

19th Century Architecture



- In the nineteenth century, each nation came to value its past as evidence of the validity of its ambitions and claims to greatness. Art and architecture of the remote past came to be regarded as products of cultural and national genius.
- Neoclassical, Gothic, Baroque, Renaissance revivals, as well as eclectic style which combines different elements from various historical styles.

- Additionally, new building materials - iron, steel and glass, as well as reinforced concrete lead to new architectural forms.
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Neo-Baroque/Beaux-Arts style

A grandiose architectural style as taught at the Ecole des Beaux Arts in Paris, widely applied to large public buildings. Beaux-Arts buildings are typically massive; have a symmetrical plan, and rich decoration.

The Opera House was built by Garnier for Napoleon the III.
It was to be part of the great revitalization of Paris.



Charles Garnier, *The Opera House (Palais Garnier)*, Paris. 1861-74



**Napoléon III-
Emperor of the
French.**

Baron Haussmann
French
administrator and
urban planner

Haussmannian
streetwork
between 1852
and 1870 (in
red).

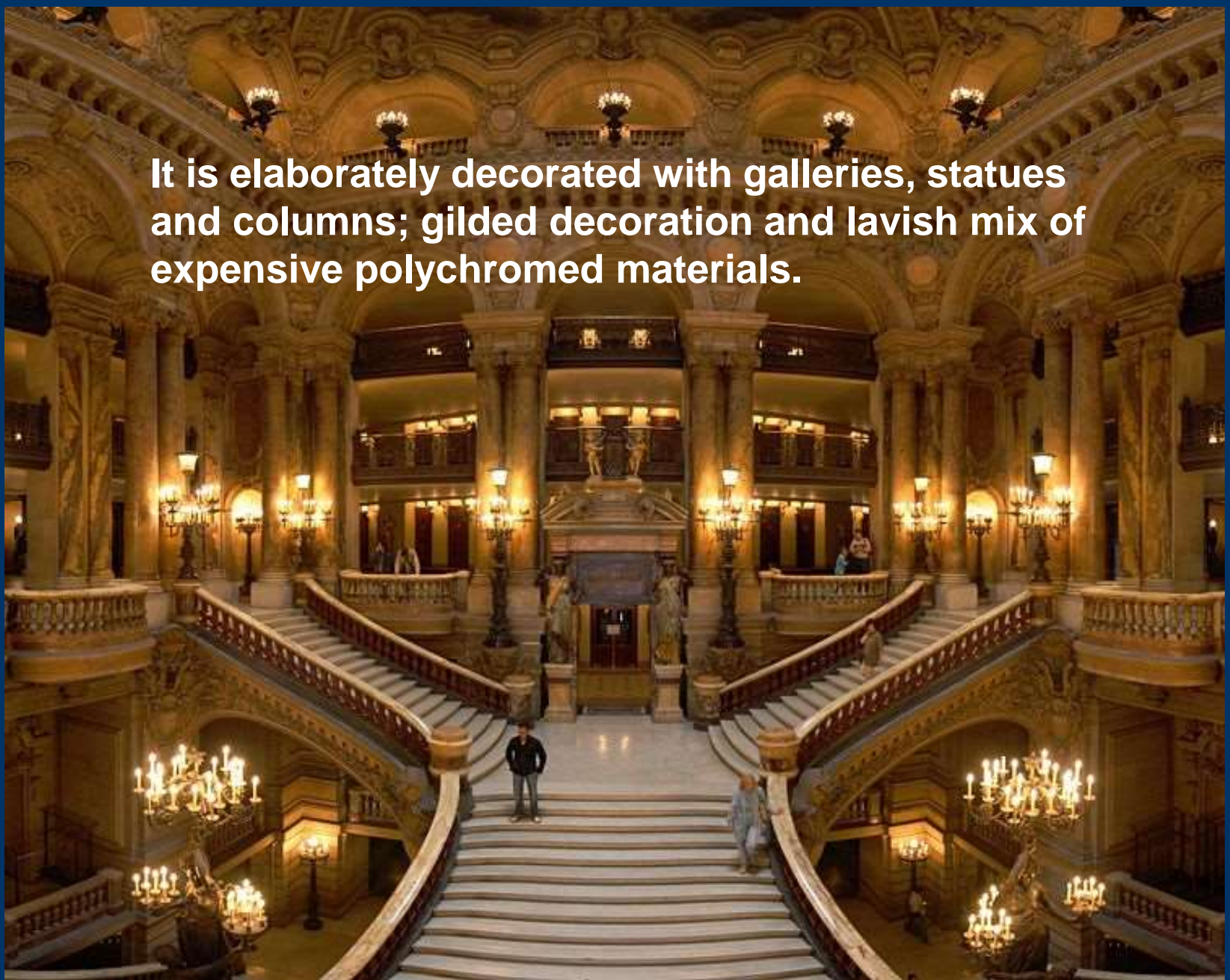
Haussmann inaugurated a wide-reaching program of municipal improvements in Paris, including a new water supply and sewage system, the creation of wide avenues through Paris's mass of small streets, the landscape gardening of the Bois de Boulogne, and the construction of the Paris Opéra.

