“Imagination is more important than knowledge. For knowledge is limited to all we now know and understand, while imagination embraces the entire world, and all there ever will be to know and understand.”

Einstein
TODAY 4/16/07:

• Quick Review of last week’s topics
• Industrialization / ford / taylorism
• Communication revolution: movable type
• Mechanical Philosophy / dualism
• Robotics / Cybernetics / Computing
• Kinetic Art
• Contemporary art using robotics
Assembly Lines: FORD
Second Industrial Revolution

commonly associated with electrification as pioneered by Nikola Tesla, Thomas Alva Edison and George Westinghouse and by scientific management as applied by Frederick Winslow Taylor.
He would break a job into its component parts and measure each to the hundredth of a minute. One of his most famous studies involved shovels. He noticed that workers used the same shovel for all materials. He determined that the most effective load was 21½ lb, and found or designed shovels that for each material would scoop up that amount.
Although first invented by the Chinese in 1040, it was not invented in the West until 1450 by Johannes Gutenberg.
Although Gutenberg was financially unsuccessful in his lifetime, the printing technologies spread quickly, and news and books began to travel across Europe much faster than before. It fed the growing Renaissance, and since it greatly facilitated scientific publishing, it was a major catalyst for the later scientific revolution.
Metal Movable type

A case of cast metal type pieces and typeset matter in a composing stick
The mechanists, of whom the most important one was René Descartes, rejected all goals, emotion and intelligence in nature. In this view the world consisted of particles of matter -- which lacked all active powers and were fundamentally inert -- with motion being caused by direct physical contact.

Where nature had previously been imagined to be like an active entity, the mechanical philosophers viewed nature as following natural, physical laws.
Descartes’s illustration of dualism. Inputs are passed on by the sensory organs to the epiphysis in the brain and from there to the immaterial spirit.
Descartes was the first to clearly identify the *mind* with consciousness and self-awareness and to distinguish this from the brain, which was the seat of intelligence. Hence, he was the first to formulate the *mind-body problem* in the form in which it exists today.
McLuhan studies the emergence of what he calls Gutenberg Man, the subject produced by the change of consciousness wrought by the advent of the printed book. A propos of his axiom, "The medium is the message," McLuhan argues that technologies are not simply inventions which people employ but are the means by which people are re-invented.

The invention of movable type was the decisive moment in the change from a culture in which all the senses partook of a common interplay to a tyranny of the visual. He also argued that the development of the printing press led to the creation of nationalism, dualism, domination of rationalism, automatisation of scientific research, uniformation and standardisation of culture and alienation of individuals.
Robotics

Origin of the word robot:
The word robot was introduced by Czech writer Karel Čapek in his play *R.U.R.* (Rossum's Universal Robots) which was written in 1920.
Fritz Lang’s Metropolis
Futurists

Marinetti’s 1916 manifesto

Laszlo Moholy-Nagy, 1924
Cybernetics

The term *cybernetics* stems from the Greek Κυβερνήτης (*kybernetes*, steersman, governor, pilot, or rudder — the same root as government).

The name *cybernetics* was coined by Norbert Wiener to denote the study of "teleological mechanisms" and was popularized through his book *Cybernetics, or Control and Communication in the Animal and Machine* (1948).
Vannevar Bush’s theoretical Memex machine, 1945

He argued that as humans turned from war, scientific efforts should shift from increasing physical abilities to making all previous collected human knowledge more accessible. “As We May Think”
Walter Benjamin: 
The Work of Art in the Age of Mechanical Reproduction, 1936

A better translation of the original German title might be "The Work of Art in the Age of Its Technological Reproducibility" (Das Kunstwerk im Zeitalter seiner technischen Reproduzierbarkeit).

"For the first time in world history, mechanical reproduction emancipates the work of art from its parasitical dependence on ritual."
Kinetic art was first recorded by the sculptors Naum Gabo and Antoine Pevsner in their Realist Manifesto issued as part of a manifesto of constructivism in 1920 in Moscow. "Bicycle Wheel," of 1913, by Marcel Duchamp, is said to be the first kinetic sculpture.

The Manifesto focused largely on divorcing art from such conventions as use of lines, color, volume, and mass. They also believed art should accompany man through all parts of his life: "at the workbench, at the office, at work, at rest, and at leisure; work days and holidays, at home and on the road, so that the flame of life does not go out in man."
Computers
Engelbart

1962 research report which Engelbart refers to as his 'bible': “Augmenting Human Intellect: A Conceptual Framework”. The concept of network augmented intelligence is attributed to Engelbart based on this pioneering work.
On October 29, 1969, the world's first electronic computer network, the ARPANET, was established between nodes at Leonard Kleinrock's lab at UCLA and Engelbart's lab at SRI. Interface Message Processors at both sites served as the Backbone of the first Internet. In addition to SRI and UCLA, UCSB, and the University of Utah were part of the original four network nodes.
Engineer Billy Kluver and artist Robert Rauschenberg "Rauschenberg decided to form Experiments in Art and Technology as a service organization for artists, engineers and scientists."
In his work as a scientist and engineer, Malina had access to an abundance of scholarly periodicals that enabled peers in any given field to stay abreast of each other's work and to monitor important news developments. There was no equivalent publication for artists, so he decided to start one. The concept was simple---a publication by serious artists with subject integrity secured by the same kind of peer review of articles that is common in scientific journals. Malina felt that the demystification of modern art could, in part, be accomplished by the free exchange of information regarding artistic disciplines.
One of the first theoretical attempts to integrate the emerging fields of human-computer interactivity and cybernetics with artistic practice is Ascott's article, "Behavioral Art and the Cybernetic Vision," from 1966-67. Ascott noted that the computer was "the supreme tool that... technology has produced.

Used in conjunction with synthetic materials it can be expected to open up paths of radical change in art." Ascott saw that human-computer interaction would profoundly affect aesthetics, leading artists to embrace collaborative and interactive modes of experience.
BIOROBOTICS
Robotic painting
Ken Goldberg
Survival Research Labs

25 Year SRL Retrospective
Donna Beam Gallery
University of Nevada Las Vegas
January 30 2004
Stelarc
A Public Lecture:
The Nature of Roughness in Mathematics, Science and Art

presented by
Benoit Mandelbrot

Time and Location:
April 16, 2007, 4:30 pm
LaKretz Hall (click on core-south), Room 110