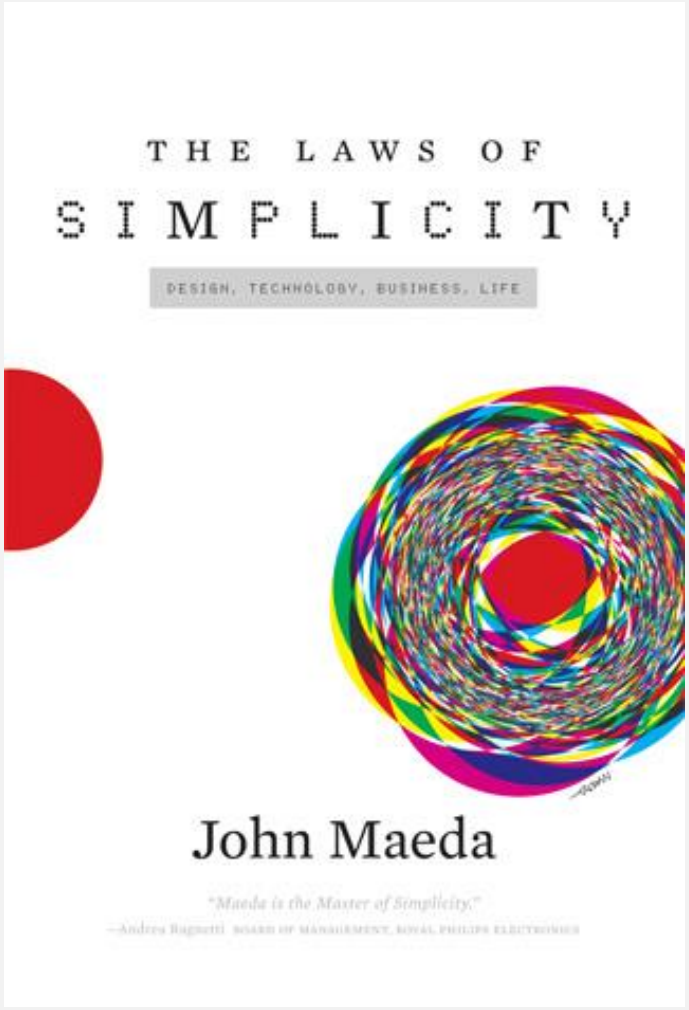
원 광 연



Ars Electronica, 2006

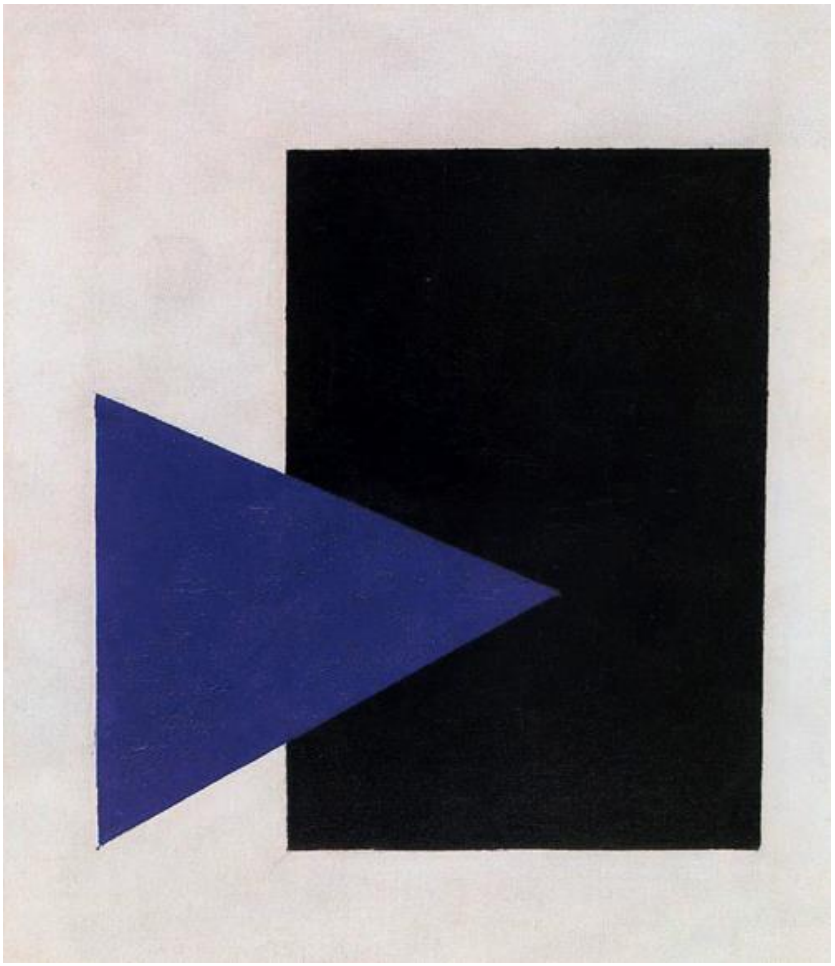
Tsuyoshi Ozawa, Vegetable Weapon: Saury fish ball hot pot/Tokyo, 2001 courtesy: Ota Fine Arts, tokyo

“The Laws of Simplicity”
John Maeda (2006)

