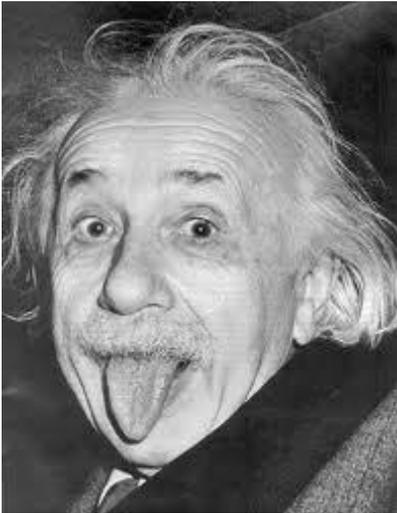


## Science, Technology and Art around 1920:

### Physics, Geometry, Logic:



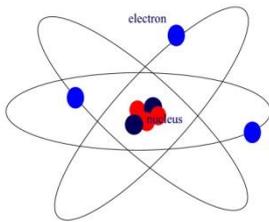
**Albert Einstein**: *Special Theory of relativity* (1905) and *General theory of relativity* (1915)

**Special Theory of relativity**: is a theory of the structure of spacetime. Special relativity is based on two postulates which are contradictory in **classical mechanics**:

**Consequences of the theory**: Two events, simultaneous for one observer, may not be simultaneous for another observer if the observers are in relative motion.

**General theory of relativity (1915)**: is a theory of **gravitation** developed by Einstein in the years 1907–1915. Consequence of the theory: **spacetime is curved**.

- **Enrico Fermi** (†1954): Italian physicist particularly known for his work on the development of the first nuclear reactor. Along with J. Robert Oppenheimer, he is frequently referred to as "**the father of the atomic bomb**".



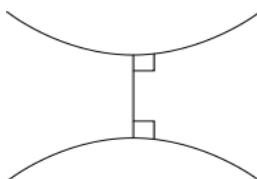
Atomic Planetary Model

**Ernest Rutherford**, (†1937): known as the father of nuclear physics. He was doing research in the radioactive decay, and also differentiated and named alpha and beta radiation.

He postulated that **atom** does not look like **homogenous spheres**, but that its structure corresponds to a or **planetary model**.

He is widely credited with first "**splitting the atom**" in 1917.

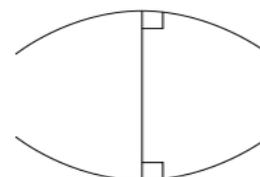
- **Werner Heisenberg** (†1976): German theoretical physicist best known for asserting **the uncertainty principle of quantum theory**. In quantum mechanics, the **Heisenberg uncertainty principle (1927)**: states it is impossible to *determine* simultaneously both the position and the momentum of an electron or any other particle with any great degree of accuracy or certainty.
- **Kurt Gödel** (†1978): in 1931 published his incompleteness of the theorems which says that: 1. If the system is consistent, it cannot be complete, 2. The consistency of the axioms cannot be proven within the system.
- **Non-Euclidean geometry** (**hyperbolic** and **elliptic geometry**): Euclid's fifth postulate states that, within a two-dimensional plane, for any given line  $\ell$  and a point  $A$ , which is not on  $\ell$ , there is exactly one line through  $A$  that does not intersect  $\ell$ . In **hyperbolic geometry**, by contrast, there are infinitely many lines through  $A$  not intersecting  $\ell$ , while in **elliptic geometry**, any line through  $A$  intersects  $\ell$ .



Hyperbolic



Euclidean



Elliptic



### Chemistry:

**Wilhelm Conrad Röntgen** (†1923): German physicist, who, in November **1895**, produced and detected electromagnetic radiation in a wavelength range today known as X-rays or Röntgen rays. Since Röntgen's discovery that X-rays can identify bone structures, X-rays have been used for medical imaging.



**Antoine Henri Becquerel** (†1908): was a discoverer of radioactivity along with Marie Curie and Pierre Curie, for which **all three won the 1903 Nobel Prize in Physics**.