The style is monumental, with multicolored marbles and lavish statuary.

**Charles Garnier, *The Opera House*, Paris.
1861-74**



It is elaborately decorated with galleries, statues and columns; gilded decoration and lavish mix of expensive polychromed materials.



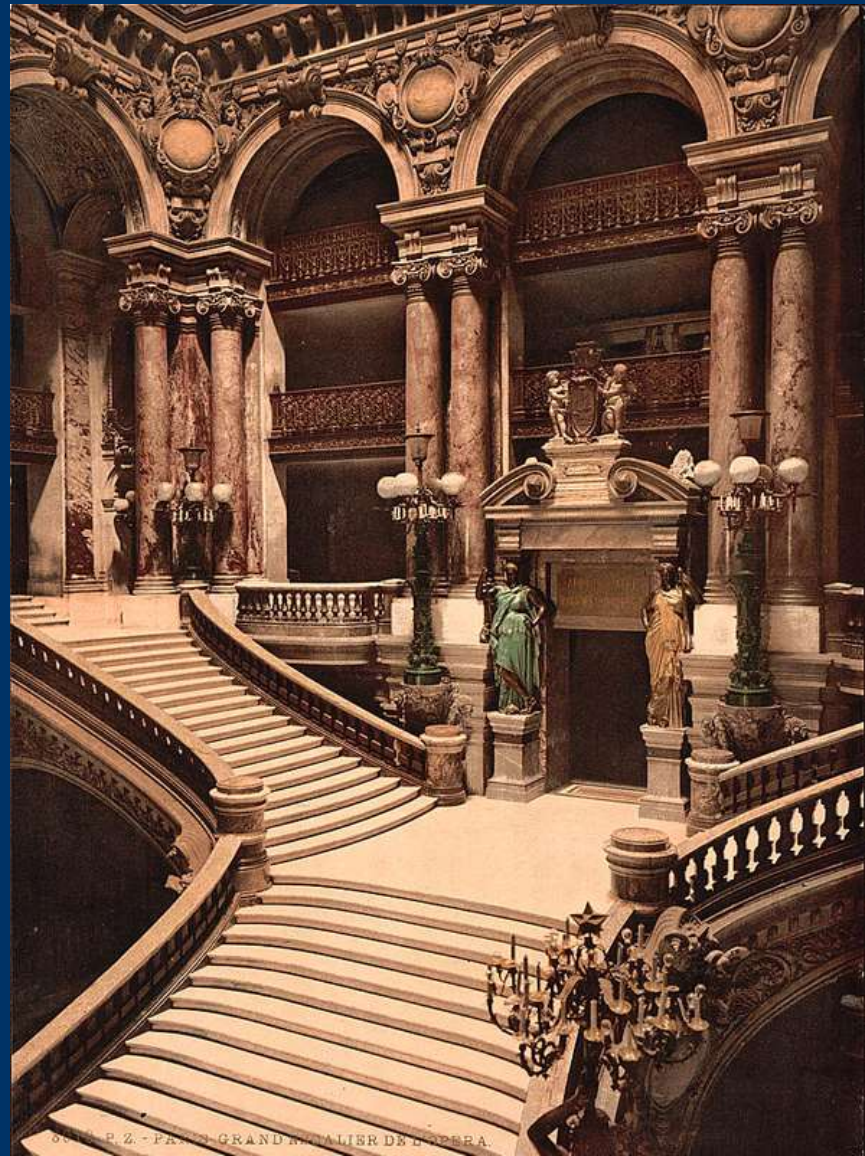
The Grand Escalier in the main hall

CARLO MADERNO, *facade of Saint Peter's*, commissioned by Pope Paul V, Vatican City, Rome, Italy, 1606-1612.



Charles Garnier, *The Opera House*, Paris. 1861-74

Garnier's design reflected the aspirations of the Second Empire with its rich coloring and decoration.





