

# Perspectives on the Evolution of Structures

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Lecture Themes (Write these down each class!)

Social, Scientific, and Symbolic meaning in structures  
Evolution of form in the work of Eiffel  
Compare and contrast Washington Monument and Eiffel Tower

## Pre-course survey

- Demographic questions (race, sex) optional
- Data being collected at multiple universities
- Anonymous
- Data will be used in proposals for funding to improve the course and engineering/liberal arts education
- 5 minutes

Washington Monument

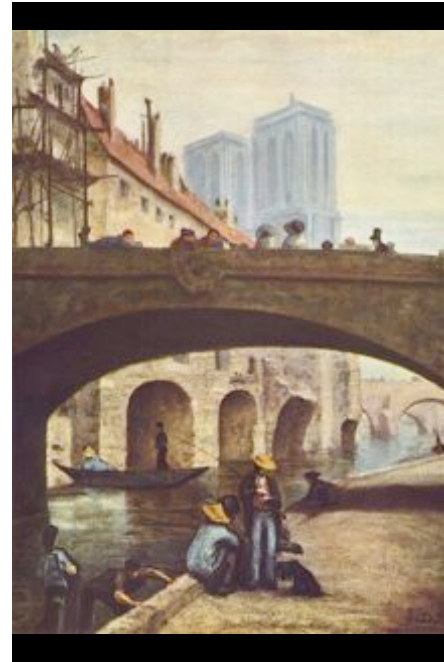
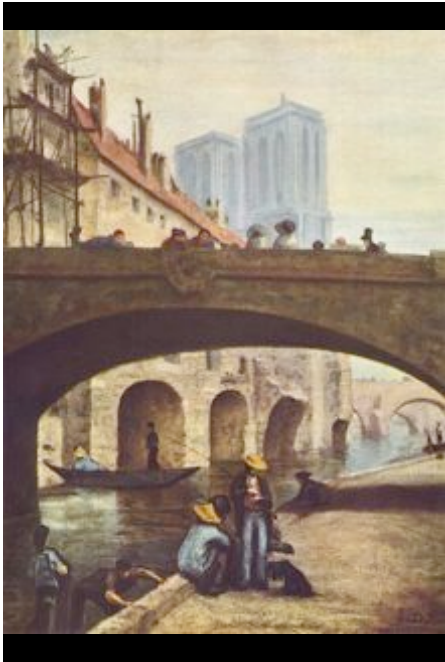


