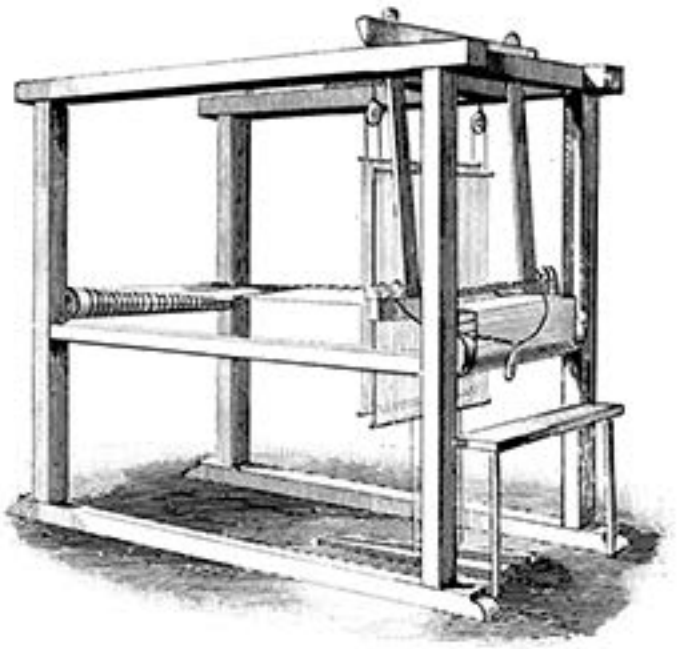
Architecture of the First Industrial Revolution

Introduction to Architectural History
Eugene Han
Spring 2021, 7:15 – 8:30 pm
Remote

- Mid-18th century to Mid-19th century
    - Heavily centered in Britain, though also Europe and US
    - From hand production to machines

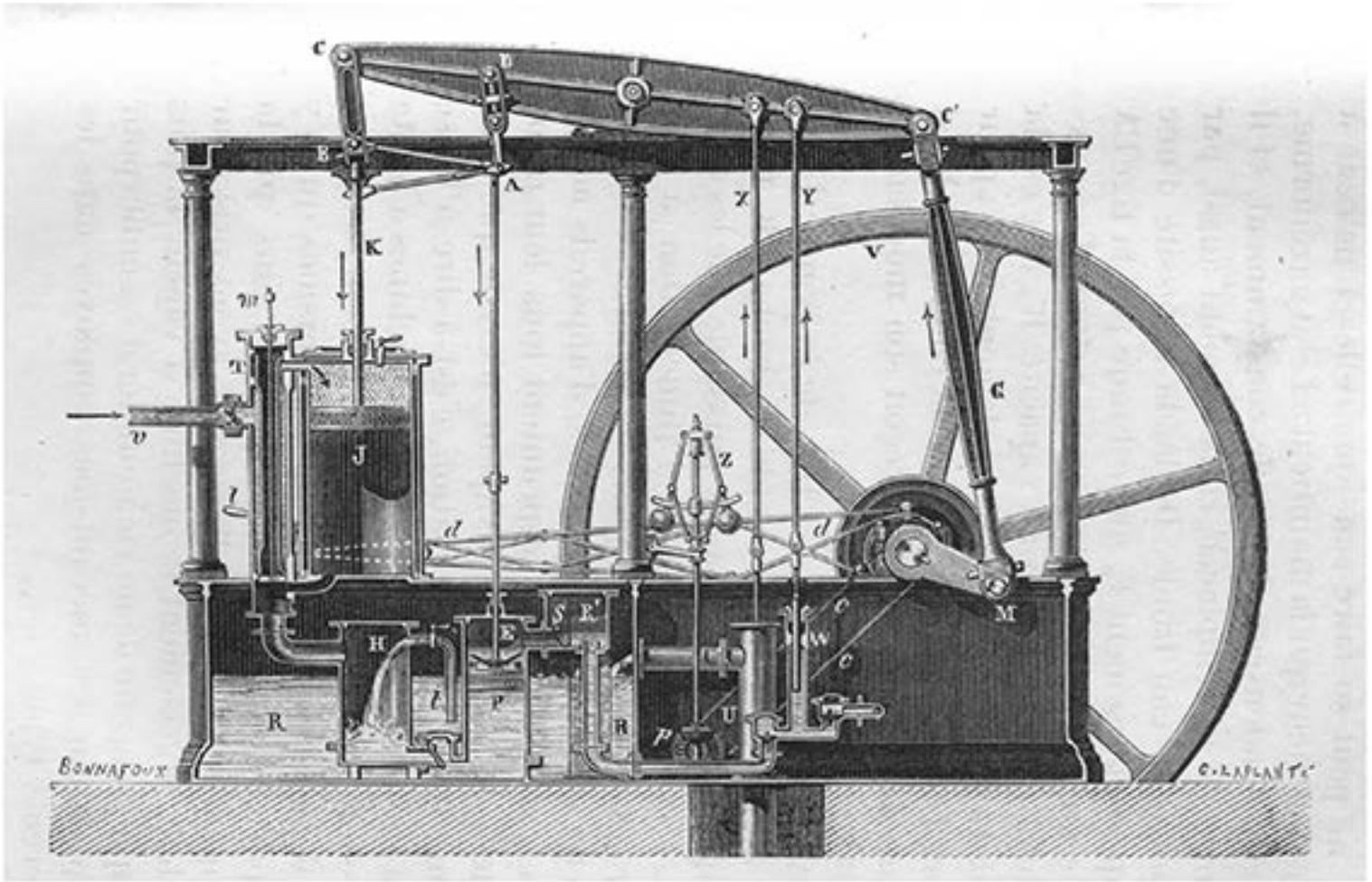
Textiles
Steam Power
Locomotives
Telegraph
Dynamite
Photography
Typewriter
Electric Generation
Factory production
Iron

- Most important contributions during the First Industrial Revolution
- Began in England

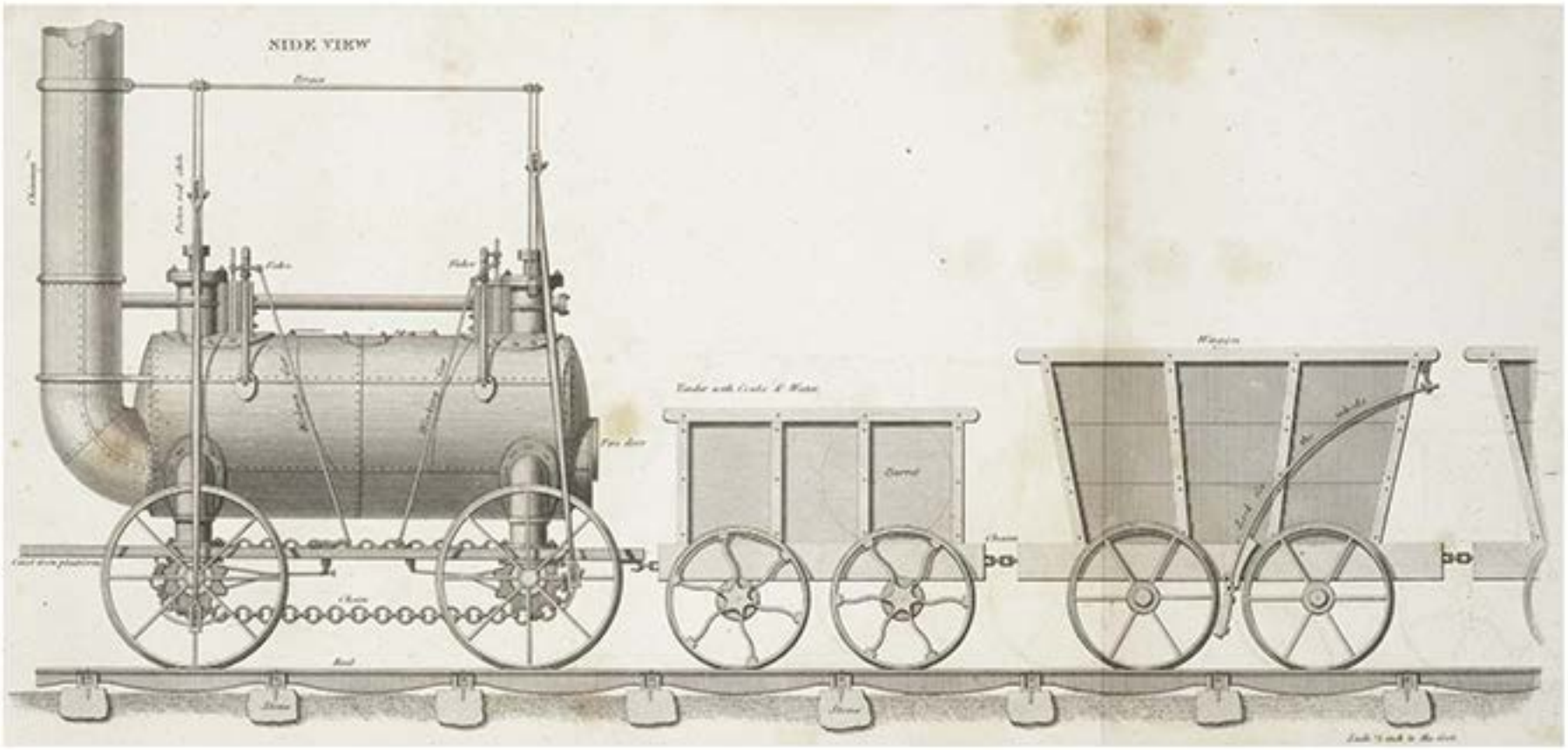


Left: James Hargreaves' *Spinning Jenny*
Right: The 'Flying Shuttle'

- Prior to this, 'Cottage Industry': materials brought to homes and picked up
    - 80% of population in England lived in rural areas up to 1850



- Steam used for automation
- Not the first steam engine, but much more efficient than predecessors



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George Stephenson, *Steam powered train*

- Locomotion for transport of raw materials

IRON

- Architecturally, among the most important innovations of the First Industrial Revolution
    - Technically not developed during IR