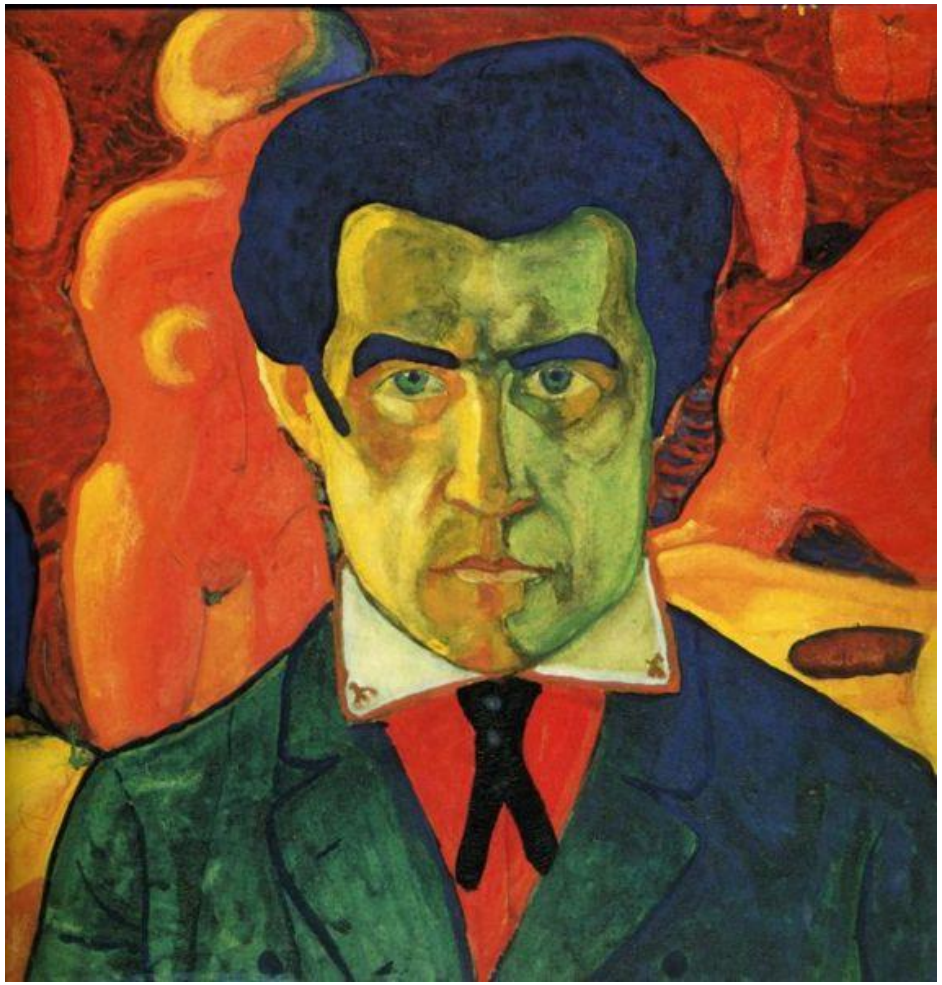


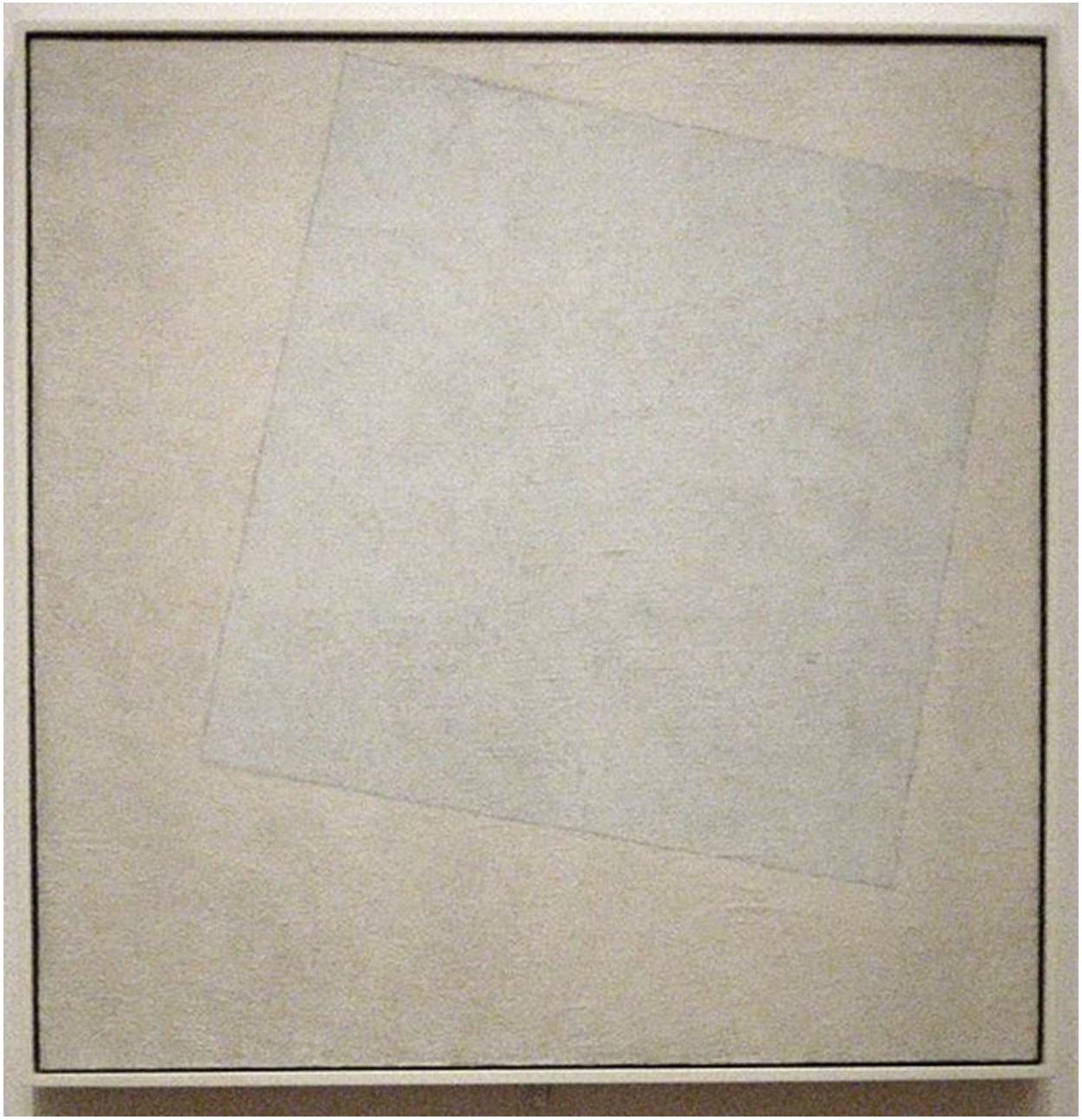
1. Reduce
2. Organize
3. Time
4. Learn
5. Differences
6. Context
7. Emotion
8. Trust
9. Failure
10. The one