Apollo, Poetry and Music roof sculpture by Aimé Millet

Palaces of Iron and Glass:

Industrialization and the new building materials

Giant glass-and-iron exhibition hall that housed the Great Exhibition of 1851. It was one of the first prefabricated buildings and one of the first buildings with large expanses of glass wall.

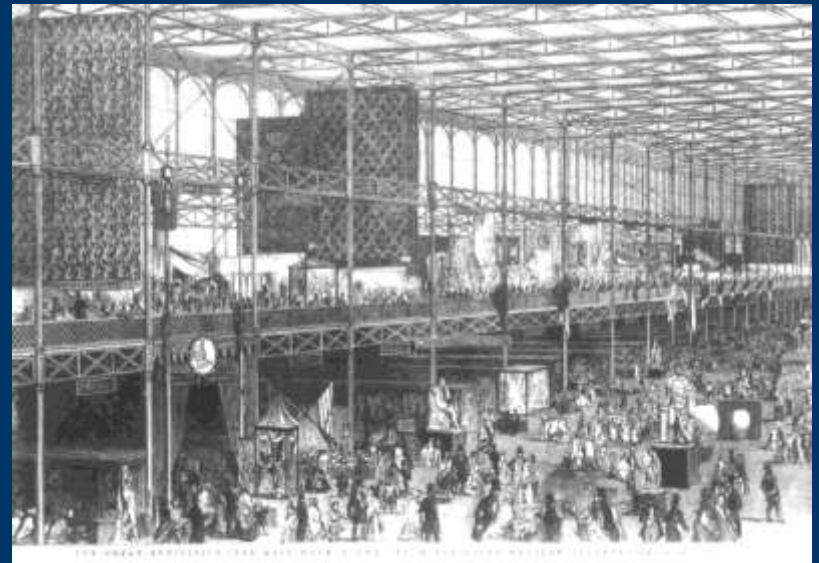
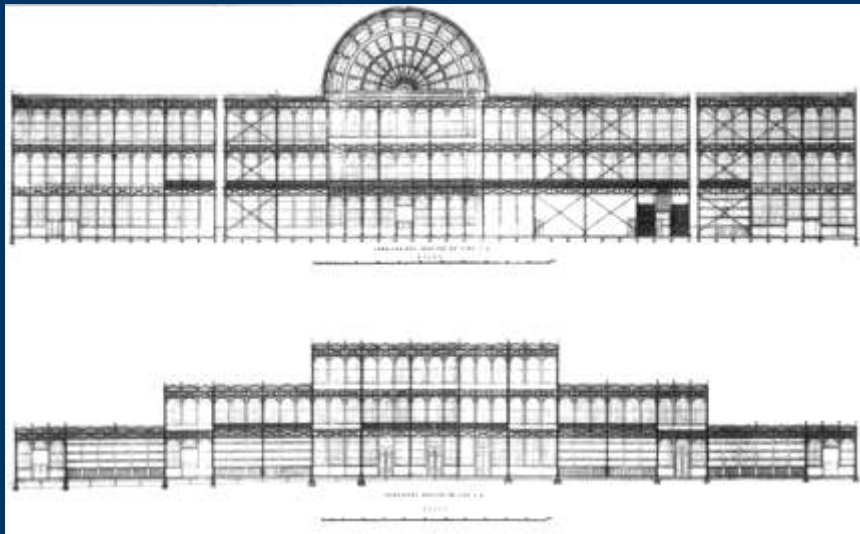
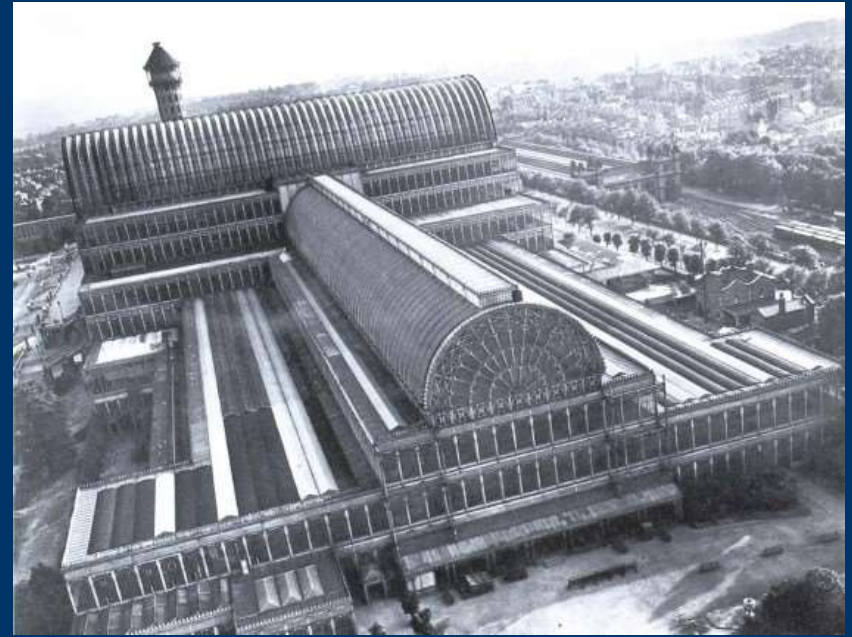
It had the largest space ever enclosed up to this time - covering more than 18 acres (as long as 18 football fields and as wide as 8). The structure was completed in just over 6 months.