IRON

CAST IRON

~2-4% Carbon Content

Hard but brittle

WROUGHT IRON

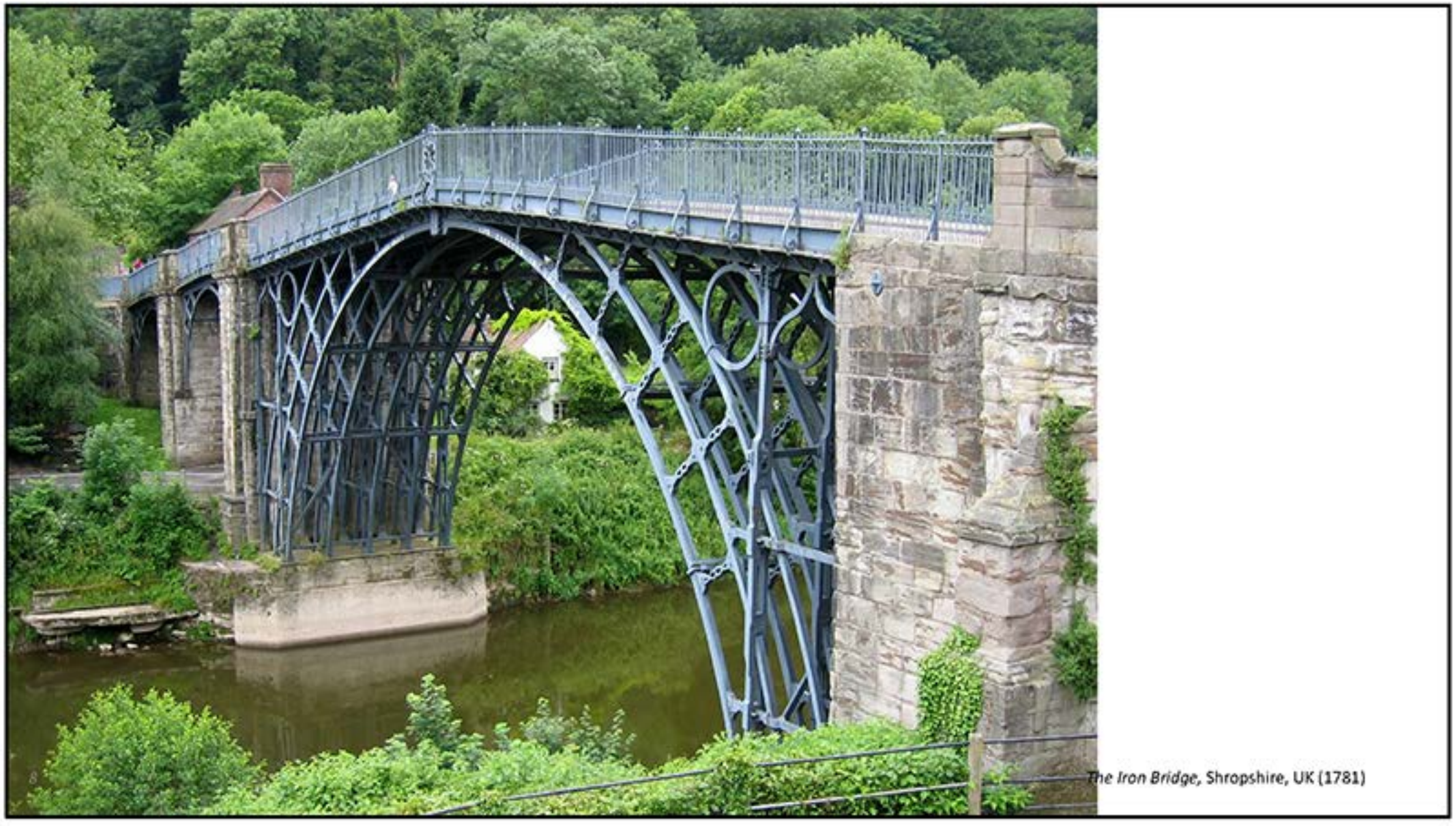
< 0.08% Carbon Content

Can bend under loads without breaking

STEEL

0.08 – 2% Carbon Content

Mix between strength and flexibility



The Iron Bridge, Shropshire, UK (1781)

- First major bridge in the world to be constructed of iron
- Crosses River Severn in Shropshire, England
    - Spans ~100 ft
- Constructed in 1781, first major bridge made of cast iron

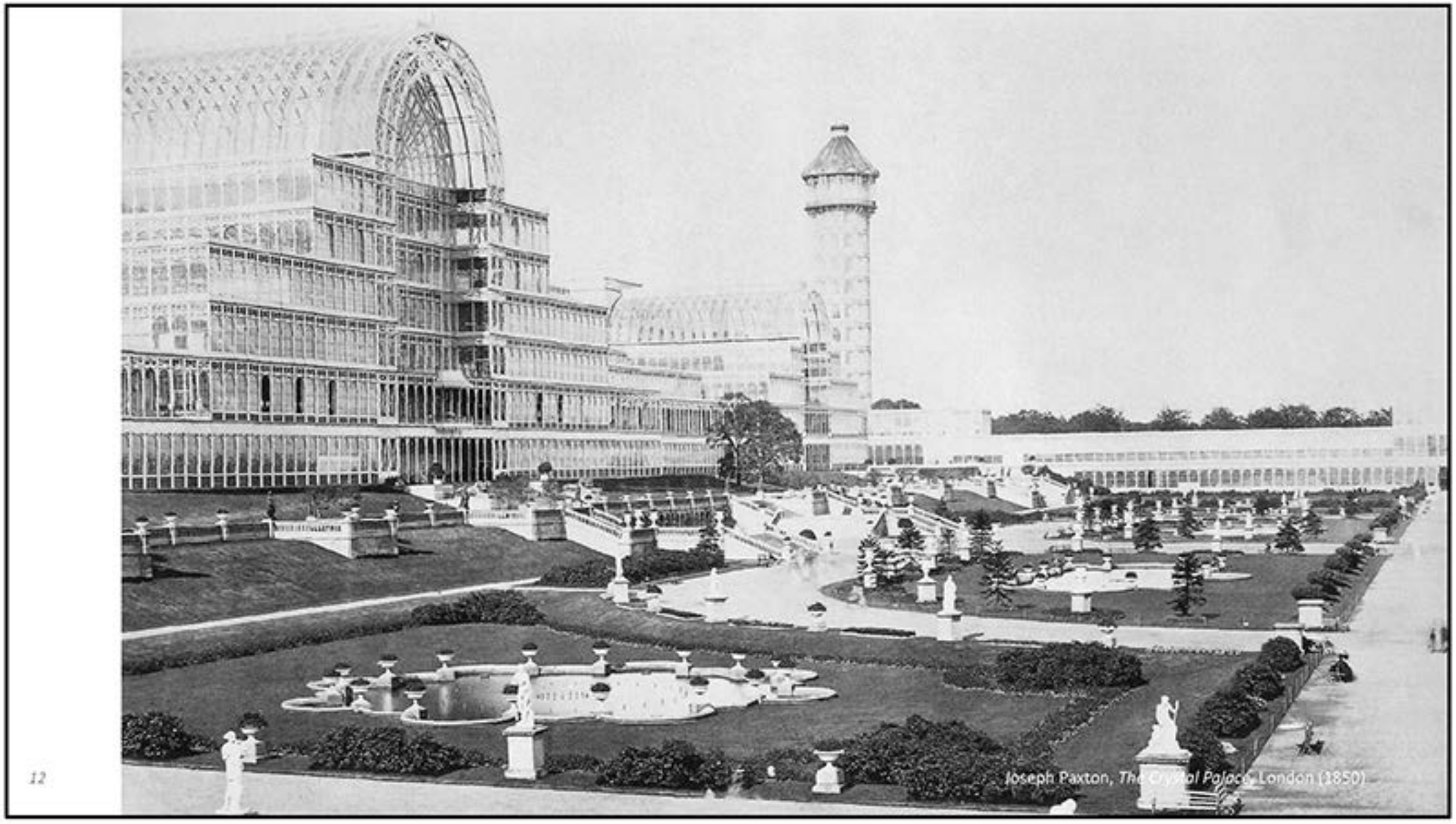
Left: The Coalport Bridge, Shropshire, UK (1818)
Right: Craigellachie Bridge, Craigellachie, Scotland (1812 - 14)

- Coalport Bridge – still in use for vehicles today

Joseph Paxton, *The Crystal Palace*, London (1850)

- Crystal Palace - Single most important building of the time
- Cast-iron and CAST plate-glass structure
- The 'convention center' for the *Great Exhibition* of 1851

- Moved in 1854, destroyed in 1936



Joseph Paxton, *The Crystal Palace*, London (1850)

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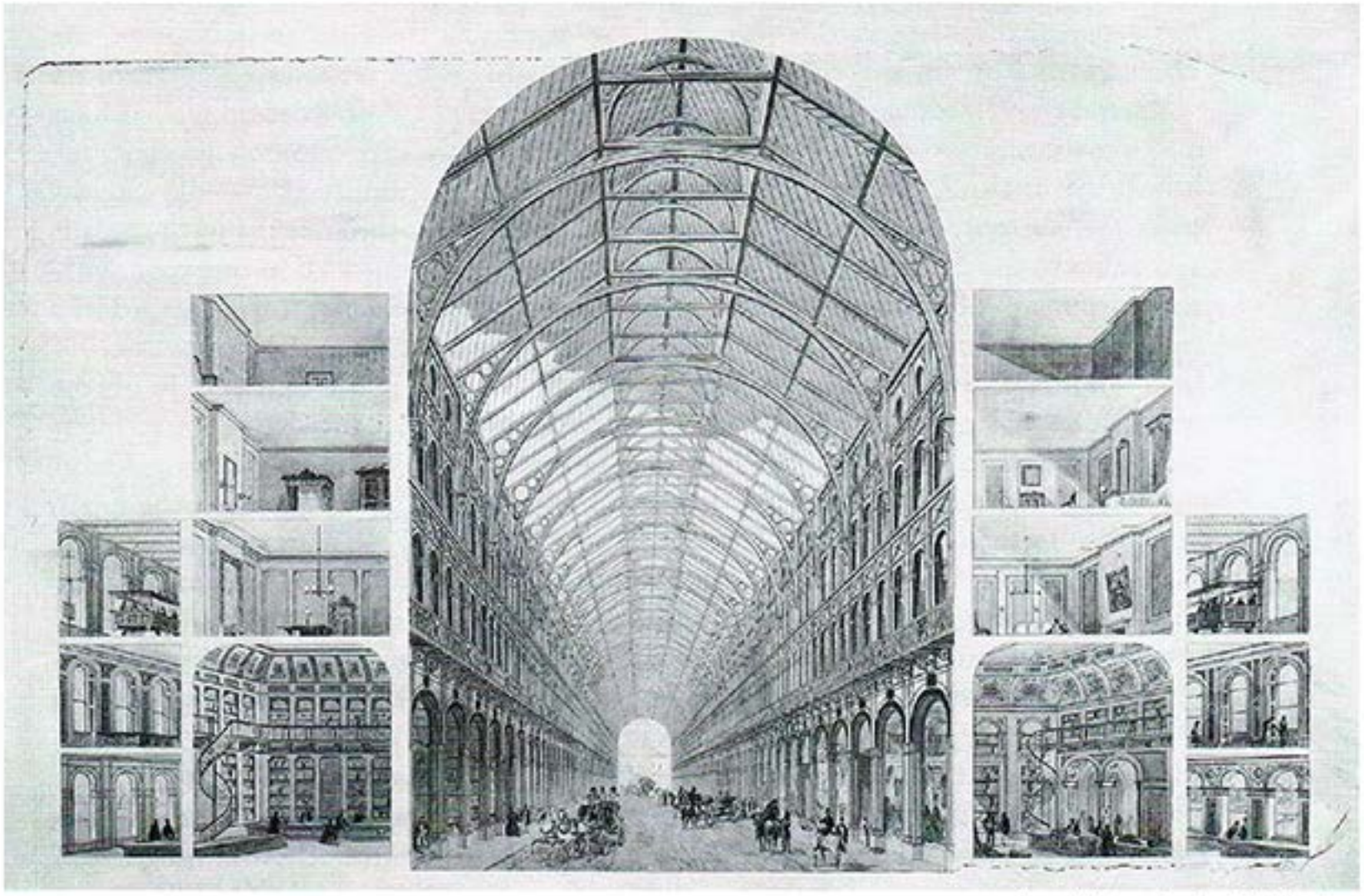
Joseph Paxton, *The Crystal Palace*, London (1850)

- Views of the interior
- Celebration not only of technology, but also culture (art)



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Joseph Paxton, *The Crystal Palace*, London (1850)