Visual Complexity

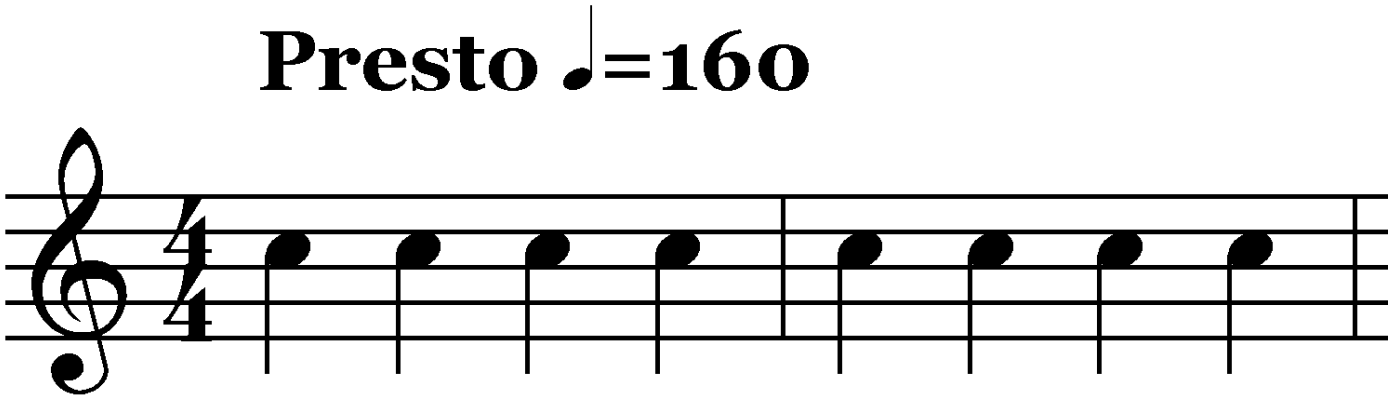


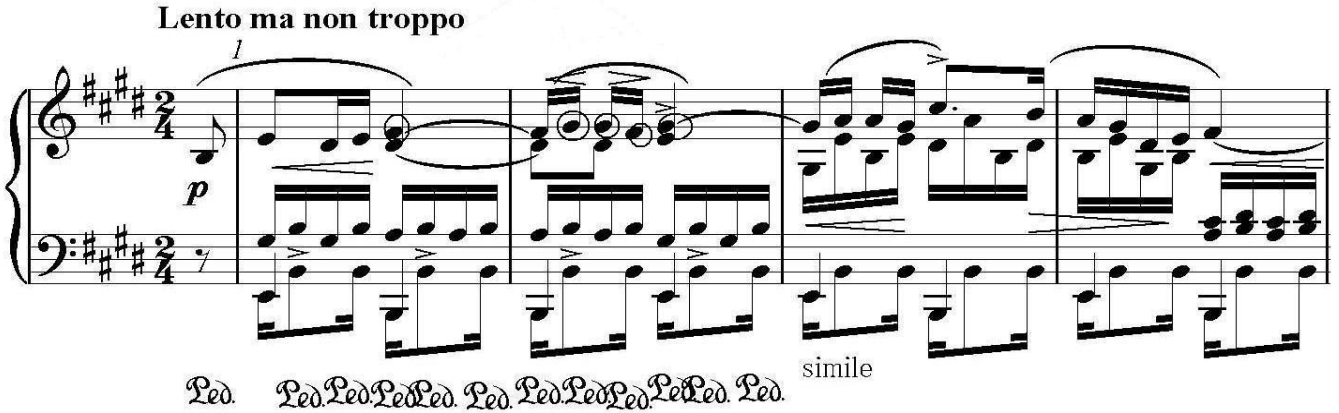
Kazimir Malevich (1879~1935)