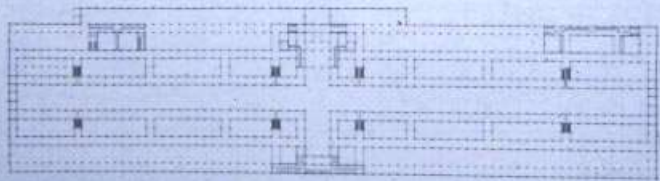
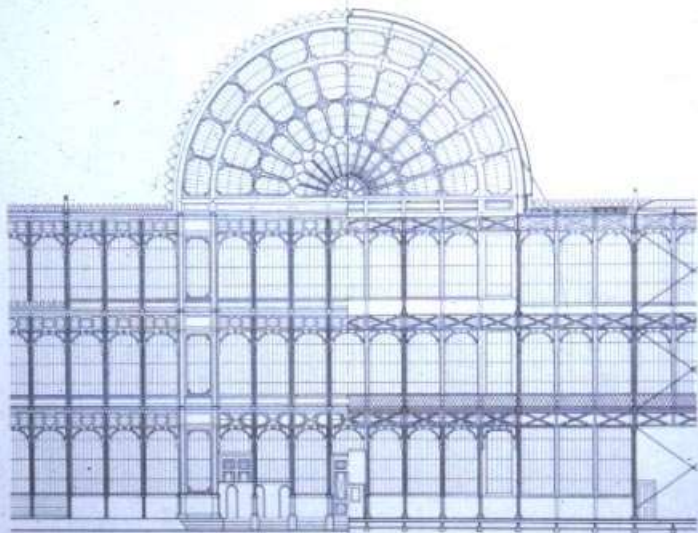


JOSEPH PAXTON, *Crystal Palace*, London, England, 1850 (destroyed by fire in 1936)

The Crystal palace was built to showcase the achievements of Great Britain during the Industrial Revolution.