- **MODULAR DESIGN** – could be grown without limit

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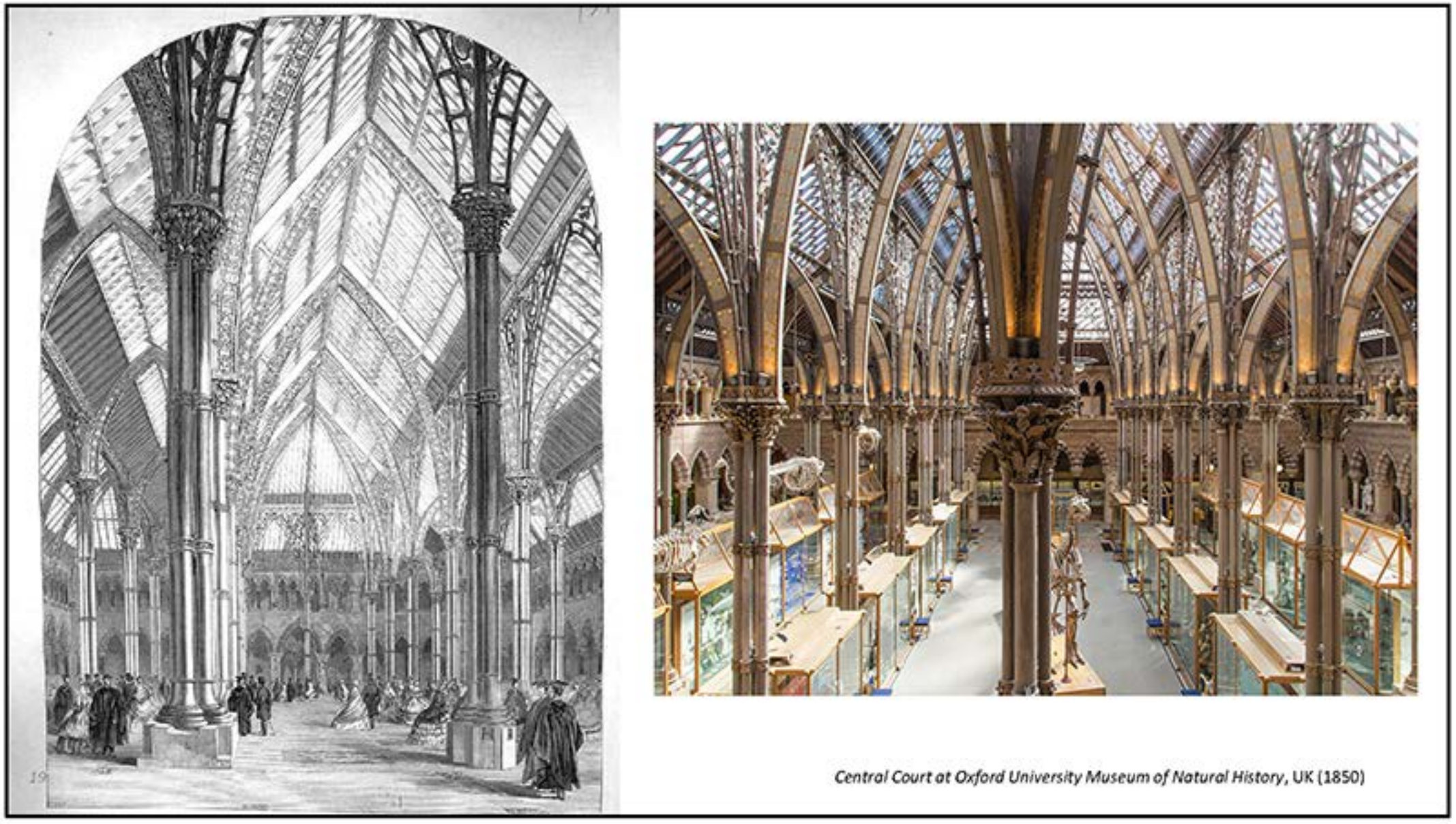
Georg Carstensen and Charles Gildemeister, *New York Crystal Palace* (1853)

- New York Crystal Palace – Constructed for the *Exhibition of the Industry of All Nations 1853*

Fires destroyed both Crystal Palaces (UK: 1936, NYC: 1858)

Ricardo Velázquez Bosco, *Palacio de Cristal del Retiro*, Madrid, Spain (1887)

Ricardo Velázquez Bosco, *Palacio de Cristal del Retiro*, Madrid, Spain (1887)



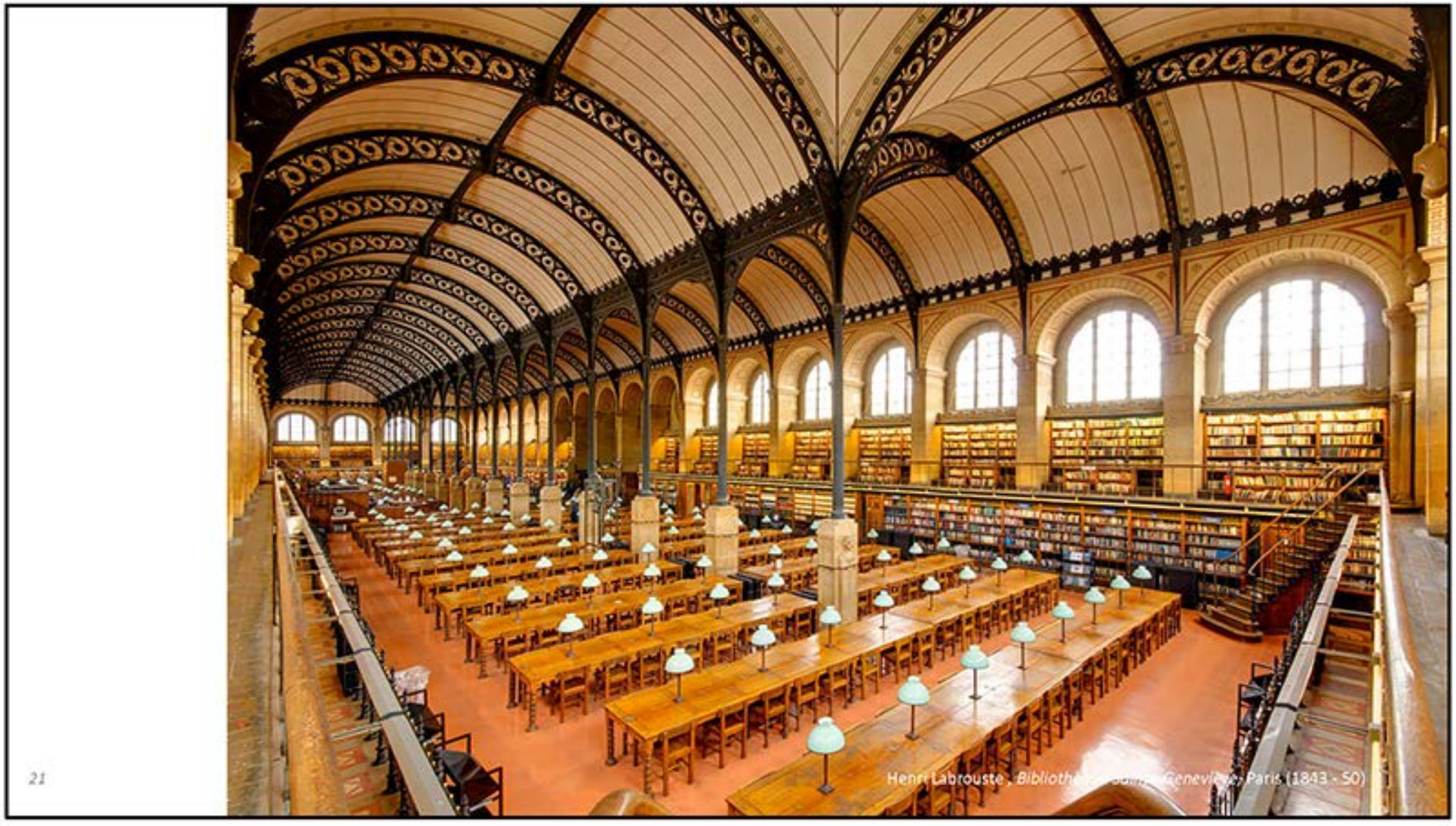
Central Court at Oxford University Museum of Natural History, UK (1850)

- Plate glass paneling of a cast iron skeleton
    - Central Court at Oxford University Museum of Natural History
- Cast Iron pillars – classical order, but new materials

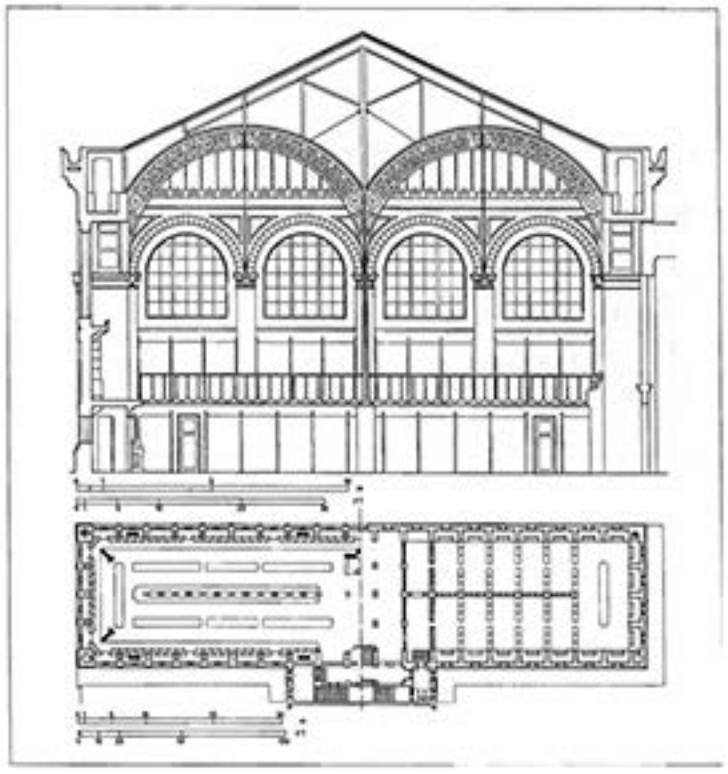
Pierre-François-Henri Labrouste

French, 1801 - 1875

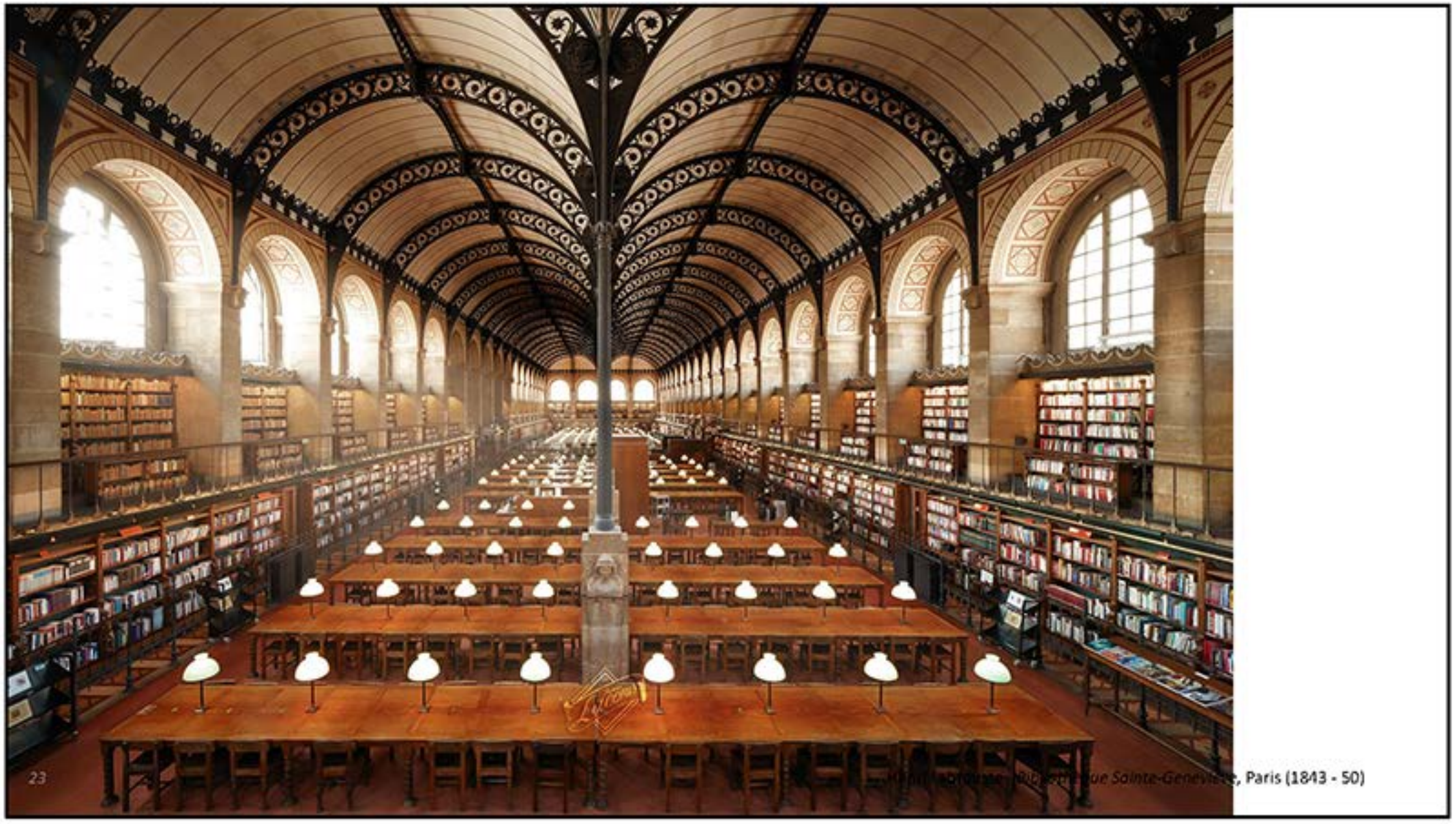
- Integration with classical aesthetics with new technologies – new ‘modern’ grammar