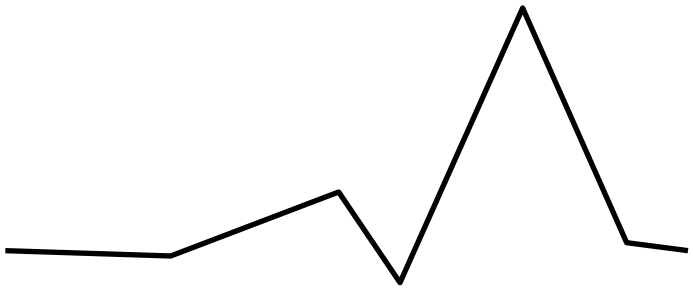


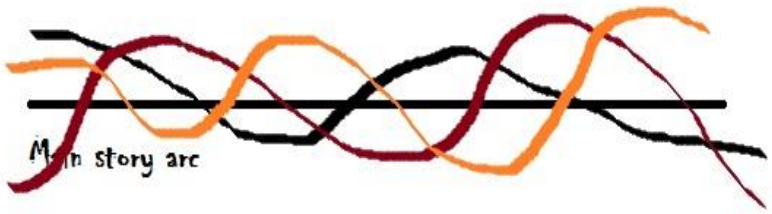
Musical Complexity



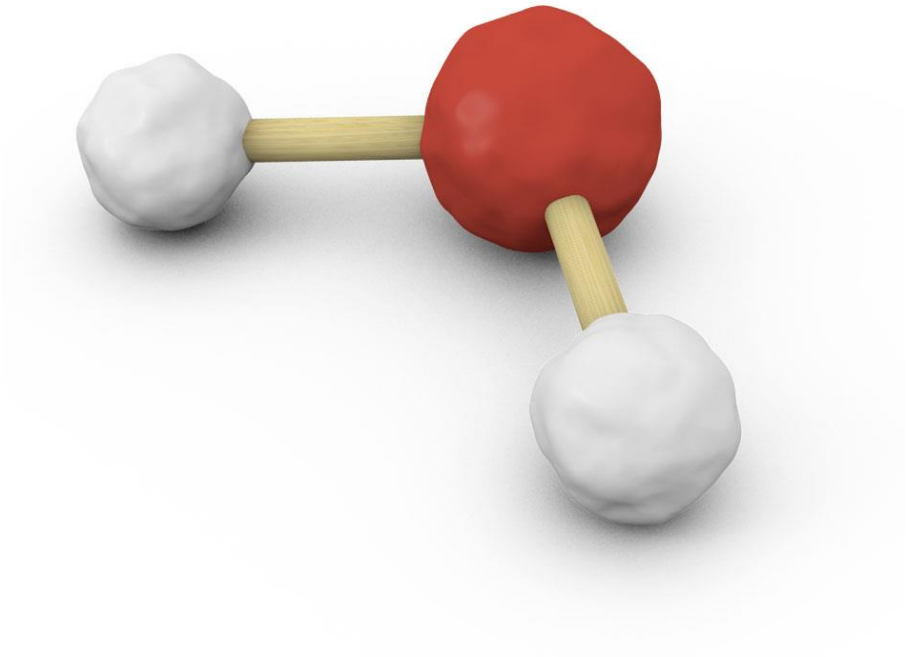


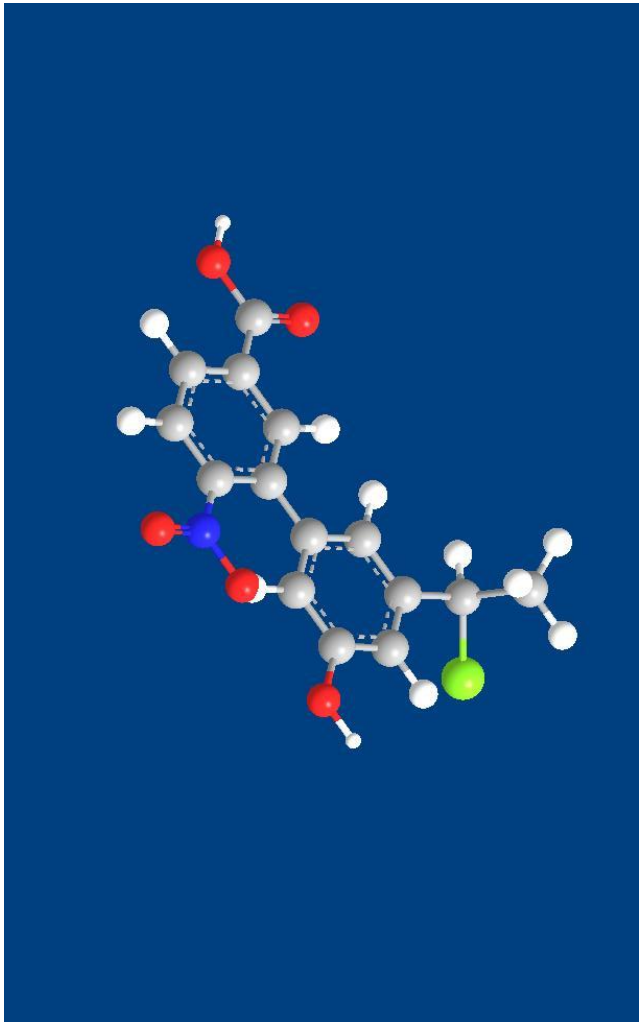
Story Complexity