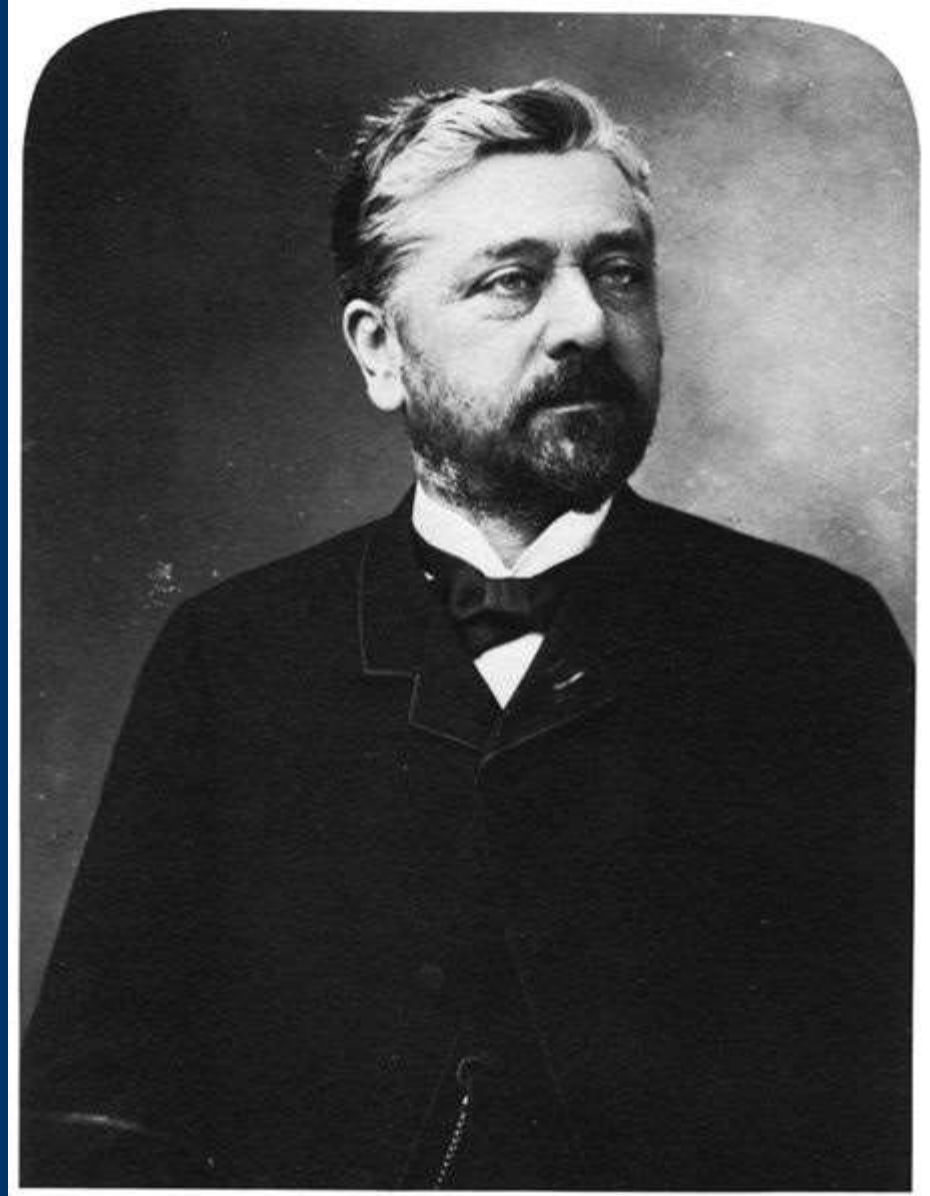
Over 13,000 exhibits were displayed and viewed by over 6,200,000 visitors to the exhibition.





Gustave Eiffel (1832-1923)

- French engineer. A noted constructor of bridges, he also designed the Eiffel Tower and the internal structure of the Statue of Liberty.
- He was initially charged with corruption in the 1888 scandal of the failed Panama Canal project, but was cleared of all wrongdoing by a French appeals court. Nonetheless, he withdrew from commercial life and spent the rest of his years studying aerodynamics.





Gustave Eiffel. *Garabit viaduct* (a railway arch bridge). 1880- 1884
It is a railway arch bridge spanning the Truyere river.

The *Eiffel Tower* was built for the entrance to the International Exposition of 1889, which celebrated the 100th anniversary of the French Revolution..

It was the world's tallest tower from 1889-1931

More than 200,000,000 people visited it since its construction

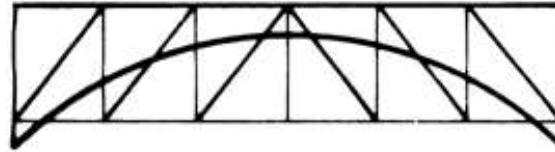
Gustave Eiffel, *Eiffel Tower*, Paris, France. 1889. 984-foot (300-meter), Iron.



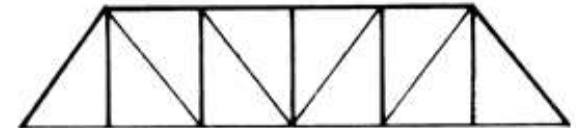
Nineteenth-century patented truss designs.

Truss: truss is a structure comprising one or more triangular units.

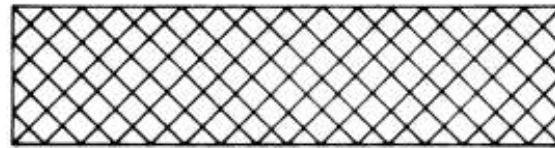
Trusses are used for large spans and heavy loads, especially in bridges and roofs.