- Second floor of the library
- Most famous element – Iron Frame supporting the roof
- OPEN-WORK IRON ARCHES
    - Barrel Vaults of plaster reinforced by iron mesh

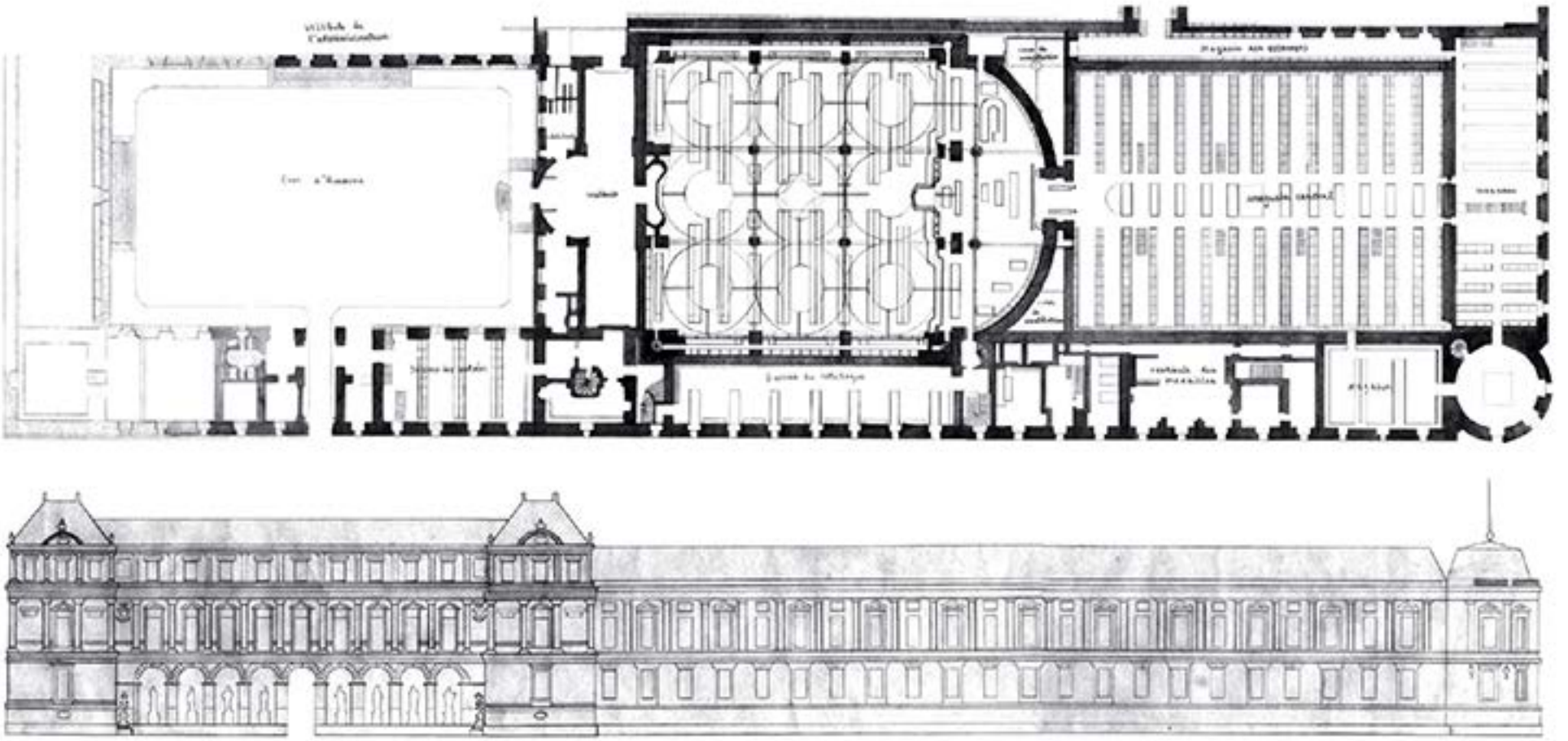


Henri Labrouste , *Bibliothèque Sainte-Geneviève*, Paris (1843 - 50)



- Labrouste inspired by use of cast-iron in markets and train stations

Henri Labrouste , *Bibliothèque Nationale*, Paris (1860 - 67)



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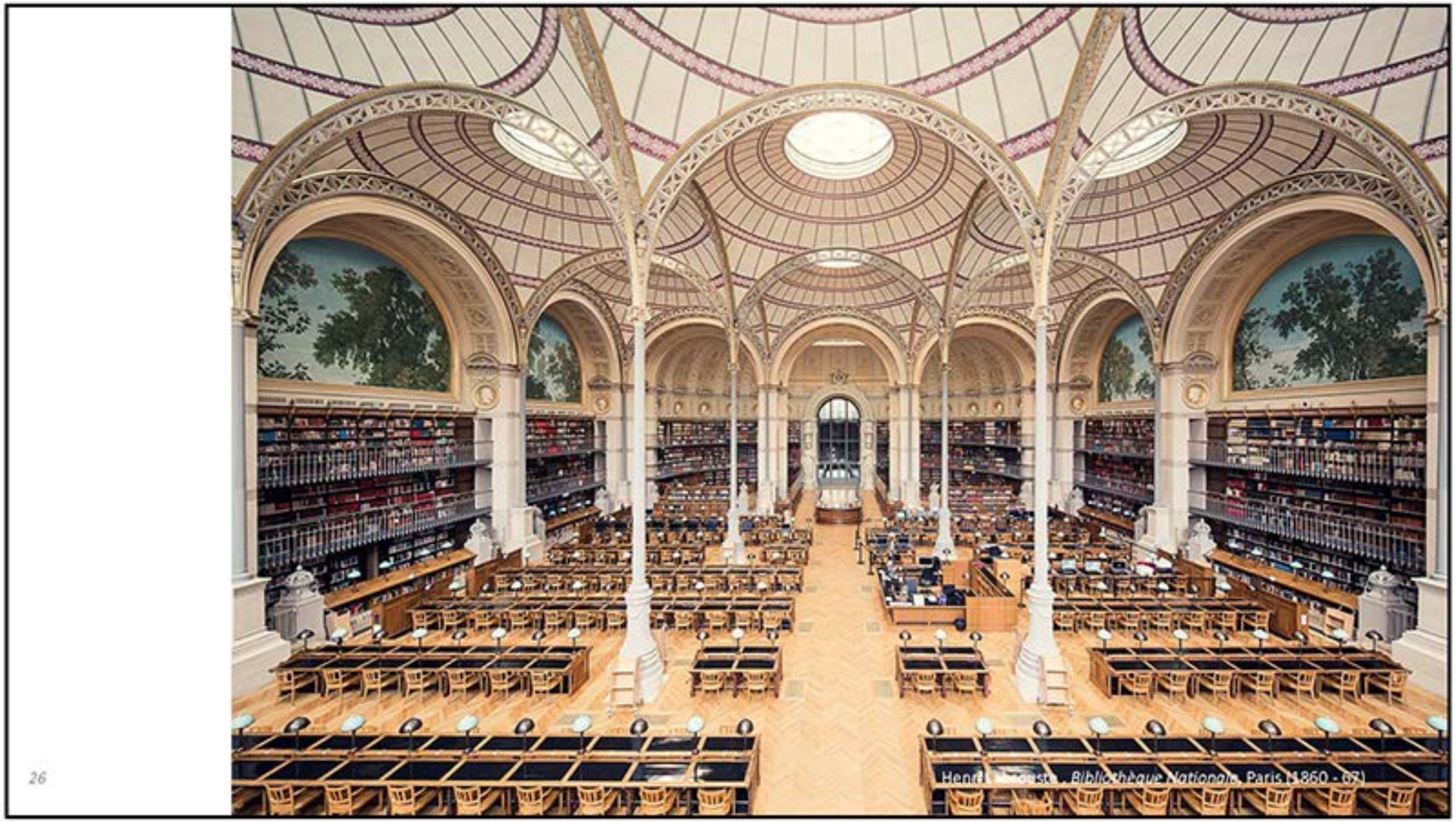
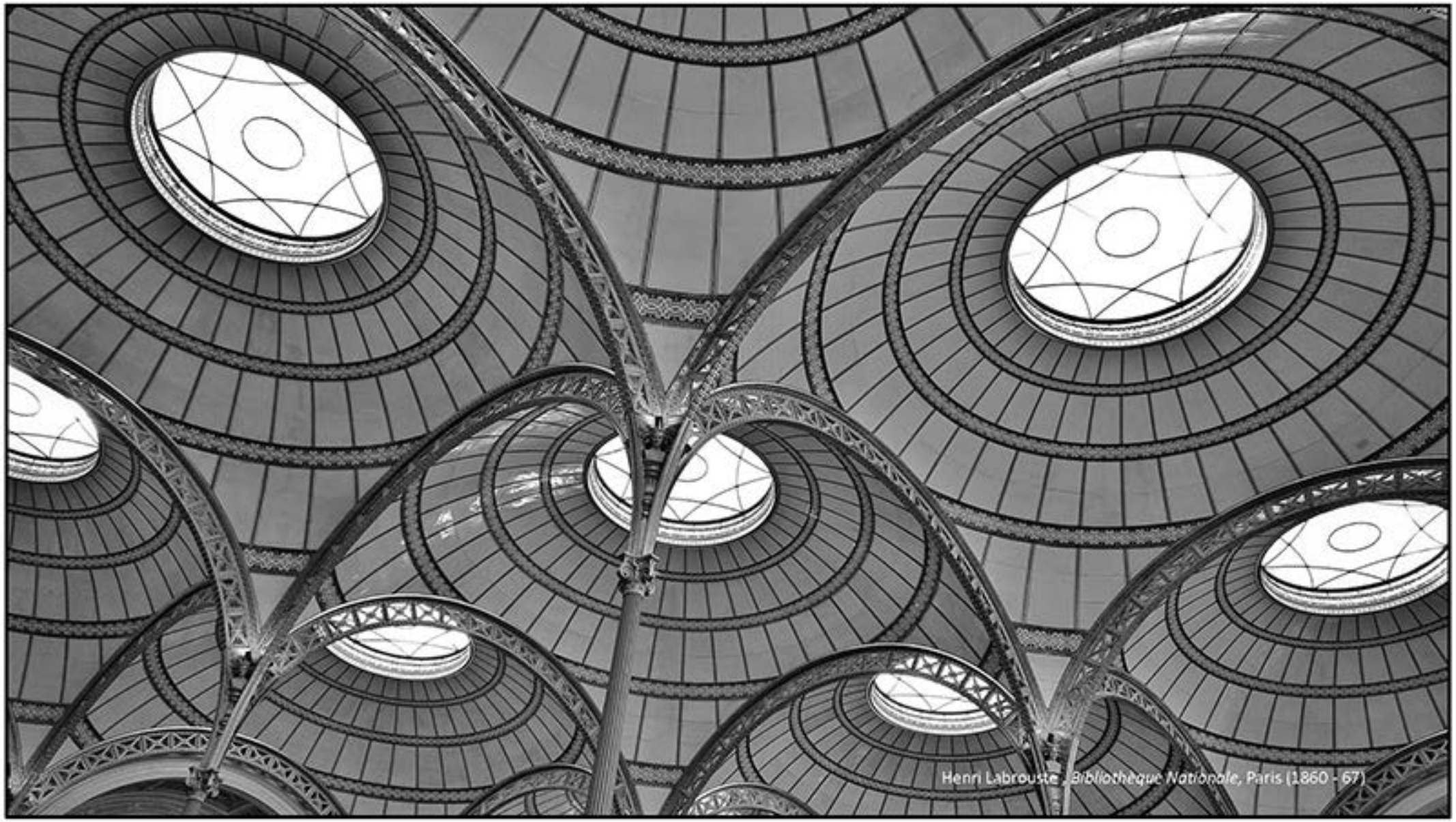
Henri Labrouste , *Bibliothèque Nationale*, Paris (1860 - 67)