On the picture: **Marie Skłodowska Curie** with her husband **Pierre Curie**

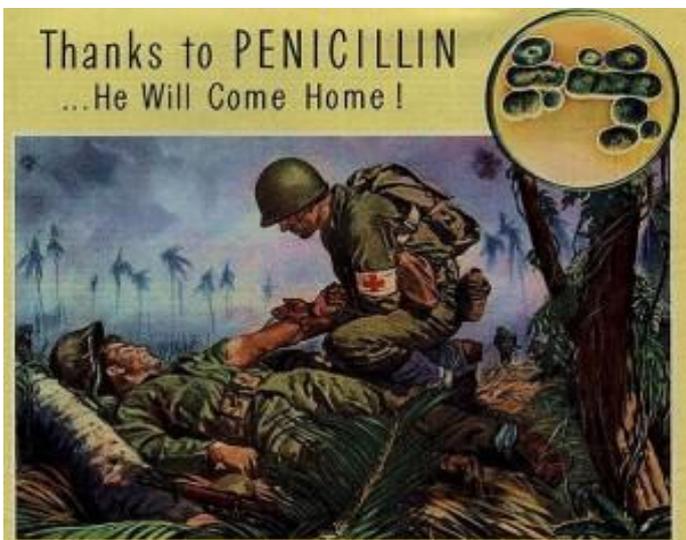
**Marie Skłodowska Curie** (†1934) was a Polish-born French physicist and chemist famous for her work on **radioactivity**. She was a pioneer in the field of **radioactivity** and the **first person honored with two Nobel Prizes** in physics and chemistry. Her achievements include the creation of a theory of **radioactivity (a term she coined)**, techniques for isolating radioactive isotopes, and the discovery of two new elements, polonium and radium.

### The era of new materials:

**Nylon**: first produced in 1935

**Plastic**:

*Consider this: Since the raw materials needed to make most plastics come from petroleum and natural gas, what happens when we run out of these commodities? Discuss:*



### Biology, Medicine:

**Sir Alexander Fleming** (†1955): Scottish biologist and pharmacologist. His best-known discovery is the **antibiotic substance penicillin** from the mold *Penicillium notatum* **in 1928**.

In 1999, *Time Magazine* named Fleming **one of the 100 Most Important People of the 20th Century** for his discovery of penicillin, and stated: "It was a discovery that would change the course of history. The

*active ingredient in that mould, which Fleming named penicillin, turned out to be an infection-fighting agent of enormous potency. When it was finally recognised for what it was, the most efficacious life-saving drug in the world, penicillin would alter forever the treatment of bacterial infections. By the middle of the century, Fleming's discovery had spawned a huge pharmaceutical industry, churning out synthetic penicillins that would conquer some of mankind's most ancient scourges, including syphilis, gangrene and tuberculosis."*

**Sir Frederick Grant Banting** (†1941): Canadian medical scientist, doctor and Nobel laureate noted as one of the main discoverers of insulin in 1921.

### Public broadcasting:

#### Radio broadcasting:

- During 1917 the German Army had broadcast music and propaganda to its troops on the Western Front.
- First commercial broadcast was made in Pennsylvania, USA in 1920.
- 1923 radio broadcasting in Europe.

#### Television broadcasting:

**John Logie Baird** (†1946): Scottish engineer and inventor of the world's first practical, publicly demonstrated television system in 1926.



The cost of transmission and TV receivers was high, so that few people enjoyed television in their homes during this period. Nevertheless, the Nazis broadcasted transmission from Berlin after 1934 and **1936 Berlin Olympic Games was televised**.

The first regular television broadcasts began in 1937.

The BBC was the world's first national broadcasting organisation and was founded in 1922. Nowadays, it is the largest broadcaster in the world, with about 23,000 staff.

### Radar:

(abbreviation for radio location – „radio detection and ranging“)

In the 30s, progress was made in the detection of objects by radio waves. Several inventors, scientists, and engineers contributed to the development of radar. The Radar was widely used in the **WWII** and became **indispensable in defeating the German Luftwaffe during the Battle of Britain**.

### Car Production:

**Three oldest car makers** in the world: **Daimler Mercedes-Benz** and **Peugeot** and **Tatra**: in 1897 Tatra produced the **first motor car in central Europe, the Präsident**.

**Henry Ford** (†1947): the founder of the Ford Motor Company located in Detroit, who was behind the development of the **assembly line technique of mass production** which replaced the individual hand crafting. He is credited with "**Fordism**", that is, mass production of inexpensive goods coupled with high wages for

workers. The **Ford Model T**: produced from 1908. The Model T was the first automobile mass produced on assembly lines with completely interchangeable parts, marketed to the middle class.

#### Aviation:

**The world's first non-stop transatlantic flight**: by John **Alcock** and Arthur Whitten **Brown** in June 1919 in the **Vickers Vimy** - British aircraft.