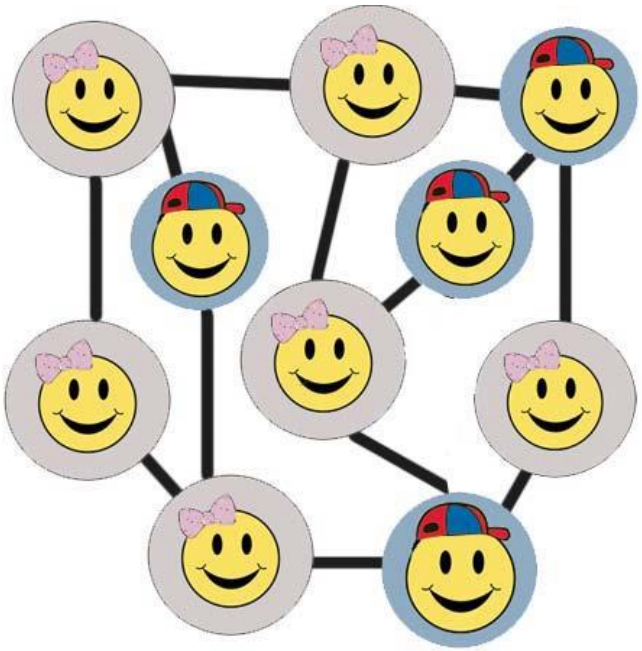
Structural Complexity

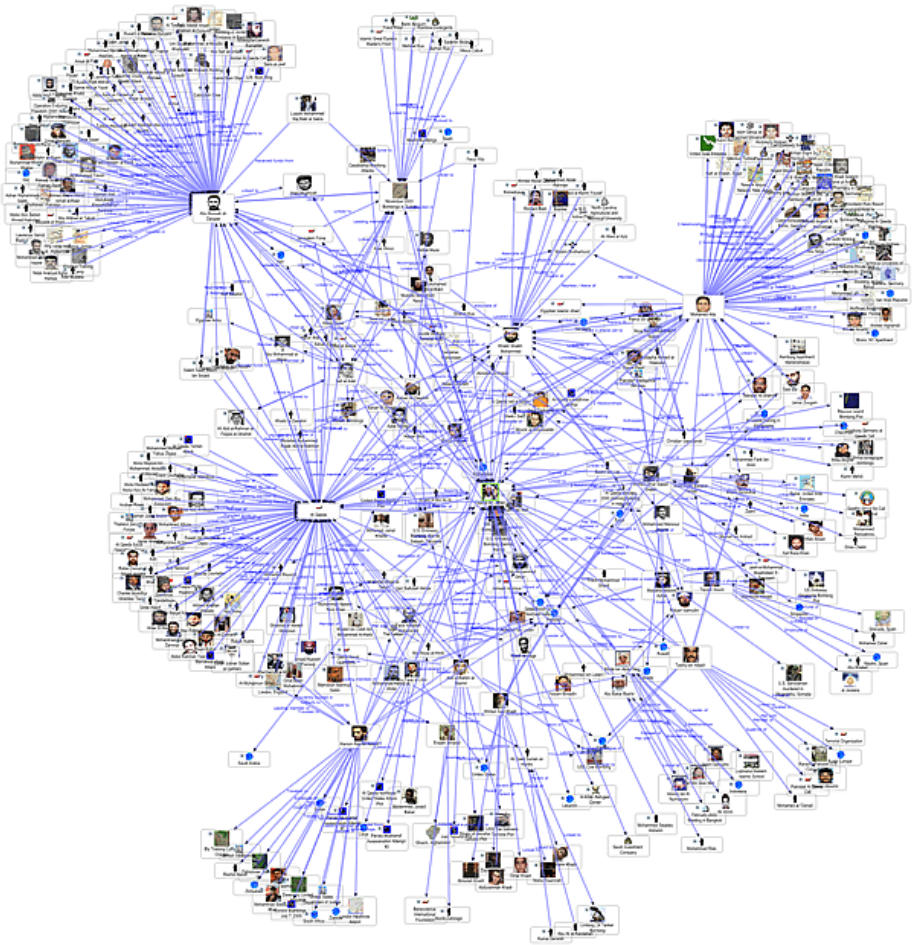




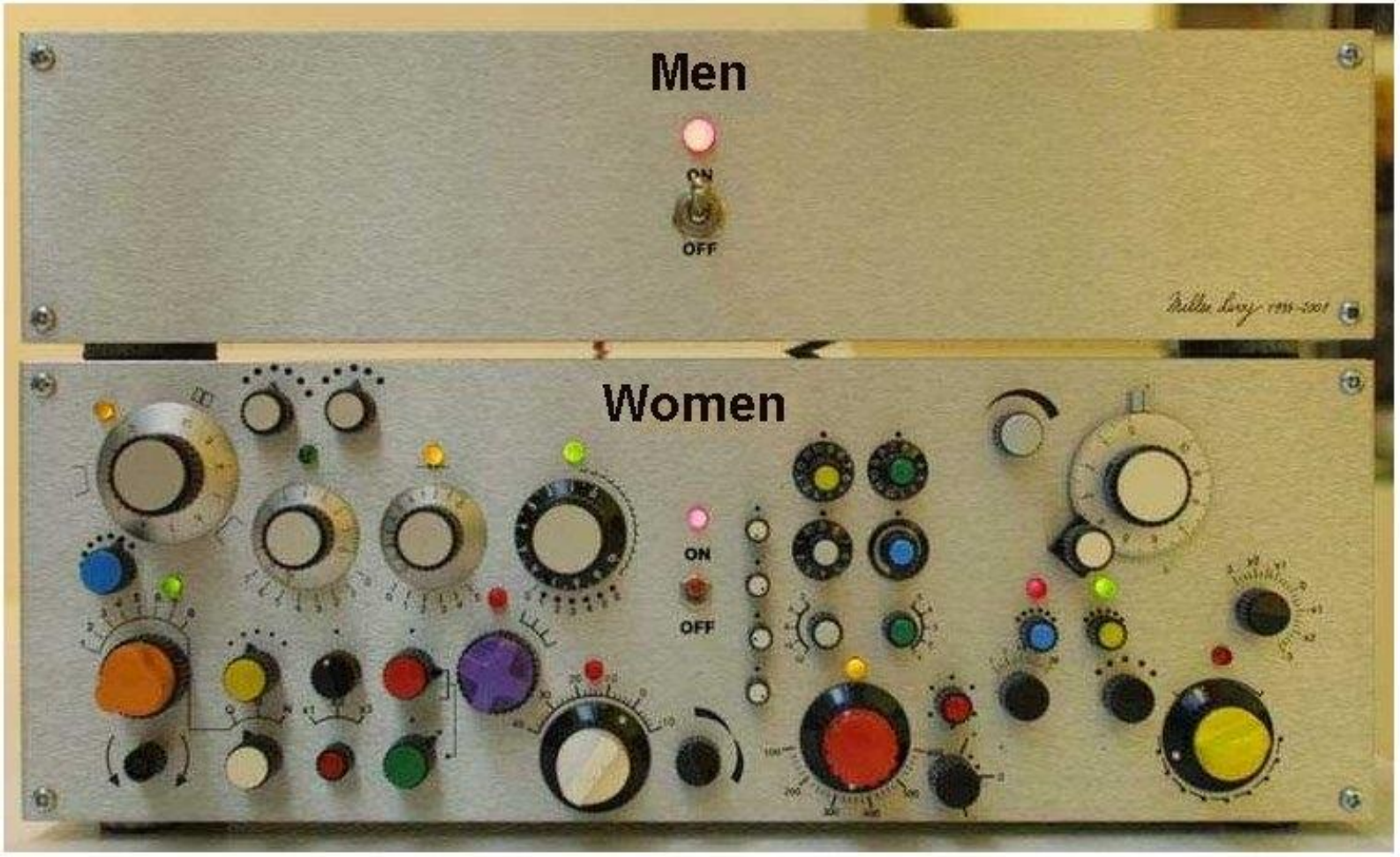
Behavioral Complexity

Network Complexity





Interaction Complexity