- The 9 circles representing the interior domes

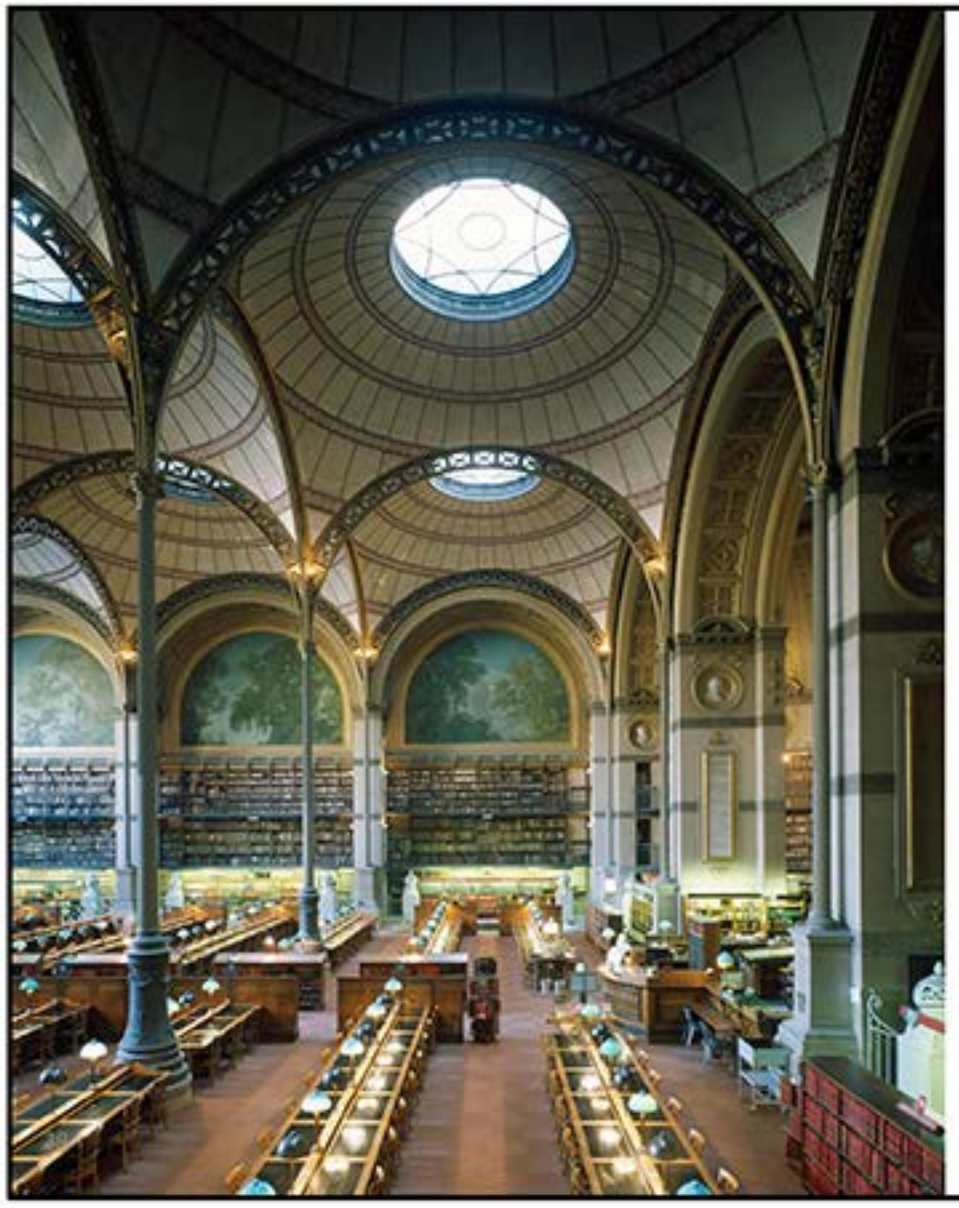


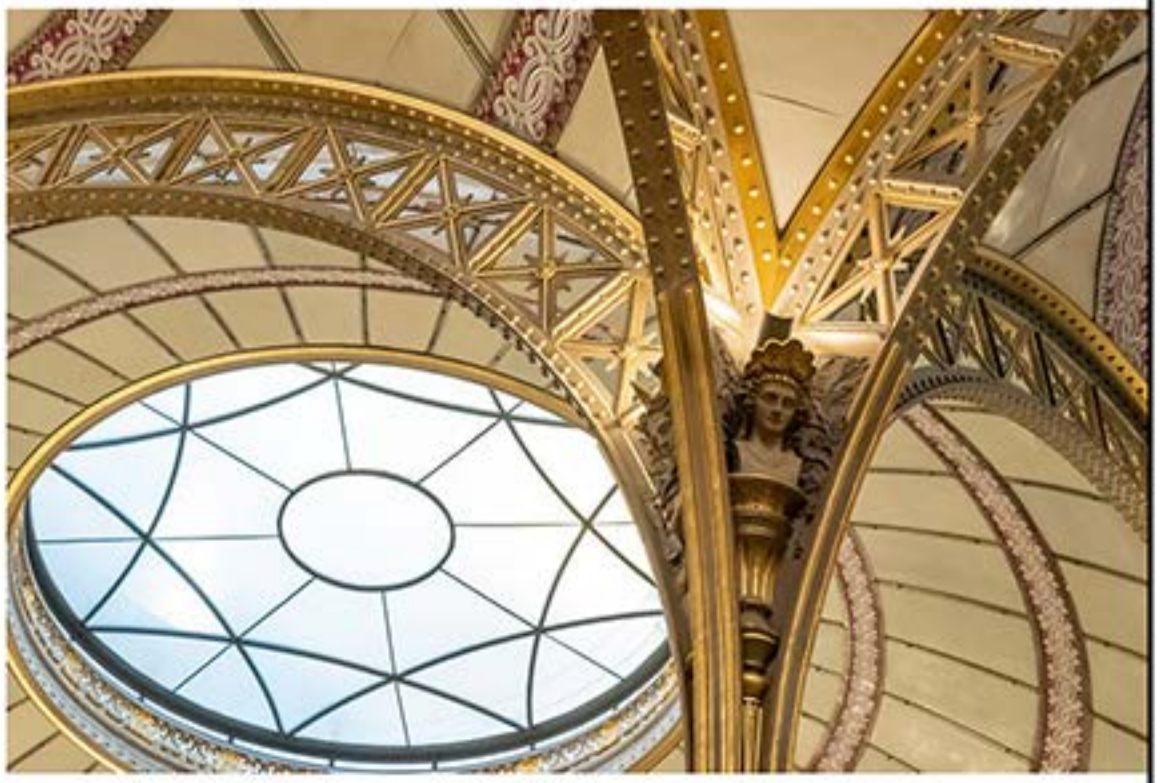
- Because of the use of cast iron, as opposed to stone, incredibly light and strong structural formwork
- 16 Iron pillars
- Domes made of terracotta tile

Henri Labrouste , *Bibliothèque Nationale*, Paris (1860 - 67)



Henri Labrouste, *Bibliothèque Nationale*, Paris (1860 - 67)





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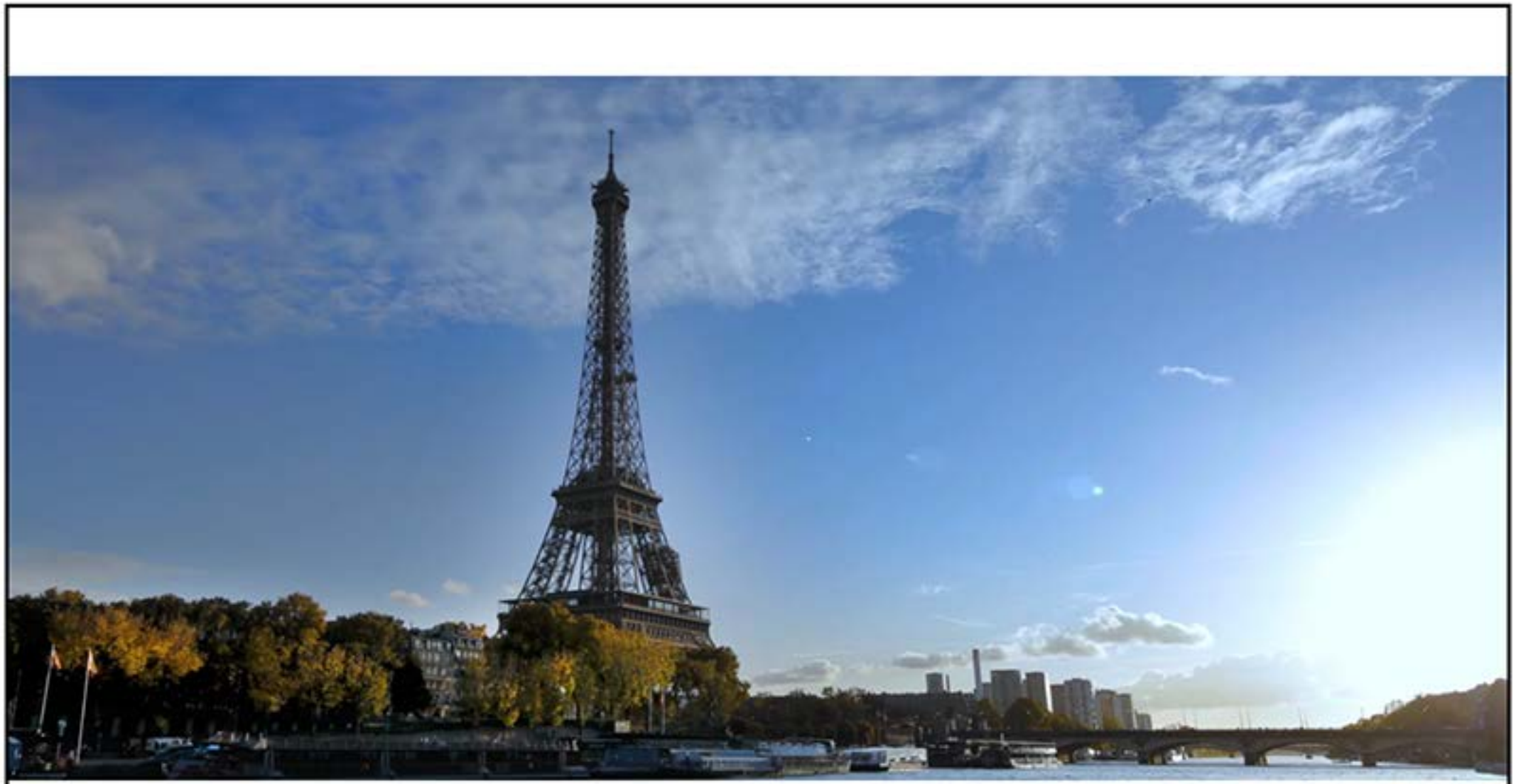