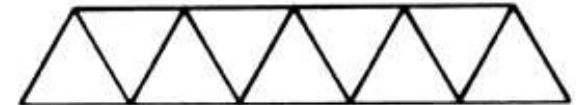
Burr Arch-Truss 1804



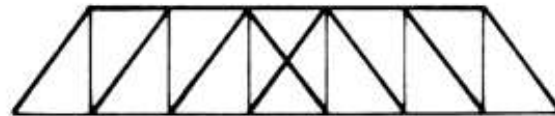
Pratt Truss 1844



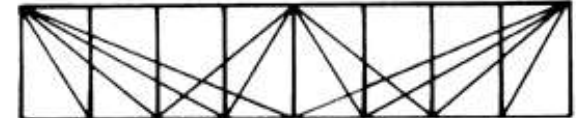
Town Lattice Truss 1820



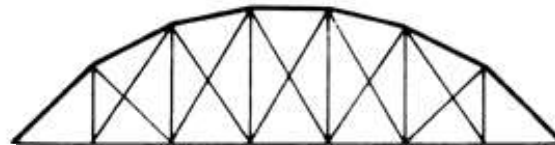
Warren Truss 1848



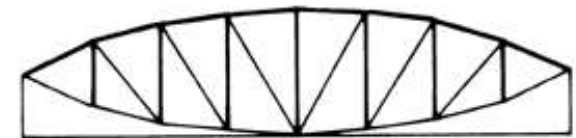
Howe Truss 1840



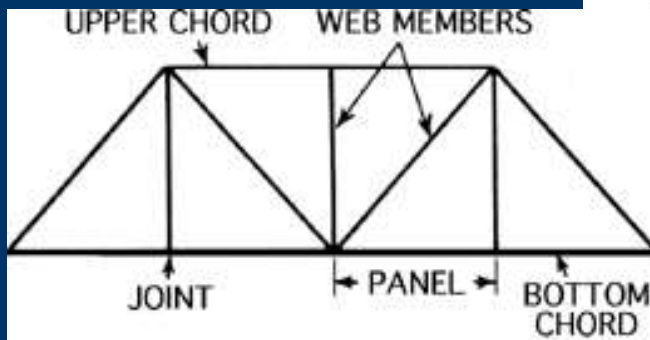
Fink Truss 1851



Whipple Bowstring 1840



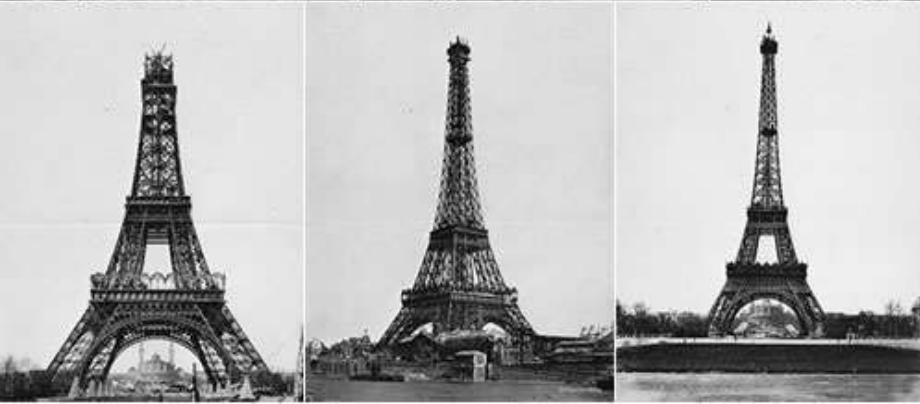
Lenticular Truss 1878



Truss Types



Making use of advanced knowledge of the behavior of metal arch and truss forms under loading, the structure presaged a revolution in civil engineering and architectural design.



The pieces of the tower were prefabricated and it was assembled at the site in 17 months by only 150 workers.



The curvature of the uprights is mathematically determined to offer the most efficient wind resistance possible.





Once every seven years the Eiffel Tower is re-painted by hand.

On the top of the tower are a meteorological station, a wireless station, and a television transmission antenna.



Developments in Steel

Steel is a strong metal of iron alloyed with carbon and other materials.

From 1875 onward steel began to replace iron because its compressive and tensile strengths exceeded those of iron. It is also more rust and fire resistant.

Suspension Bridge

A bridge having the roadway suspended from cables that are anchored at either end and usually supported at intervals by towers.



John A and Washington A. Roebling. *The Brooklyn Bridge.*
NY. 1600'. 1869-83

- It was the longest suspension bridge in the world from its opening until 1903

<http://youtu.be/Tsi95z1Nmhg>

- This is the first steel-cable suspension bridge. Here each cable contains over 5000 strands of wire.
- Steel cable is flexible, allowing the roadway to sway in response to weather conditions.



**John A and Washington A. Roebling. *The Brooklyn Bridge.*
NY. 1600'. 1869-83**

The First Skyscrapers



The Great Chicago Fire – October 1871

The fire cost some 300 lives, destroyed 17,450 buildings, and caused \$200 million in damage — about a third of the city's estimated value.

