Chicago and the Birth of the Skyscraper

Lecture Themes:
Conditions that give rise to innovation in Structure Engineering role of structural innovation in the skyscraper The birth of the steel ‘skeletal’ skyscraper form Structural Art of Buildings (as opposed to Bridges)
First Chicago School

credited with “the invention and mastery of steel framing and with the ... modern office building.” (Carl Condit)

Jenney

Burnham & Root

Adler & Sullivan
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Burnham & Root

Jenney

Adler & Sullivan
The business buildings of Burnham & Root were the first tall buildings in which the conditions both of commercial architecture in general and of elevator architecture in particular were recognized and expressed.

—Montgomery Schuyler, 1895

Yes, we made all these buildings together, but they are chiefly his, for he it was who did the designing.

—D. H. Burnham, 15 January 1891
Viollet-le-Duc
Viollet le-Duc

structure makes form

“The extent to which buildings are beautiful, is the extent to which the special problem each confronted was solved in an optimal way.”
Montauk Block
Rookery
Monadnock
Rand McNally
Reliance
Denouement
Montauk Block (1882)
Montauk Block
Rookery
Monadnock
Rand McNally
Reliance
Denouement
Rookery (1886)
Buildings are harder to dissect as Structural Art than Bridges

Consider the Social Category

- **Bridge**
  - Impact on two communities/sides being connected
  - Cost of construction
  - Modes of transportation allowed on bridge
  - ...

- **Building**
  - (You fill in)
Burnham "... don't you know that you can hire any number of civil engineers, mechanical engineers, and electrical engineers, who will be absolutely contented to spend their whole lives doing routine?" [Collapse of a Burnham designed ballroom in Kansas City a few years later had him rethinking things a little bit...]
“this is the thing, itself”
-Schuyler

Monadnock Building
1891
Root & Burnham
Monadnock Building
1891
Root & Burnham

plan view (partial)
Montauk Block
Rookery
Monadnock
Rand McNally
Reliance
Denouement
Rand McNally
Building
1890
Root & Burnham
Steel columns

Rand McNally Building
1890
Root & Burnham
Need to improve wind design

The *Engineering Record* [in 1893] noted, “the construction of skeleton buildings has but recently been commenced hence but little opportunity has been afforded to test them in the face of ordinarily destructive winds. As a general rule, how-ever, it may be considered very indifferent engineering that is fortified only by a lack of failure. If a construction is sound in principle it can be shown to be so, but if its character is not capable of a clear defense, it can only be regarded with well-grounded suspicion.”
Improve this structure!
Wind Bracing

Masonry walls
Rod bracing
Knee bracing
Portal frame bracing
Montauk Block
Rookery
Monadnock
Rand McNally
Reliance
Denouement
Reliance Building
1895
(Root) & Burnham & Atwood & Shankland
Root on Structures
"... it is obvious that if a column is primarily a structural feature ... it may be legitimate to use the column in a very small scale as a purely decorative detail, but it is the greatest of architectural crimes to use a great column in a large building for any purpose than primarily to carry weight."
"Steel columns are rapidly coming into use instead of cast iron ... The steel columns are made of rolled plates of steel which are bent into proper form and riveted together. Thus, they may be perfectly inspected and are absolutely trustworthy."

"Generally speaking, however, it will be found that the simplest arrangements ... are best fitted to great buildings."
Montauk Block
Rookery
Monadnock
Rand McNally
Reliance

Denouement

Aside on Sullivan
First Chicago School

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Burnham & Root

Adler & Sullivan

Jenney
Sullivan’s Wainright in St. Louis
Sullivan’s Wainright in St. Louis
Carson Scott Pirie Building
1899
Adler and Sullivan
Montauk Block
Rookery
Monadnock
Rand McNally
Reliance

Denouement
extras
The (First) Chicago School

Jenney
Sullivan
Burnham
Root

...
Unity Building
1892
(demolished 1989)

Shows skeletal construction of the time. Architect is Warren, not part of the story line for Chicago talk.
Reliance Building