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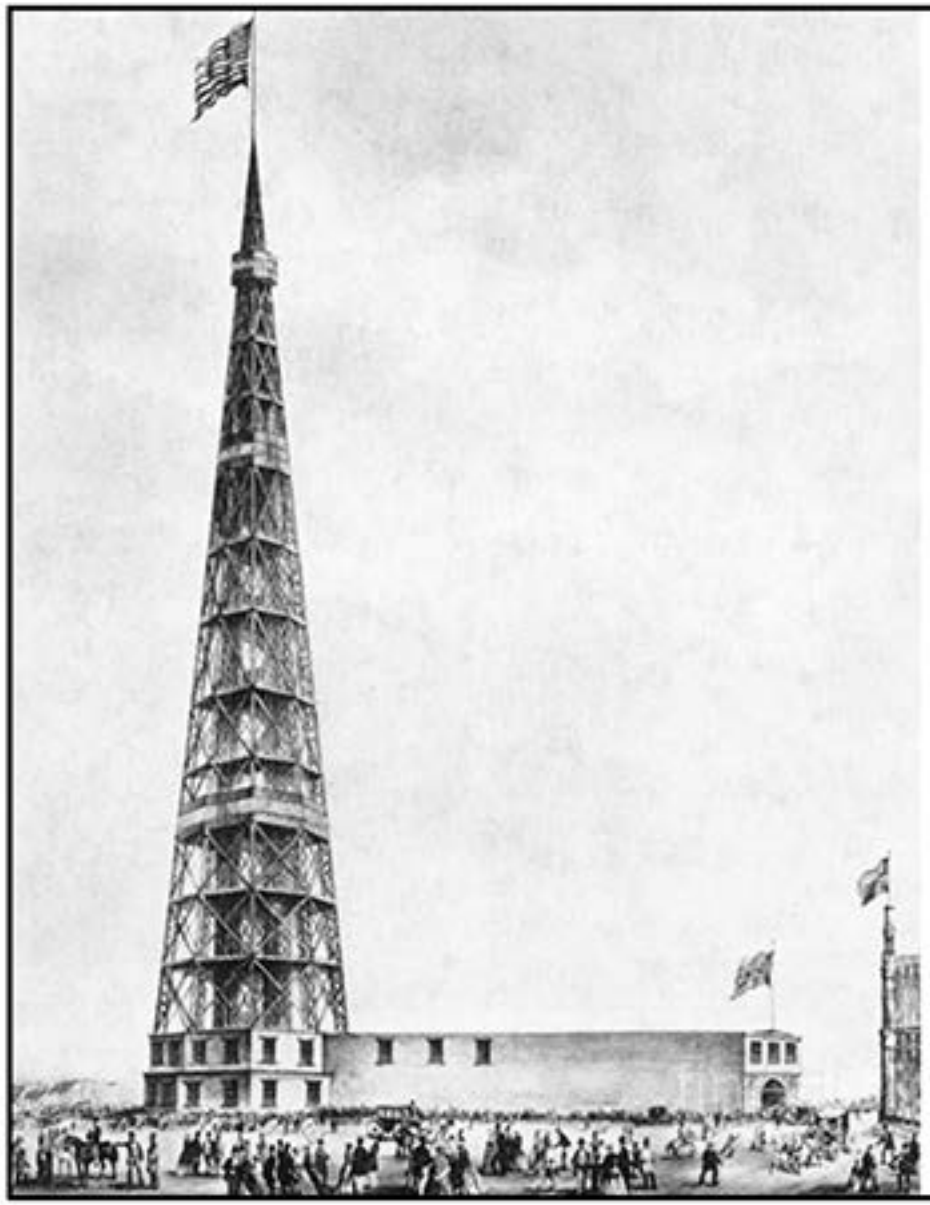
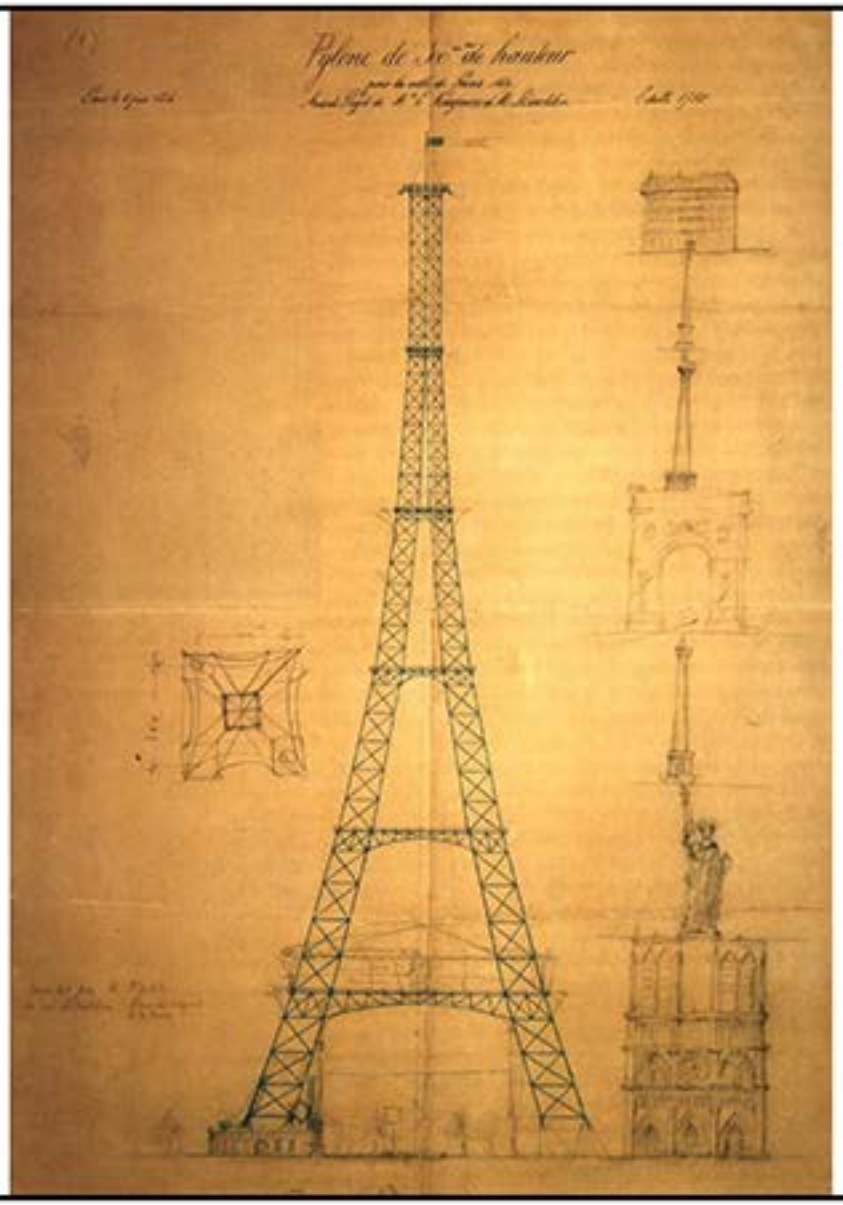
Gustav Eiffel (et. al), *Eiffel Tower*, Paris (1889)

- Known as a 'Lattice Tower'
- Constructed as a commemoration for the centenary of the French Revolution (1789 – 1799)
    - Officially opened in 1889.

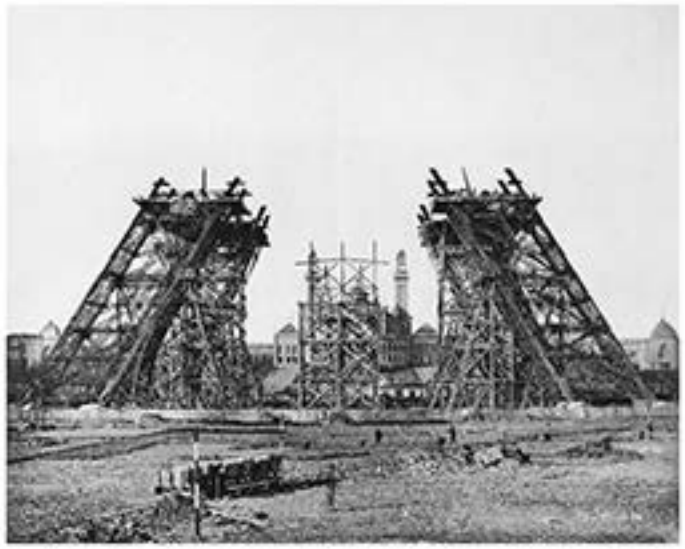


Latting Observatory, concept: Waring Latting, design: William Naugle

- Inspiration for the Eiffel Tower – Latting Observatory
- Wooden tower in NYC, part of the 1853 Exhibition
- Burnt down in 1856



Maurice Koechlin, Émile Nouguier, *Original design*



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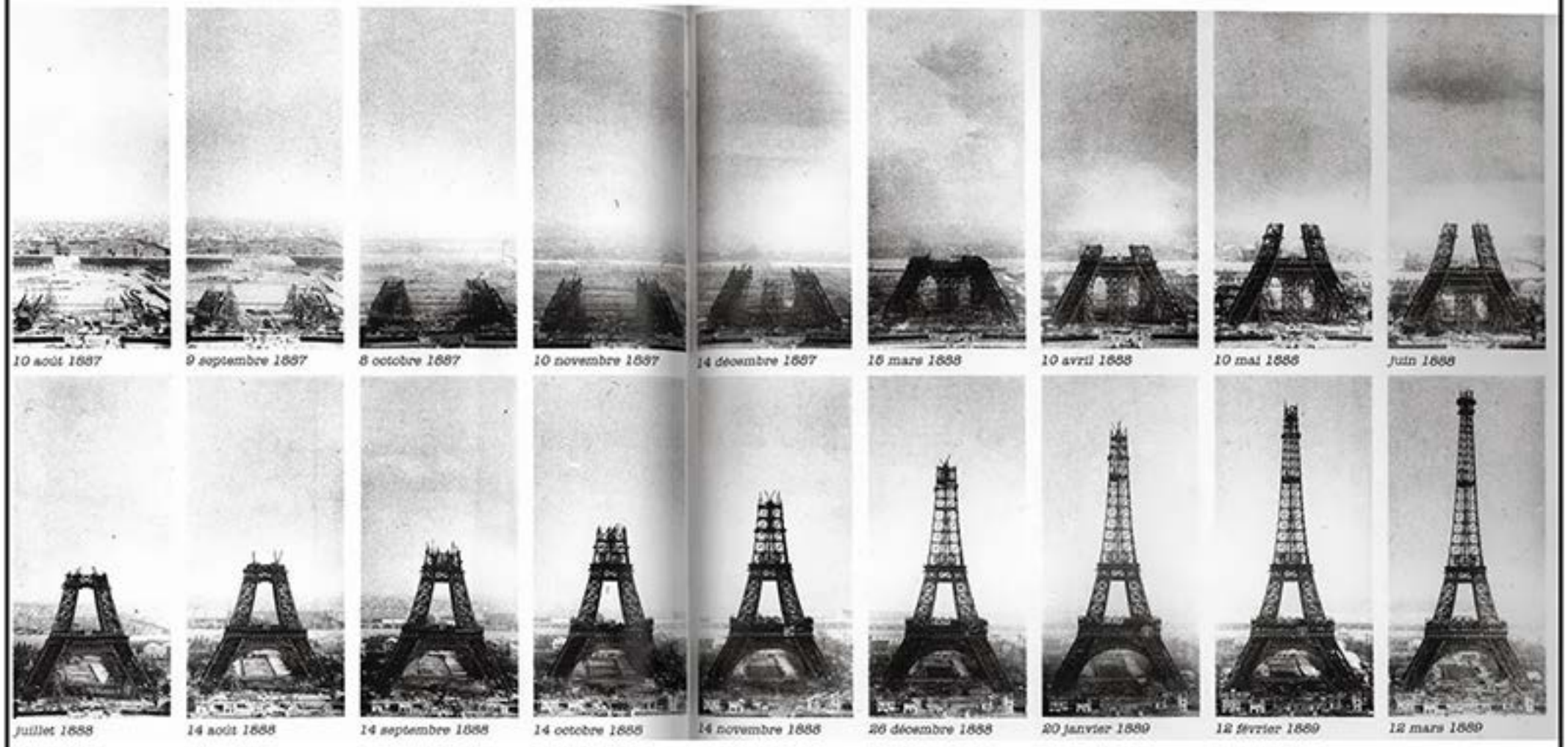