The "Burnt District," nearly four miles long and almost a mile wide, included most of the central business district and many residential areas.

Even the so-called "fireproof" buildings had gone down; the fire had melted exposed cast-iron, which in turn spread the fire.

Chicago School

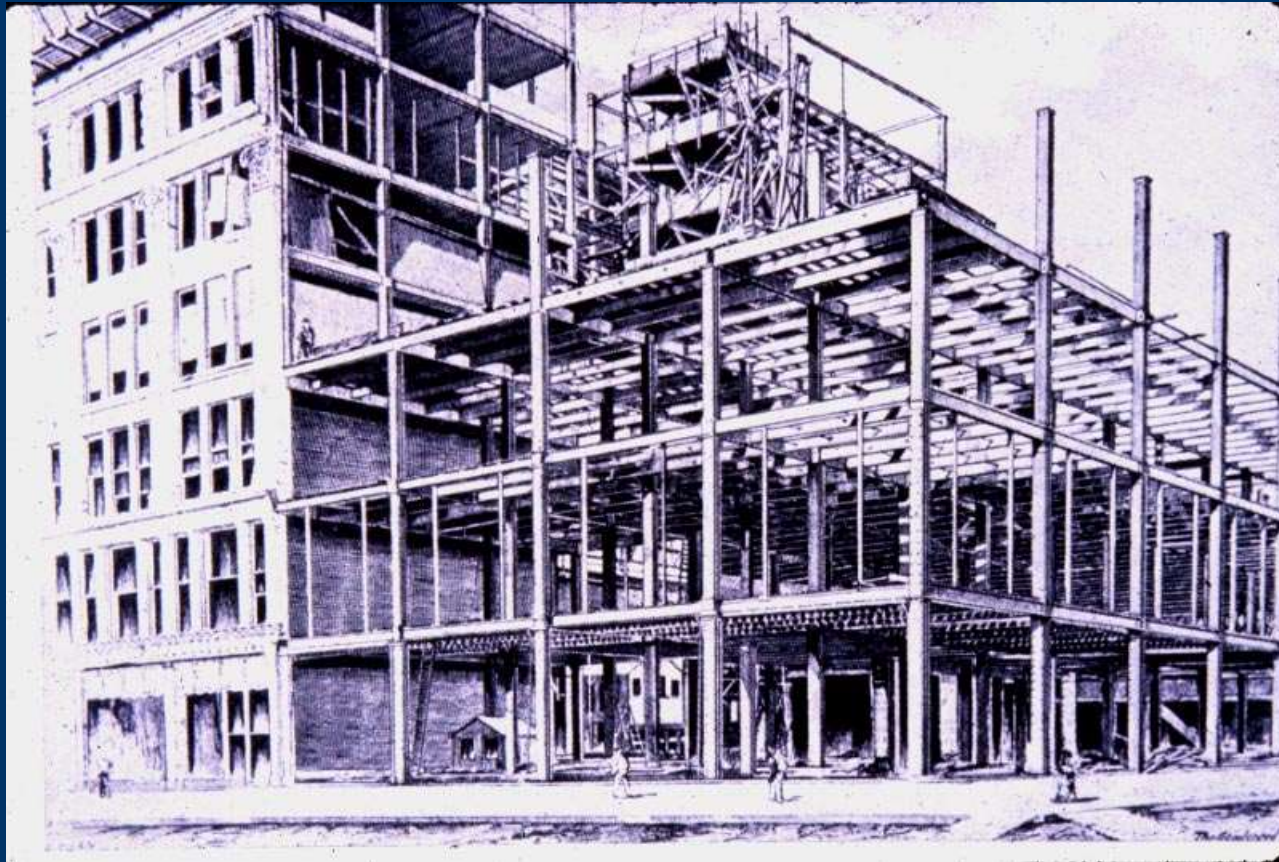
A group of U.S. architects of the late 19th to early 20th century, including William Le Baron Jenney and Louis Sullivan, noted for their utilitarian designs and their use of steel framing as a skeleton for multistory buildings.

- Use of steel-frame buildings with masonry cladding (usually terra cotta).
- Large plate-glass window areas.
- Limiting the amount of exterior ornamentation.
- Sometimes elements of neoclassical architecture are used.

William Le Baron Jenney, *Home Insurance Building*, Chicago, 1884-85, demolished 1929. It had 10 stories and rose to a height of 42 m (138 feet). In 1890, two additional floors were added.