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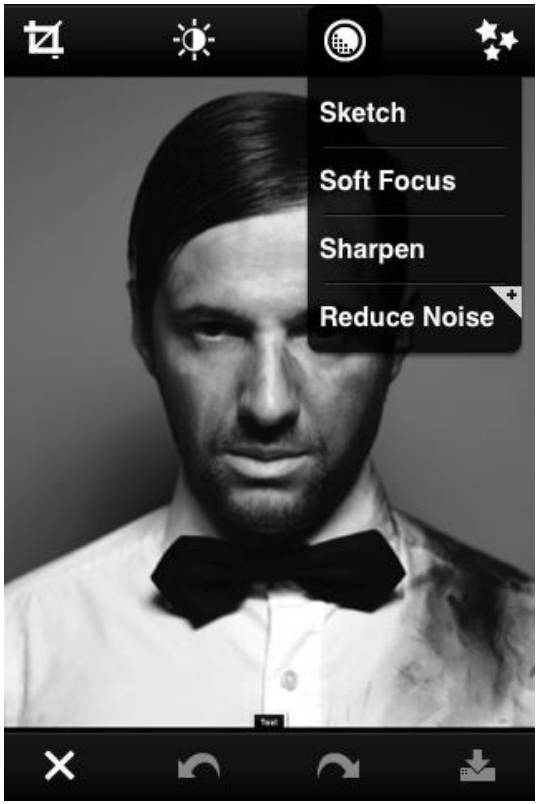
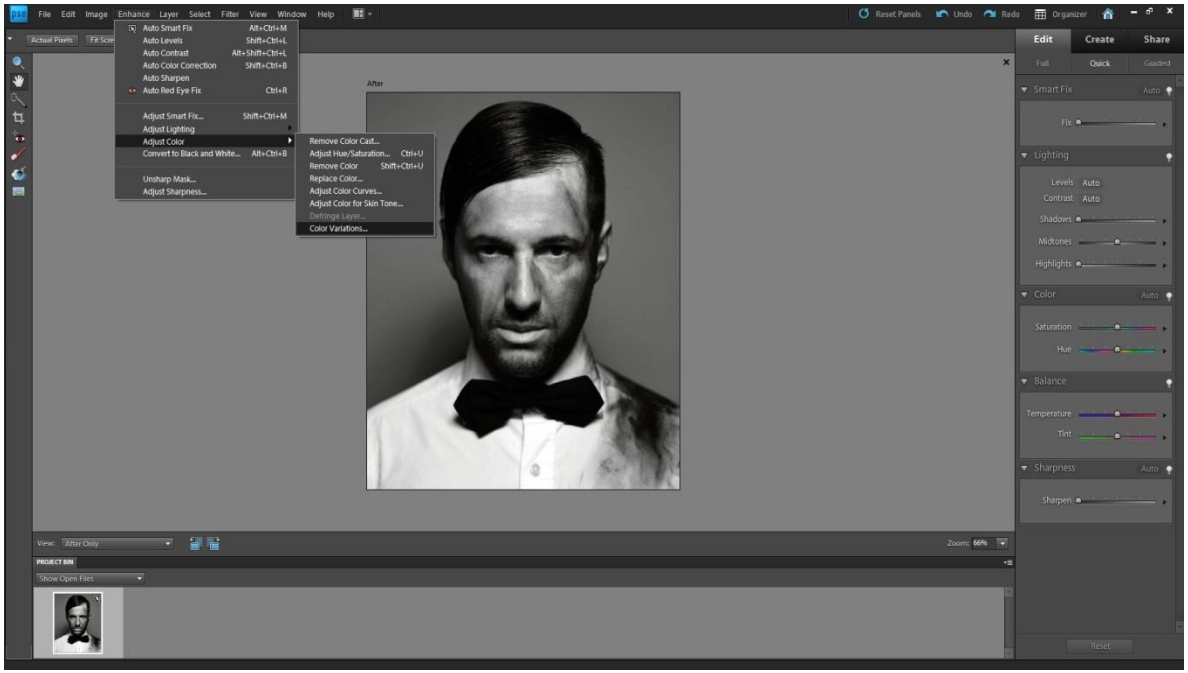
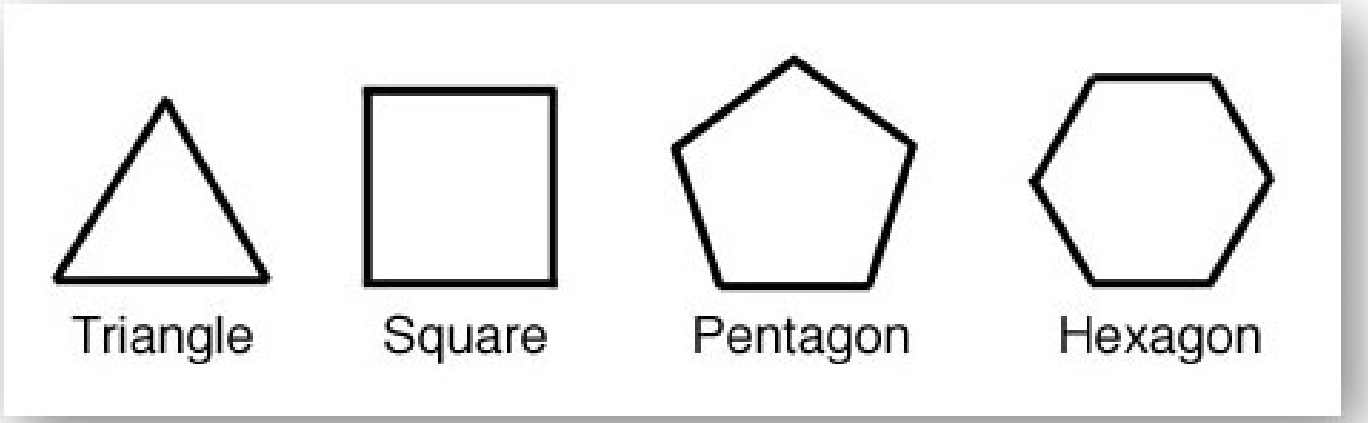
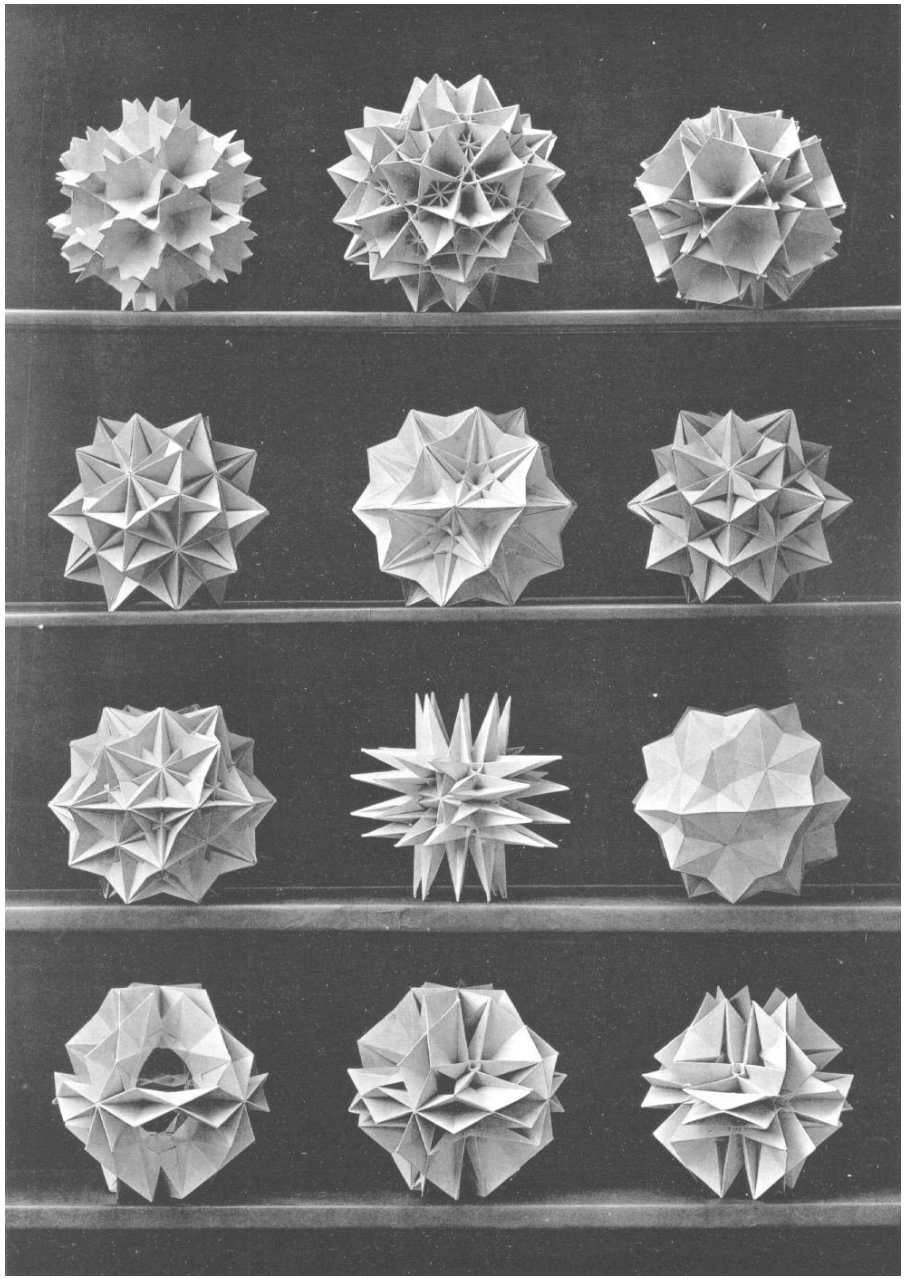