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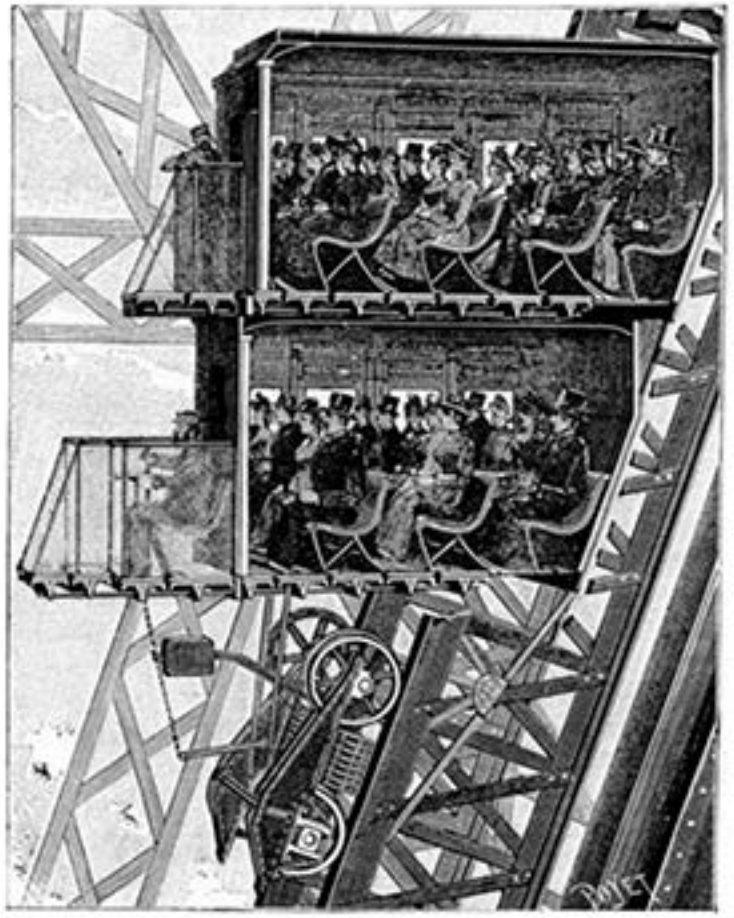

Gustav Eiffel (et. al), *Eiffel Tower,* Paris (1889)

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Gustav Eiffel (et. al), *Eiffel Tower*, Paris (1889)

- 72 names of French scientists, engineers, and mathematicians

19th Century Revival Movements
Beaux Arts, Victorian, Gothic Revival

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Beaux Arts

~1830s to 1900

- Influence by Ancient Greece and Rome
    - Even by standards back then, considered Conserative
- Strongest influence in France, and also the US
- Can be thought of as a subsection of Neoclassicism

École des Beaux-Arts

A school of art (and architecture) founded in 1648*, celebrating the arts of Classical Antiquity. Its namesake is associated with a particular architectural style made popular in 19th century France and the US.

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- Founded in 1648, Academie des Beaux-Arts (Academy of the Fine Arts)

École des Beaux-Arts

Painting & Sculpture

Architecture

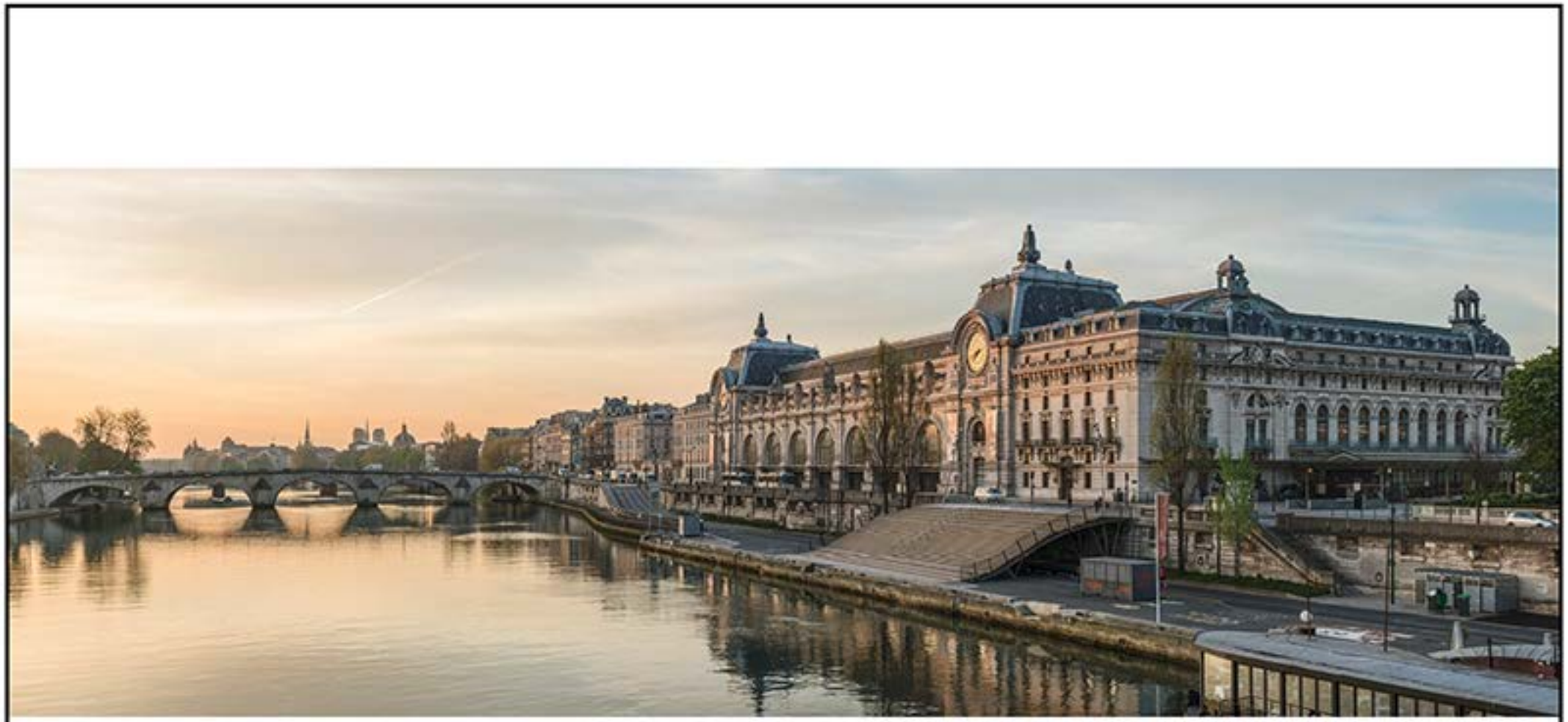
↓

École nationale supérieure des Beaux-Arts

- In 1968, architecture department separated, became École nationale supérieure des Beaux-Arts

Key comments on Beaux-Arts

- Flat roof
- Mixture of classical motifs
- Arcuated windows
- Heavier first floor (often rusticated masonry)
- Symmetry
- Heavy use of sculptural accents
- Heavy use of Neoclassical details:
  - Festoons, Cartouches, Agrafes, Pilasters



Various, *(Gare) Musée d'Orsay*, Paris (1898 – 1900)

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Various, *(Gare) Musée d'Orsay*, Paris (1898 – 1900)

- Interior of main hall (originally a train station – 'gare')
- Aerial view, with Seine River to left

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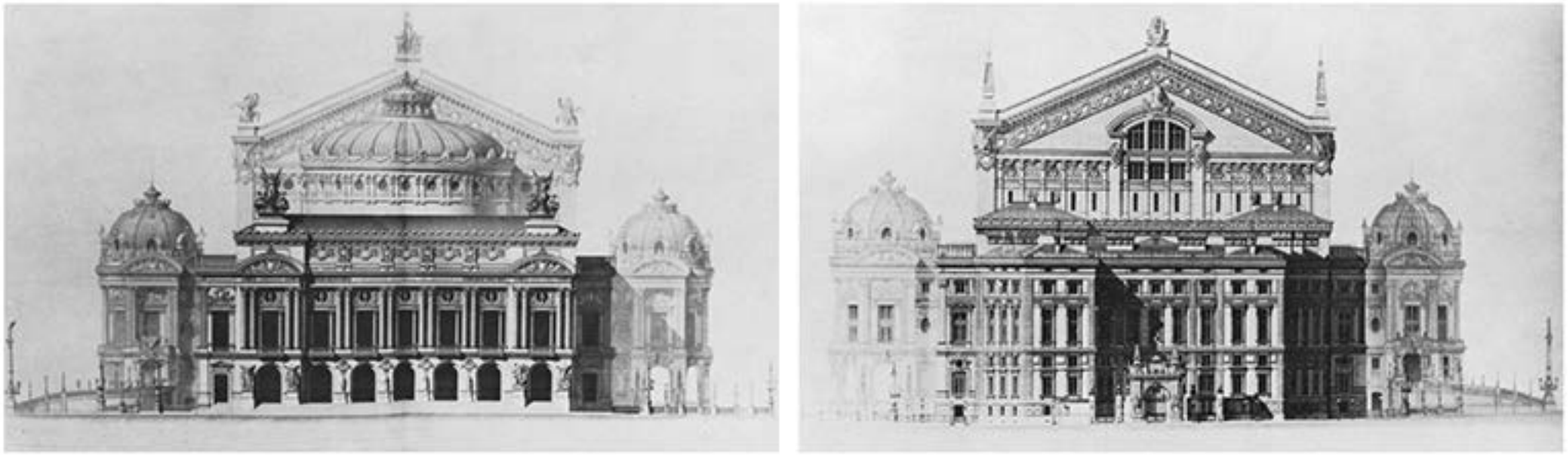
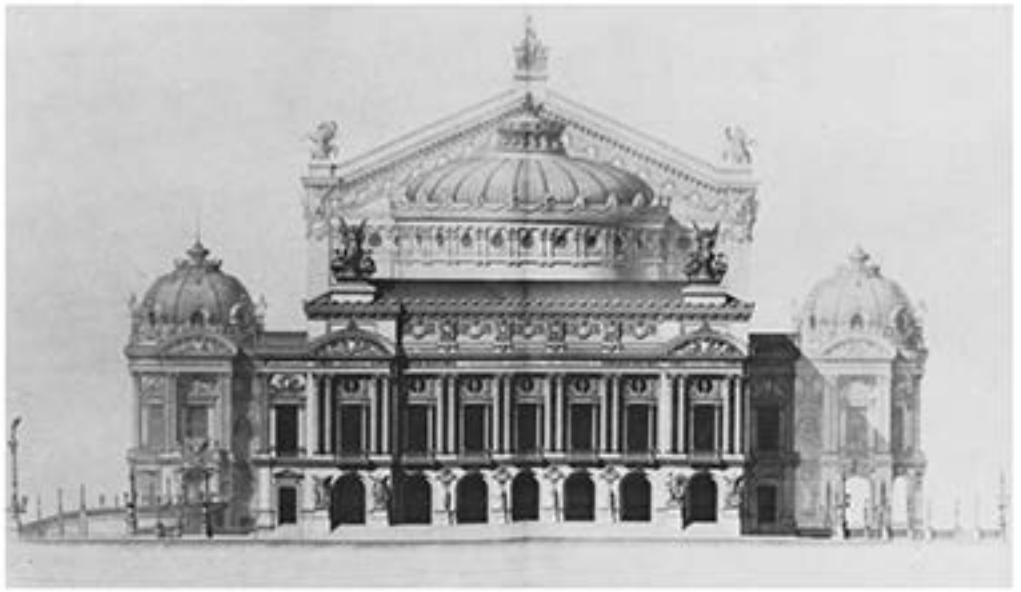
Various, *(Gare) Musée d'Orsay*, Paris (1898 – 1900)