- Considered the world's first skyscraper due to its unique architecture, but was never the tallest in the world.
- The internal metal skeleton carried the weight of the external masonry shell. This invention, together with the invention of the elevator (1853) permitted buildings to rise to great heights.





Jenney's method of Steel frame construction

It was the first building to use steel in its frame, but the majority of its structure was composed of iron.

Louis Sullivan, *Guaranty (Prudential) Building*, Buffalo, NY, 1894-1896.

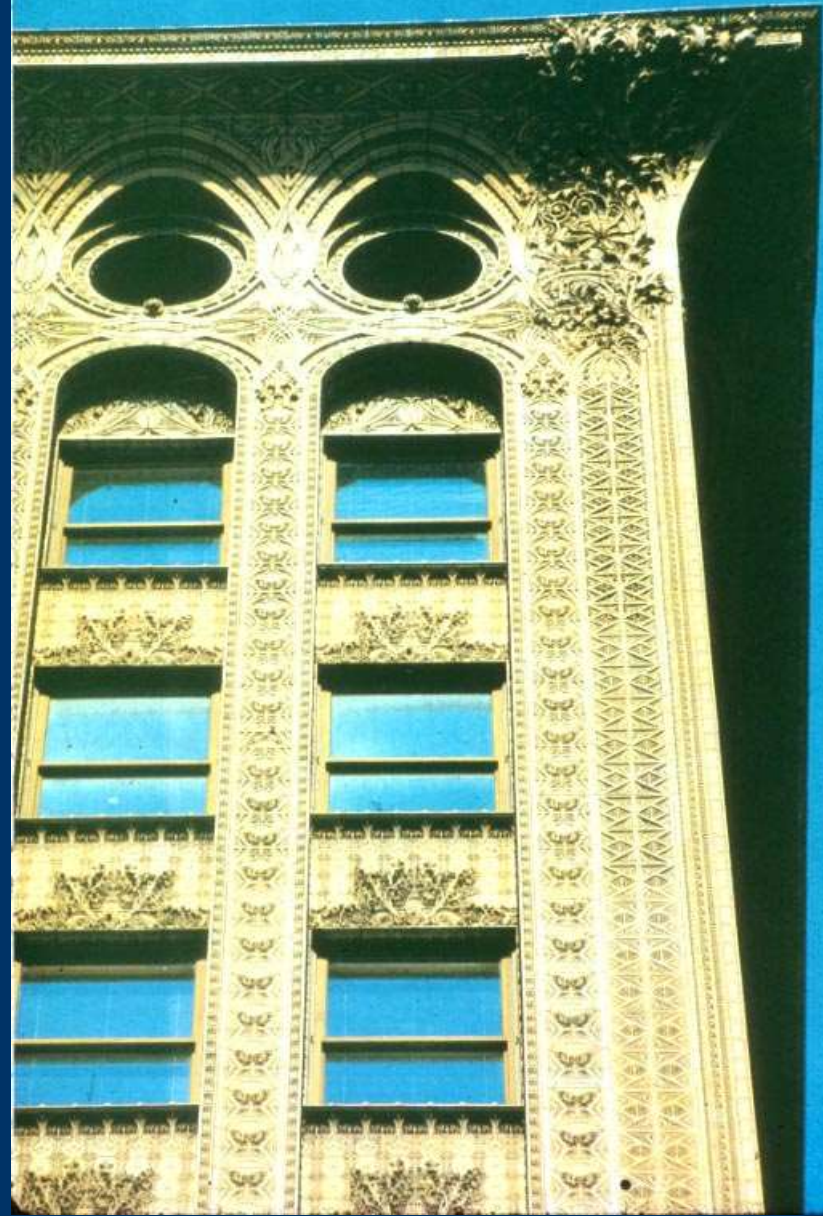
“Form Follows Function”

A principle associated with Modern architecture and industrial design in the 20th Century, which states that the shape of a building or object should be based on its intended purpose.





The division of the façade; base, piers, and attic is similar to classical columns.



Accentuated the horizontal layers with ornamented bands.

Louis Sullivan, *Guaranty (Prudential)
Building*, Buffalo, NY, 1894-1896.



Charles Garnier, *The Opera House*, Paris. 1861-74

Reinforced concrete/ferroconcrete

Concrete in which steel is embedded in such a manner that the two materials act together in resisting forces.

The invention of reinforced concrete in the 19th century revolutionized the construction industry, and concrete became one of the world's most common building materials.



Cantor Center for Visual Arts. Stanford University. 1894

- **One of the first entirely reinforced concrete structures on the West Coast.**