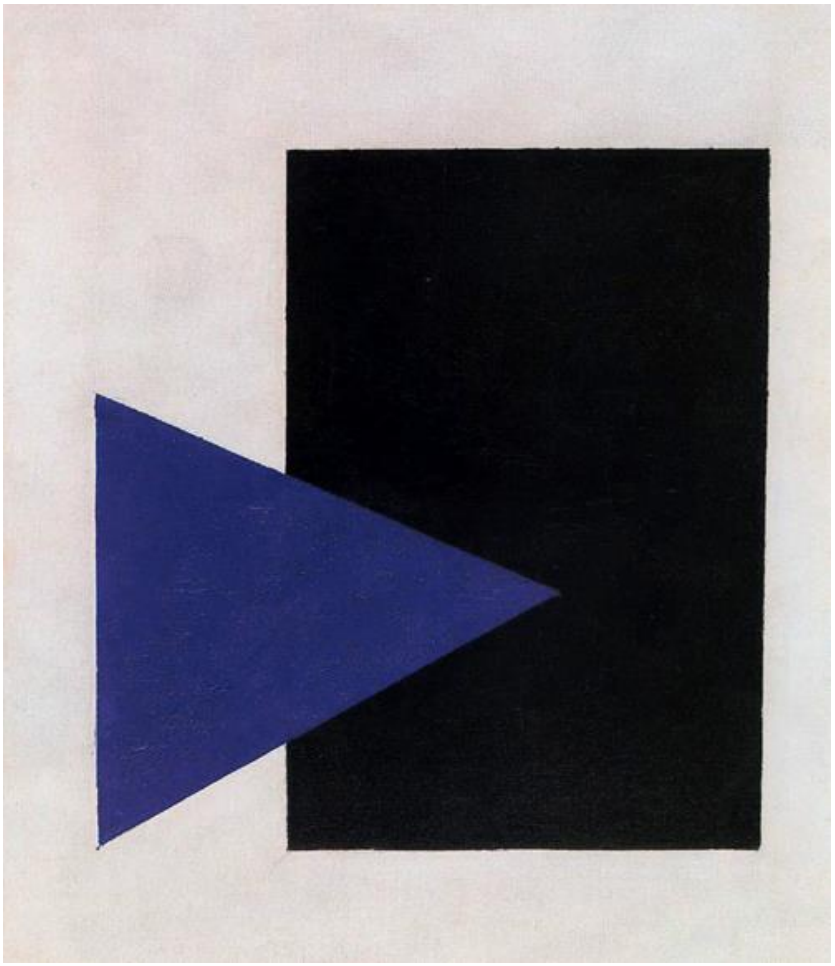


Geometric Complexity

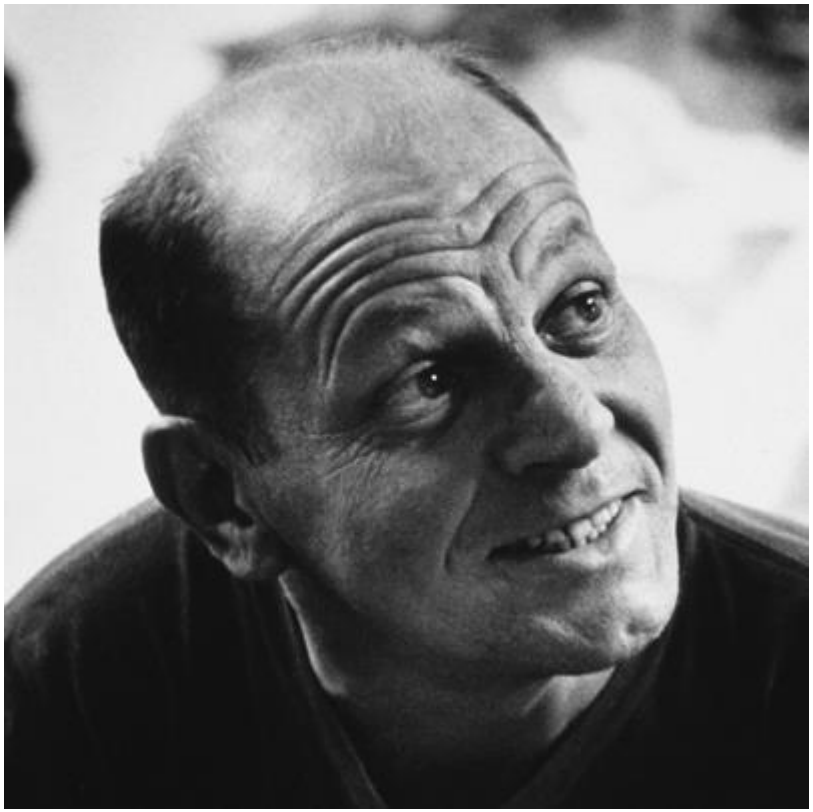




Visual Complexity



Jackson Pollock (1912~1956)



Abstract Expressionism
추상표현주의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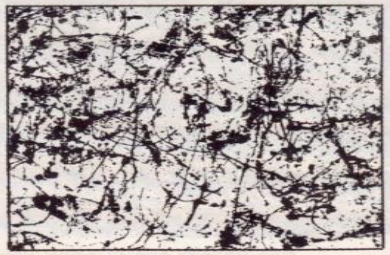
ANALYZING POLLOCK'S TECHNIQUE

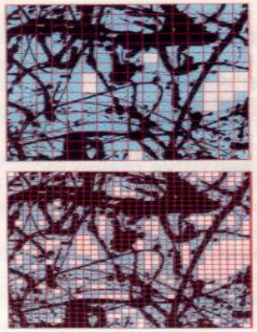
COMPUTER-ASSISTED ANALYSIS of Pollock's paintings reveals that the artist built up layers of paint in a carefully developed technique that created a dense web of fractals. Pollock was occasionally photographed while painting [*see illustration on page 121*], which gave me and my colleagues Adam Micolich and David Jonas more insight into his technique.

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

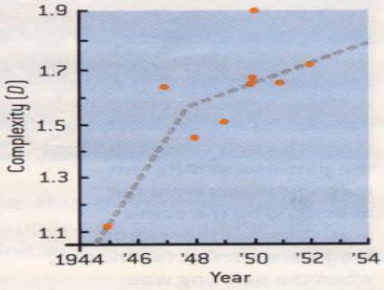
1 We began by scanning a painting into a computer. We could then separate the painting into its different colored patterns and analyze the fractal content of each pattern. We also looked at the cumulative pattern as the layers were added one by one to build the total picture. A detail from the black layer of *Autumn Rhythm* is shown at the right.



2 We covered the painting with a computer-generated mesh of identical squares. We then had the computer assess the statistical qualities of the pattern by analyzing which squares are occupied by the pattern (*blue*) and which are empty (*white*). Reducing the mesh size (*bottom*) is equivalent to looking at the statistical qualities of patterns at a finer magnification. We found the patterns to be fractal over the entire size range.



3 Studying the paintings chronologically showed that the complexity of the fractal patterns, *D*, increased as Pollock refined his technique. One *D* value is clearly an outlier—1.9 in 1950, a work that Pollock later destroyed (the analysis is based on a photograph). He may have thought this image was too dense or too complex and subsequently scaled back.