**Charles Augustus Lindbergh** (†1974) was an American aviator. In **May 1927** Lindbergh flew from **New York's Long Island to Le Bourget Field in Paris**, France, a distance of nearly 6000 km in the single-seat, single-engine monoplane ***Spirit of St. Louis***. This flight lasted for almost 34 hours.



**KLM**: It is the oldest airline in the world still operating under its original name. Three next are: Colombia's Avianca (1919), Australia's

**Qantas** (1920), and the Czech Republic's **Czech Airlines** (1923).

#### Other Achievements:

**Fridtjof Nansen** (†1930): was a Norwegian explorer. He led the **first crossing of the Greenland interior in 1888**, and won international fame after **reaching the North Pole during the expedition of 1893–96**.

**Pierre de Coubertin** (†1937): renewed the **Olympic Games**, the first in Modern era, which took place in **1896 in Athens, Greece**.

#### Art:

##### Music: Names:

- **Jazz: Louis Armstrong, Swing: Duke Ellington**
- **Enrico Caruso** (†1921) was an Italian tenor.
- **George Gershwin** (†1937) was an American composer and pianist. Gershwin's compositions spanned both popular and classical genres, and his most popular melodies are widely known.
- **Claude Debussy**: (†1918) was a French composer. Along with **Maurice Ravel** (†1937 known best for his orchestral work ***Boléro* from 1928**), he was one of the most prominent figures working within the field of **impressionist music**. Debussy is among the most important of all French composers and a central figure in European music of the turn of the 20th century.
- **Long-playing (LP) record albums**: vinyl, gramophone records. Not successfully introduced until 1948.

##### Movie:

- **Hollywood and Oscars:** *See worksheet „20's in the USA”*
- **Actress/Actor: Marlene Dietrich, Charlie Chaplin:** *See worksheet „20's in the USA”*
- **Festival in Venice, Italy: from 1932**

**Literature:** R. Rolland, E. M. Remarque, Marcel Proust, Aldous Huxley, Virginia Woolf, Franz Kafka, Mikhail Bulgakov, James Joyce,...

**Fine Art:**

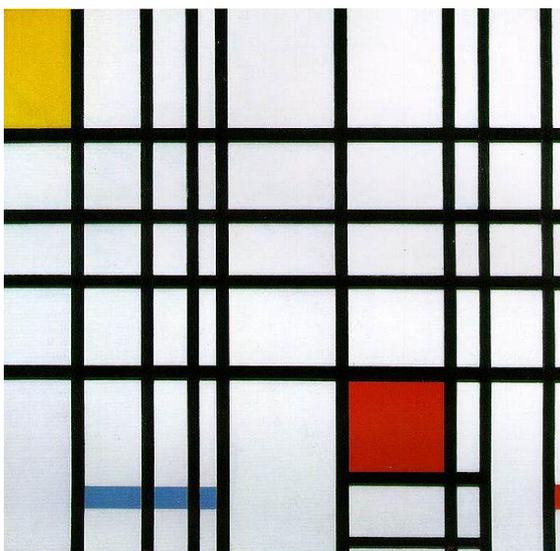
**Signs:**

**Abstract art:** Western art had been, from the Renaissance up to the middle of the 19th century, underpinned by the **logic of perspective** and an attempt to **reproduce an illusion of visible reality**. On the contrary, abstract art uses a **visual language of form, color and line** to create a composition which may exist with a degree of **independence from visual references in the world**. **Abstract art is nonfigurative, nonobjective art, and nonrepresentational art.**

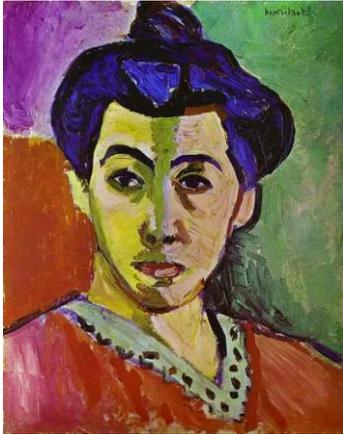


Pioneer of abstraction **Wassily Kandinsky**

Wassily Kandinsky, *On White 2*, 1923



**Pieter Mondrian, (†1944)**, was a Dutch painter. He evolved a non-representational form which consisted of white ground, upon which was painted a grid of vertical and horizontal black lines and the three primary colors.



Henri Matisse: *Portrait of Madame Matisse (The Green Stripe)*, 1905

**Fauvism** is the style of *les Fauves* (French for "the wild beasts"): Fauves were characterised by seemingly wild brush work and strident colours. Paintings are "wild", multi-colored and expressive. Representatives: **Henri Matisse, Georges Braque**, André Derain,...