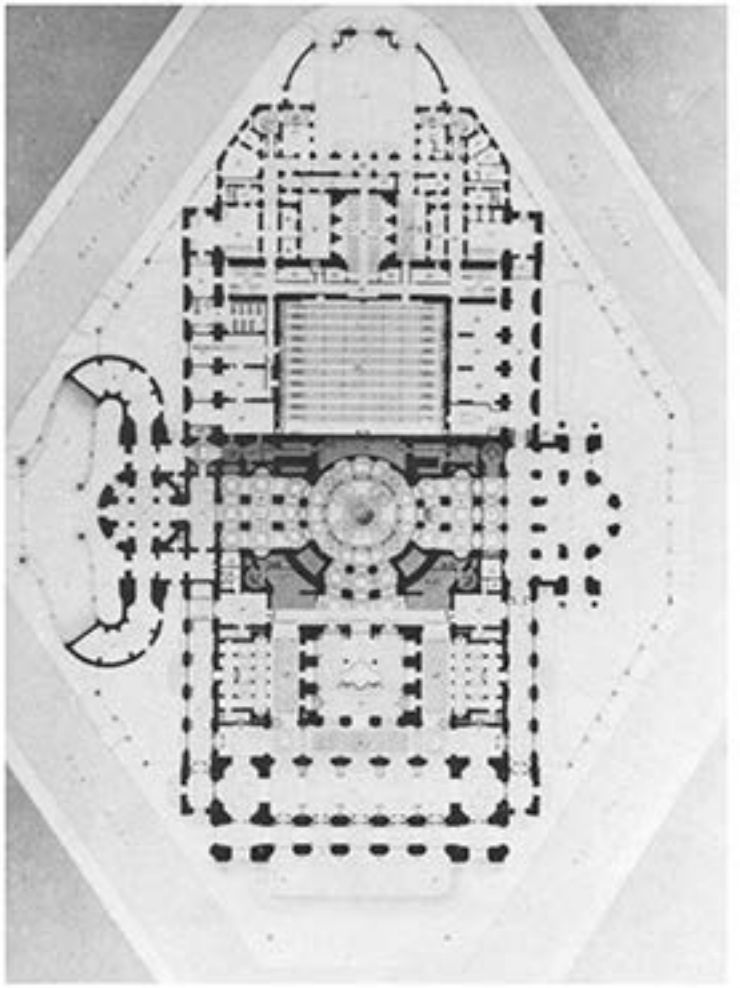
- Clearly associated with Hausmannian residential façade



Charles Garnier, *Palais Garnier*, Paris (1861 - 1875)

- The single-most important Beaux-Arts building





Charles Garnier, *Palais Garnier*, Paris (1861 - 1875)

Charles Garnier, *Palais Garnier* (model), Paris (1861 - 1875)

Charles Garnier, *Palais Garnier*, Paris (1861 - 1875)

- Beaux Arts typical style

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Charles Garnier, *Palais Garnier*, Paris (1861 - 1875)

Oeil-de-boeuf

An elliptical/circular window, usually above another, larger, window or doorway.
Made popular during the Baroque, though often used in significant Beaux Arts works.

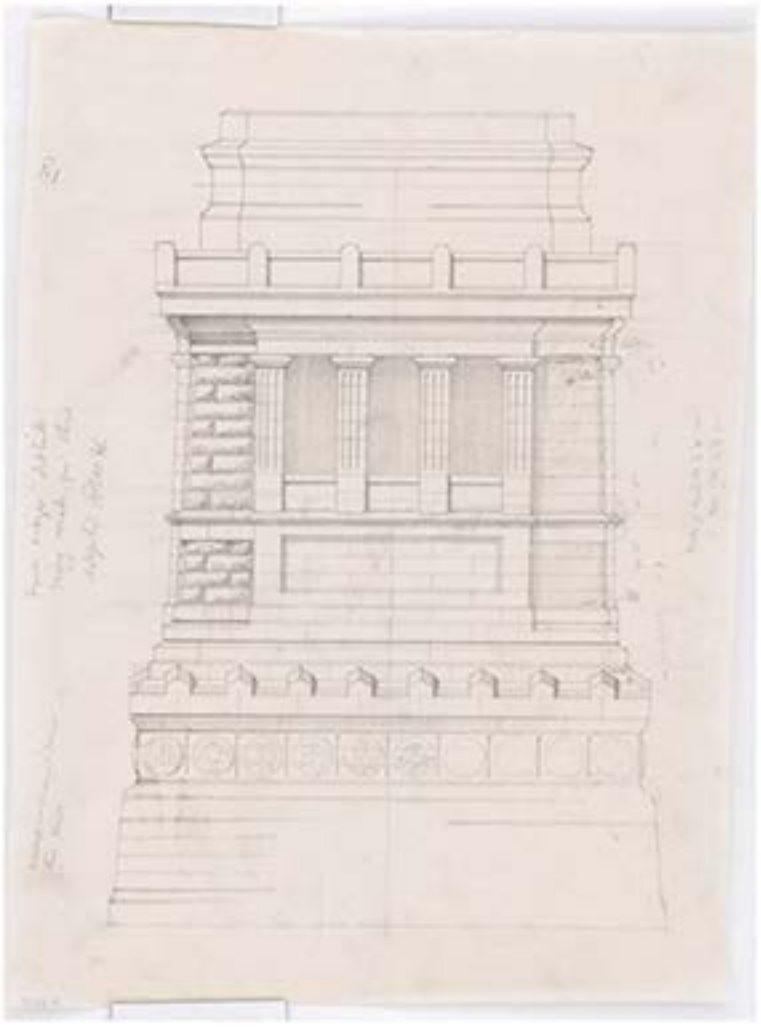
Trans: "Bull's eye"

Charles Garnier, *Palais Garnier*, Paris (1861 - 1875)

Richard Morris Hunt

1827 - 1895

- First American admitted to the Beaux-Arts



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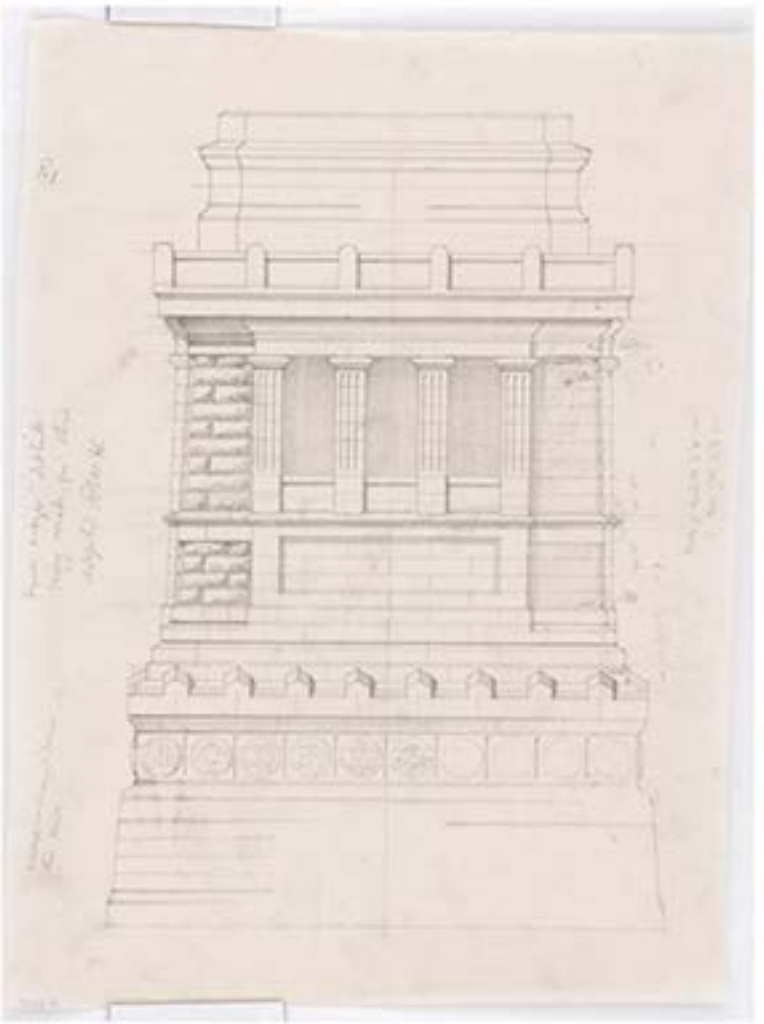
Richard Morris Hunt, *Pedestal of Liberty Enlightening the World*, New York City (1886)



Richard Morris Hunt, *Pedestal of Liberty Enlightening the World*, New York City (1886)

Richard Morris Hunt, *The Great Hall, The Metropolitan Museum of Art*, New York City (1902)

Antefix

A block, often carved with a figure, placed at the edge of a roof. Functionally, they are used to cover seams formed by two tiles.

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Richard Morris Hunt, *The Great Hall, The Metropolitan Museum of Art*, New York City (1902)

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A PERSPECTIVE OF THE NEW GRAND CENTRAL TERMINAL AND THE SURROUNDING IMPROVEMENTS.

Builders: John Feiner Co.
Waterproofing Materials: The Barrett Mfg. Co.

Warren & Wetmore | Associate
Reed & Stem | Architects

Reed & Stem, Warren & and Wetmore, *Grand Central Terminal*, New York City (1913)

Hal Morey, circa 1929

Reed & Stem, Warren & and Wetmore, *Grand Central Terminal*, New York City (1913)

Victorian Style(s)

~early 19th century – early 20th century

- A true hodgepodge of other architecture styles, including Gothic Revival, Greek Revival, Romanesque Revival, etc.
- Victorian period increasing wealth due to expanding middle class
    - Largely enable by the First Industrial Revolution

Queen Victoria

1819 – 1901

Reign: 1876 - 1901

Various examples of residences in the Queen Anne Style, Los Angeles

Queen Anne

1665 - 1714

Reign: 1707 - 1714

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- Queen Anne Style is a subset of the Victorian Style
    - Though more specific to the end of the 19th century
- Original Queen Anne Style occurred in 19th century Britain
- Primarily wood construction, though also heavy use of brick

Key comments on Queen Anne Revival

- Steep roofs
- Asymmetry
- Octagonal/Round towers and turrets
- 2-3 stories
- Wraparound porches
- Strong color (not always)
- Fish scale tiles

Various examples of residences in the Queen Anne Style

- Examples of color schemes that use high but complementary contrasts of color
- On left, common use of ‘fish-scale shingles’

Various examples of residences in the Queen Anne Style

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Various examples of residences in the Queen Anne Style

- Many ‘queens’ still standing and in use today
    - But because of their heavy ornamentation, often require a significant amount of maintenance.

turret

Also called a *Tower*.
Used heavily in the Victorian/Queen Anne Revival styles. Often cylindrical (sometimes square or polygonal), extending multiple floors, and providing adjoining room with a panoramic corner vista. Moves the eye upwards.