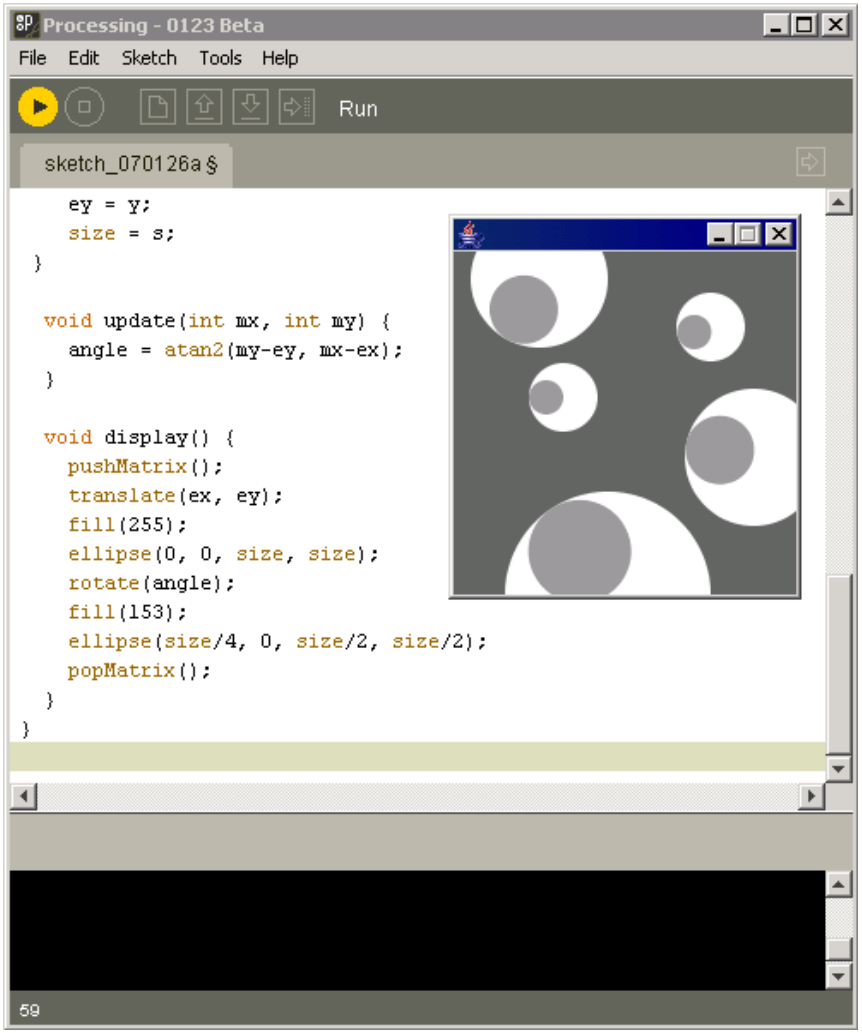


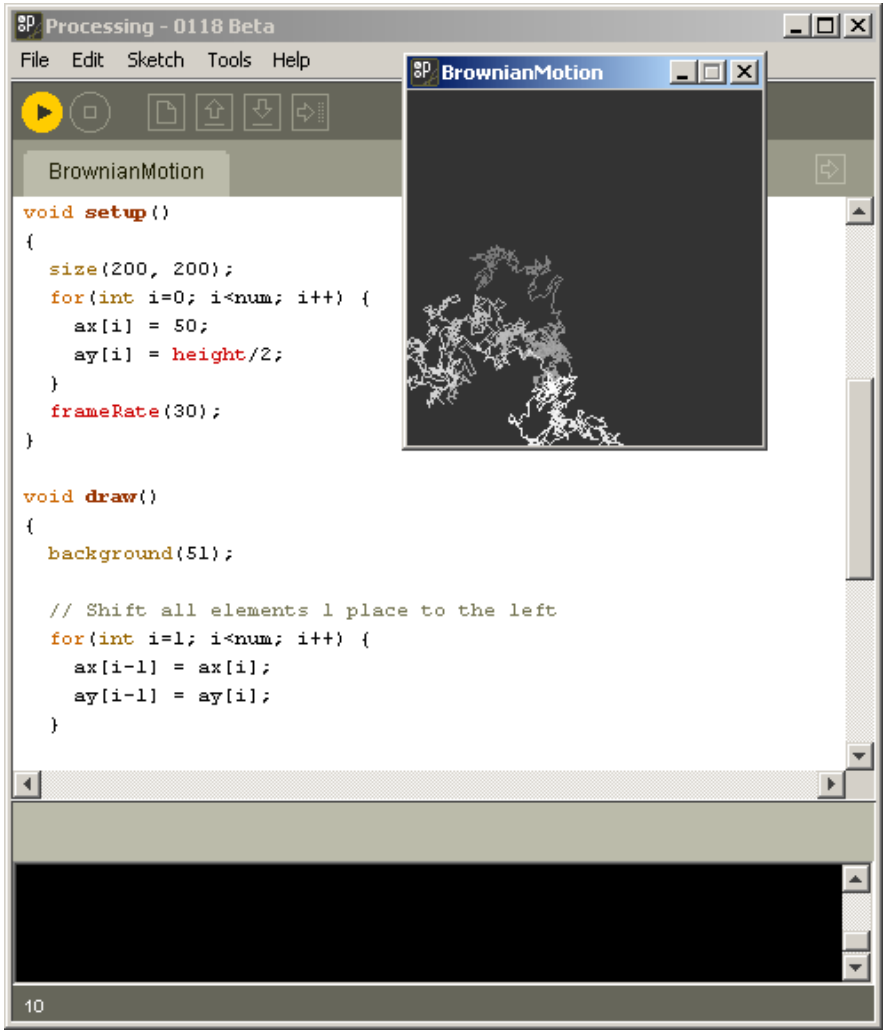
D = 1 nonfractal | *D* = 1.1 | *D* = 1.6 | *D* = 1.9 | *D* = 2 nonfractal

The evolution in *D* value had a profound effect on the appearance of the paintings. For fractals described by a low *D*, the repeating patterns build a smooth, sparse image. If the *D* value is closer to 2, however, the repeating patterns create a shape full of intricate, detailed structure.

WHAT EMERGES FROM BOTH the computer analysis and the examination of the photographs is evidence of a very systematic, deliberate painting process. Pollock started by painting small, localized "islands" of trajectories across the canvas. This is interesting because some of nature's patterns start with small nucleations that then spread and merge. He next painted longer, extended trajectories that linked the islands, gradually submerging them in a dense fractal web of paint. This stage of the painting formed an anchor layer: it actually guided the artist's subsequent painting actions. During the linking process, the painting's complexity (its *D* value) increased over a timescale of less than a minute. After this rapid activity, Pollock would take a break. He would then return to the canvas, and over a period lasting from two days to six months, he would deposit further layers of different-colored trajectories on top of the black anchor layer. Essentially, he was fine-tuning the complexity established by the anchor layer. Even when Pollock had finished painting, he took steps that maximized the fractal character, cropping to remove the outer regions where the fractal quality deteriorated. —*R.P.T.*

Program Complexity





Algorithm Complexity

- Which problem is more complex?
- Which algorithm (or program) is more complex?
- How do we measure complexity?
  - The data size plays the key role!
    (When the data size doubles, what about the computing time?)
  - Let's increase the data size and see what happens.
    → Asymptotic behavior

Reductionist Approach to Beauty

- Balance
- Symmetry
- Regularity
- Predictability
- Transparency
- Accuracy
- …

- What if complexity exceeds a “manageable” level?

Holistic Approach to Beauty

- Gestalt psychology
- Fractal expressionism
- Complex aesthetics
  - Non-linearity
  - Multiplicity
  - Interconnectivity
- Networkism

Showcase: Students Homework

- Express the concept/notion/idea of the very high complexity as simple as possible, in the form of poem/photo/drawing/music/program/dance(body movements)/game/etc.
- In addition to your ‘artwork’, you must explain your idea of complexity clearly.
- No page limit, this time. But simplicity will be the major evaluation criteria.