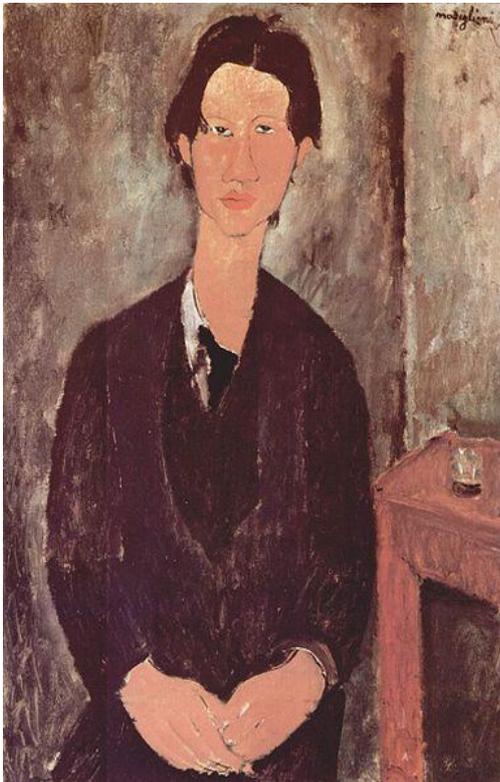


Pablo Picasso: *Bust of a Woman with a Hat*, 1939

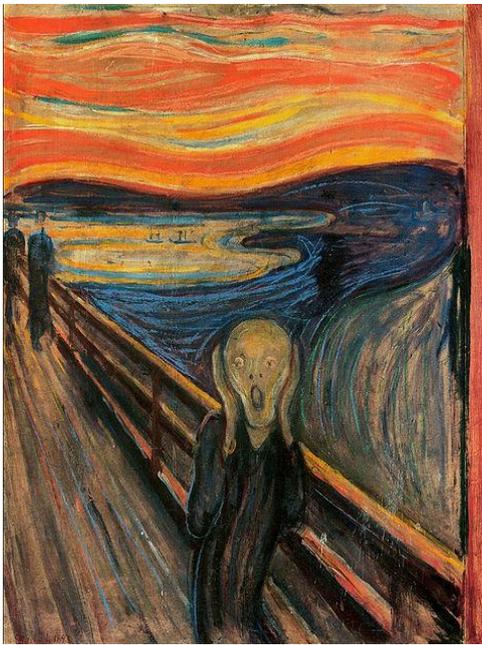
**Cubism**: In cubist artworks, objects are broken up, analyzed, and re-assembled in an abstracted form - instead of depicting objects from one viewpoint, the artist depicts the subject from a multitude of viewpoints to represent the subject in a greater context. Often the surfaces intersect at seemingly random angles, removing a coherent sense of depth.

Representatives: Pablo Picasso and Georges Braque

Pablo Picasso - "Bust of a Woman with a Hat (Dora)," 1939, Oil on canvas - Fondation Beyeler, Basel © 2007 Estate of Pablo Picasso / Artists Rights Society



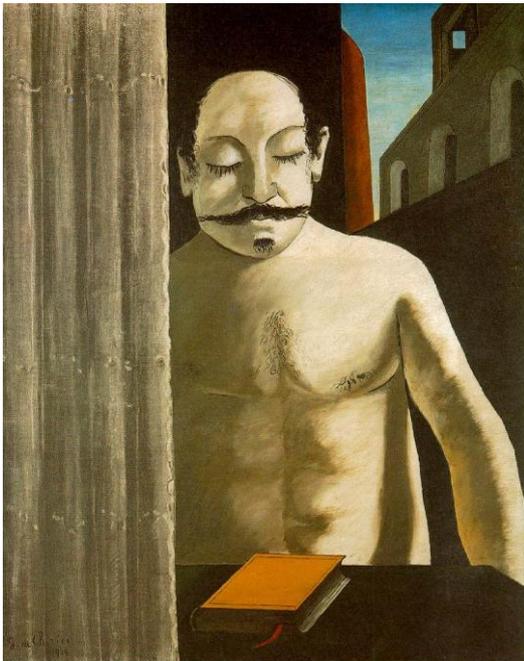
**Amedeo Clemente Modigliani** (†1920): an Italian artist. Primarily a figurative artist, he became known for paintings and sculptures in a modern style characterized by mask-like faces and **elongation of form**.



