2020-10-26 - Lecture 26

14.3 ***Industrial Europe*** **:: Bridges, Factories, Prisons**

1) ***Industrial Age*** begins in **England** about ***1750***

- The date 1750 roughly coincides with:
  (1) French and Italian theorists on the origins of architecture
  (2) Archaeological efforts in Greece and Rome which led to a neoclassicism, thereby making a strong argument for the timing of the beginnings of ***modernism***.
- ***The Industrial Revolution meant that the majority of workers moved from an agricultural way of life (farms) to an industrial way of life (factories).***
- ***Architecturally*** (spatially) this signifies a large shift of people previously inhabiting the countryside now moving to cities, which were the sites of most of the industrialization.

- ***Changes to cities due to industrialization***:
  - factories dramatically changed the scale of cities
  - over-crowding of cities
  - lack of housing due to fast influx
  - use of child labor
  - substandard safety
  - crime increase
  - pollution from coal-burning

- ***Focus of much of the Industrial Revolution*** = Central western England
  - Manchester, Birmingham, Wales, etc…
  - These locations were close to Liverpool for shipping
  - These locations were tied to extensive canal networks
  - There were large supplies of coal in the area

2) ***Bridge*** *innovators and designers*
- **Abraham Darby** (the Elder) (**1678**-**1717**)
  - Key improvement to iron production (pig iron) using ***coke*** rather than ***charcoal***
- **Abraham Darby III** (**1750**-**1791**) and Architect **Thomas Pritchard** (**1723**-**1777**)
  - First cast-iron bridge at ***Coalbrookdale*** (**1779**)
- **Thomas Telford** (**1757**-**1834**)
  - **Telford's first iron bridge at *Buildwas*** (BUILD-wuz) over the Severn River (**1795**)
  - **Telford's second iron bridge at *Sunderland*** over the River Wear (**1796**)
  - Compare ***Sunderland*** with the ancient Chinese ***Zhaozhou Bridge*** from 616CE (pure geometry)
  - **Telford's *Pontcysyllte Aqueduct*** (PONT-see-silt) (**1795**-**1805**) carried the **Ellesmere Canal** over the River Dee, a cast iron canal basin and framing held up on masonry piers
  - **Telford's *Longdon-on-Tern Aqueduct*** carried the **Shrewsbury Canal** (**1797**)
  - **Telford's masterpiece iron *Menai Bridge*** (**1819**) that connected mainland Wales to Anglesey Island. Giant iron chains suspending iron tension rods, all held up by giant masonry piers that have classical details.

3) ***Factory*** *innovators and designers*
- **James *Watt*** (**1736**-**1819**)
  - Patented key improvement to steam engine (**1765**)
- Factories resembled palaces and chateaux to a certain degree in the beginning (the ***King's saltworks at Chaux*** by Ledoux, for example)
- ***Boulton & Watt Soho Manufactory*** (made steam engines) (**1765**) in **Birmingham**. A large complex. Main facade was a five-bay facade with a central block that exhibited some classical detail, including a thermal window over the front door, symmetry, hipped roof. Made of timber beams (not fireproof). Open floor plan to accommodate manufacturing. ***Starting to develop a new building type***.
- ***Etruria Pottery Factory*** in **Burslem** (**1768**) for **Josiah Wedgewood** and his very fine china manufactory next to a canal. Projecting central block with classical details (Georgian) yet simple. Round end pieces to terminate the facade.

- ***Masson Mill** at **Cromford*** (**1783**) by **Richard Arkwright** (1732-1792).
  A five-story facade with projecting central block entry that contained Palladian windows.
- **Jedediah** and **William Strutt**, develop first fireproof factory construction at North Mill, Belper.
  An iron frame with brick vaulting.
- ***Ditherington Flax Mill*** (**1797**) designed by the owner **Charles Bage** (1751-1822)
  Fire-resistant factory as fully framed cast iron construction. Cruciform shape cast-iron column innovation. Open floor plan for machinery, a characteristic of the new ***factory building type***.

4) ***Alexis de Tocqueville*** (1805-1859) French author, diplomat, writer who traveled about America a great deal and wrote extensively on the American way of life in the middle of the 19th century **wrote of the factories and cities of industrialization in Manchester on a visit to England in 1835:**

> "From this foul drain the greatest stream of human industry flows out to fertilize the whole world. From this filthy sewer pure gold flows."

> "Here humanity attains its most complete development and its most brutish."

These quotes signifying the the irony and complexity of the impact of industrialization.

5) **Prisons**
- Jeremy Bentham (1748-1832) developed and promoted a concept for a prison design called a ***Panopticon***, wherein cells would be situated radially and open toward a central space where guards could watch from, but not themselves be seen. And **invisible omniscience** that introduced a psychological dimension to architecture. It was patented. Panopticon, of course, etymologically means ***all-seeing***….
- A Panopticon type prison was not built by Bentham, but **William Strutt** used the concept to design a factory ***Round House*** (**1803**) in **Belper**, introducing the ***invisible omniscience into factory design***.
- Panopticons were built later by others.
- ***Eastern Penitentiary** in **Philadelphia*** designed by **John Haviland** (1821)
  Radiating wings, single story, solitary cells with gardens, guards controlled corridors with angled mirrors.