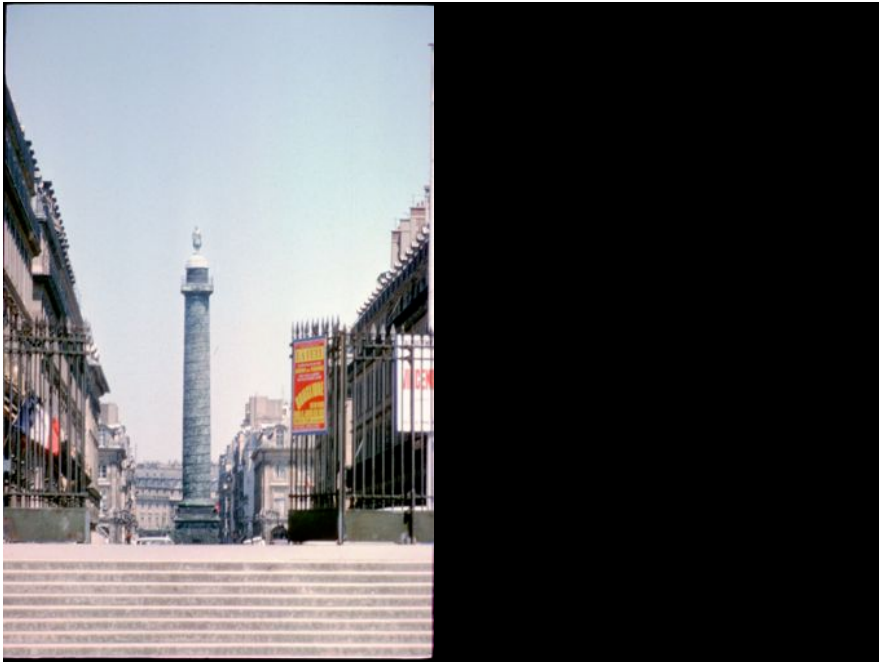
Washington Monument



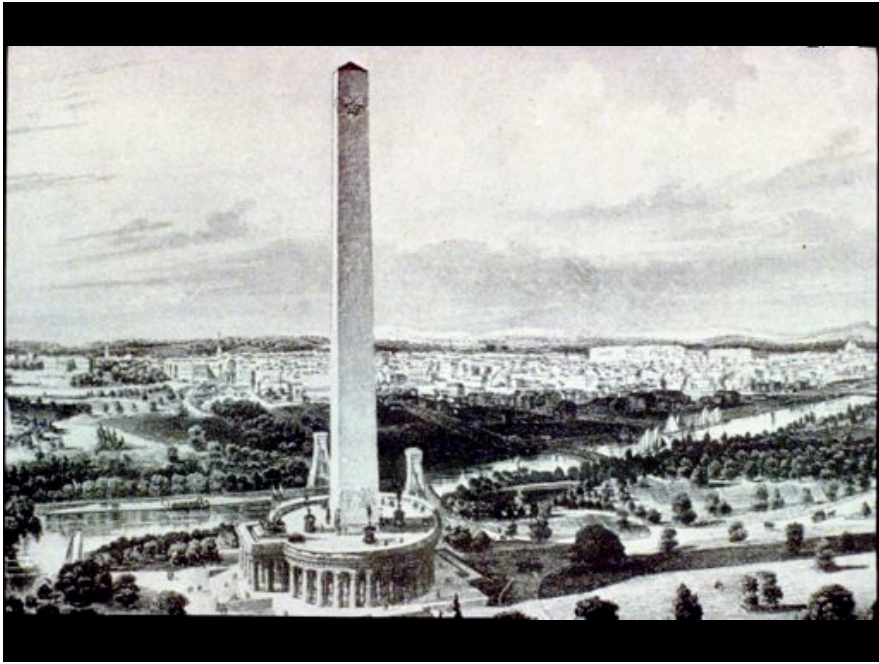
Eiffel Tower











carriages, which would be  
 size to pass under it, as  
 with  
 two  
 Park,  
 President's  
 Porter's  
 in days

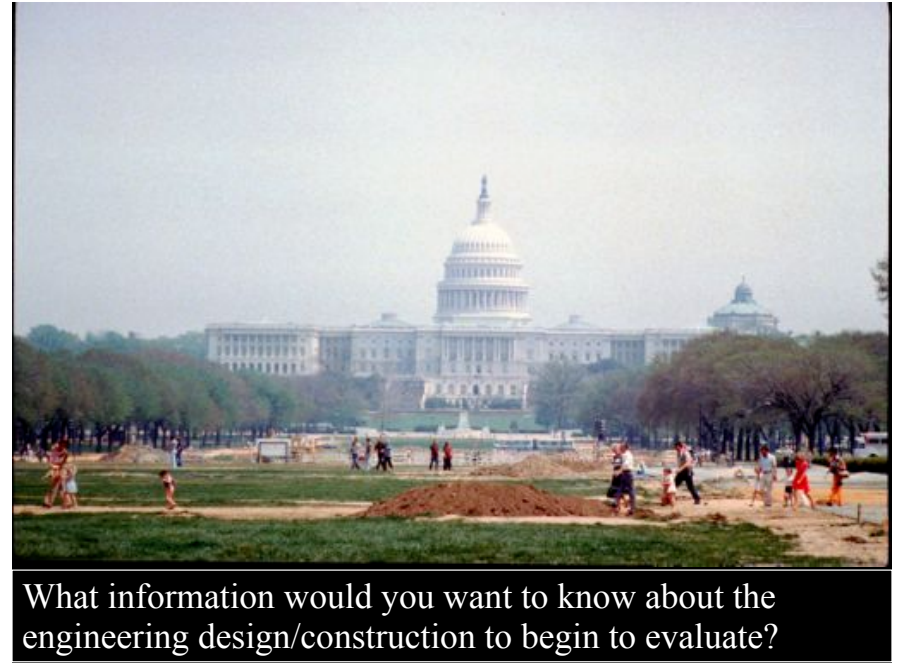
[Suspension bridge across  
 the Canal]

feature  
 plant  
 American  
 proposed  
 along of  
 river. -

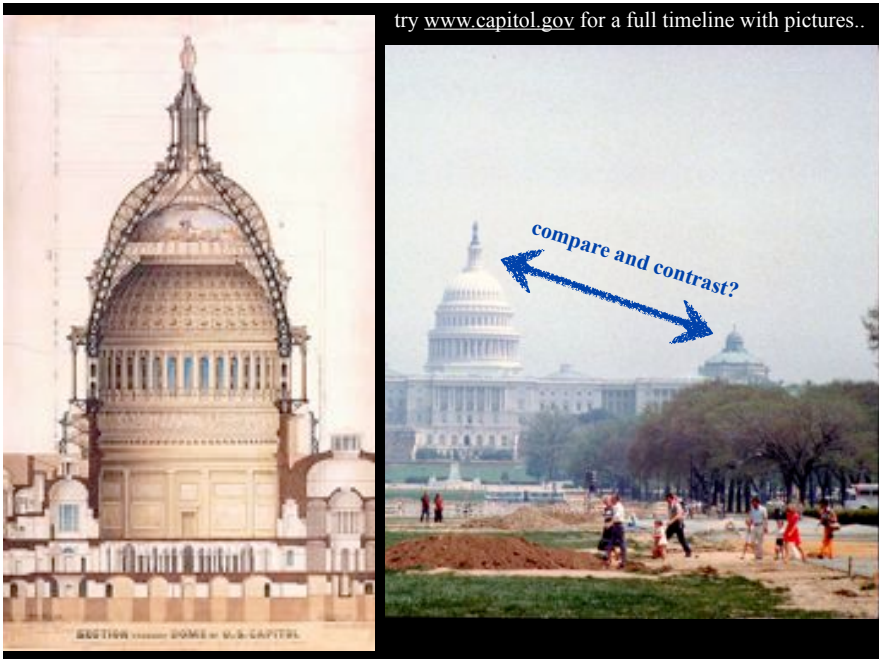
...the place...  
 ...place at the end of Pennsylv.  
 and  
 marble,  
 form  
 the  
 the  
 small  
 capital