**Expressionism:** Its typical trait is to present the world in an **utterly subjective perspective**, radically distorting it for emotional effect, to evoke moods or ideas.

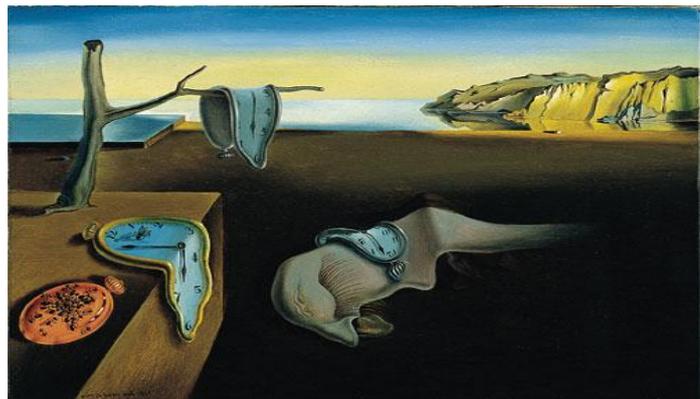
Representatives: Oskar Kokoscha, Edvard Munch

**Edvard Munch** (†1944): was a Norwegian painter and an important forerunner of expressionistic art. His best-known composition, **The Scream** (on the left), is part of a series *The Frieze of Life*, in which Munch explored the themes of life, love, fear, death, melancholia, and anxiety.



**Giorgio de Chirico** (†1978) was a **pre-Surrealist** and then **Surrealist** Italian painter. De Chirico strongly **influenced the Surrealist movement**.

Below: **surrealist** painting by **Salvador Dalí** (†1989): *The Persistence of Memory*, 1931.



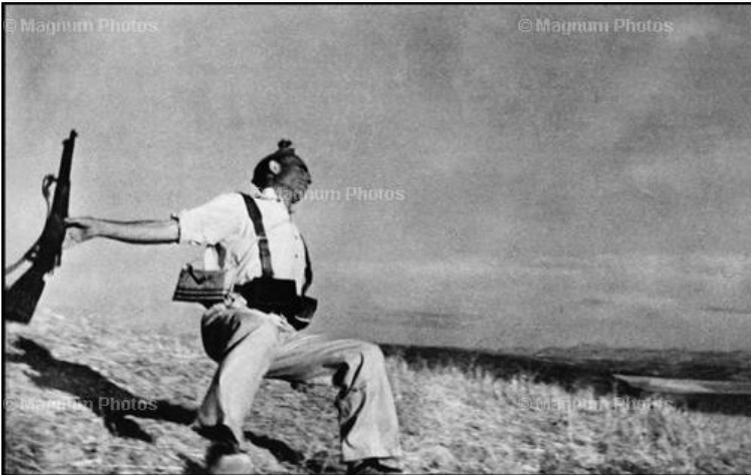
**Surrealism:** aims to depict dreams, unconsciousness, ... Surrealist works feature the element of surprise, unexpected juxtapositions. Surrealism was inspired by the movement of **Dada**, which was an anti-rational, anti-art cultural movement. Representatives: **Tristan Tzara**.



**Fountain** is a 1917 work by **Marcel Duchamp**. It is one of the pieces which he called **readymades** (also known as **found art: describes art created from the undisguised, but often modified, use of objects that are not normally considered art, often because they already have a non-art function**), because he made use of an already existing object - in this case a urinal. The work is **regarded by some as a major landmark in 20th century art**. In December 2004, Duchamp's *Fountain* was voted the **most influential artwork of the 20th century** by 500 selected British art world professionals.

## Photography:

**Robert Capa** (†1954): was a Hungarian **combat photographer and photojournalist** who covered **five different wars**: the Spanish Civil War, the Second Sino-Japanese War, World War II across Europe, the 1948 Arab-Israeli War, and the First Indochina War. He documented the course of World War II in London, North Africa, Italy, the Battle of Normandy on Omaha Beach and the liberation of Paris. His action photographs, such as those taken during the 1944 Normandy invasion, portray the violence of war with unique impact. **In 1947, Capa co-founded Magnum Photos** with, among others, the French photographer **Henri Cartier-Bresson**. The organization was the first cooperative agency for worldwide freelance photographers.



## Modern Architecture: using these materials: concrete, glass, iron, steel



*Photo:  
Manhattan in  
1931*



**Le Corbusier** (†1965): was a Swiss architect, designer, urbanist, famous for being **one of the pioneers of what now is called Modern architecture**. Le Corbusier was one of the most influential and important architects of all times.