President's Arch  
 at the end of Run & Avenue.





What information would you want to know about the engineering design/construction to begin to evaluate?





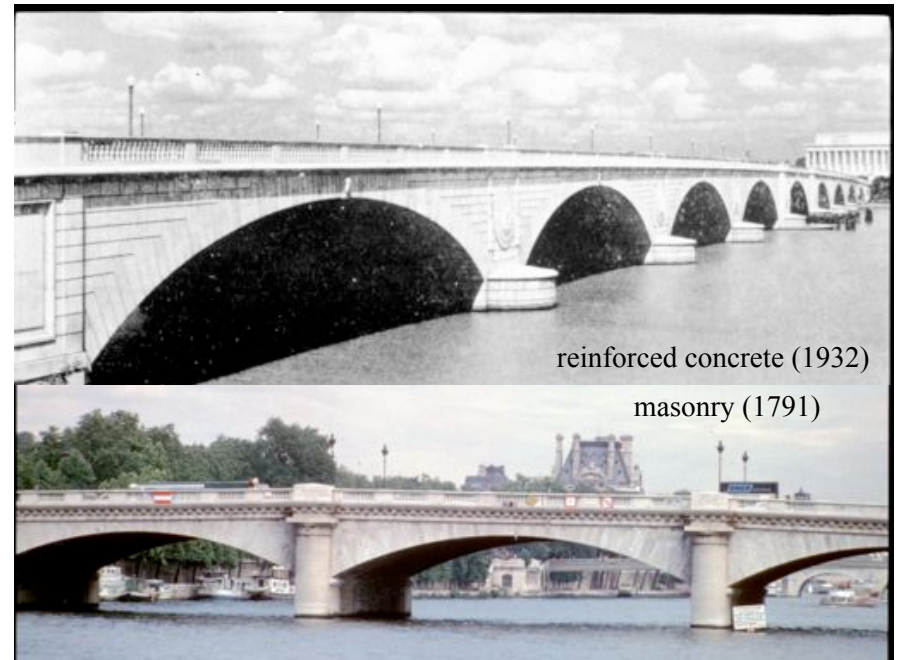
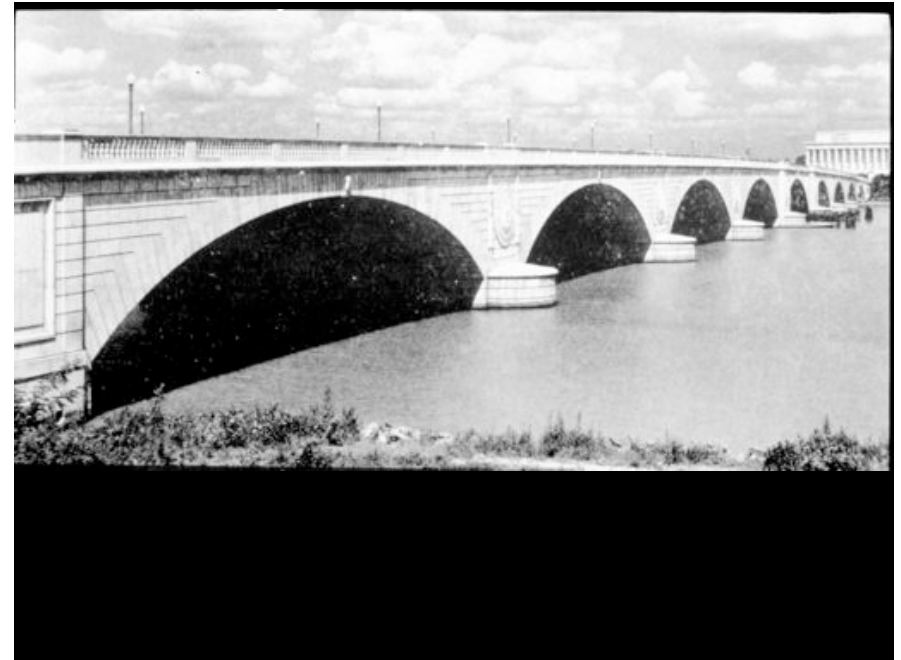
*imitation = looking backwards*



U.S. Federal Archives

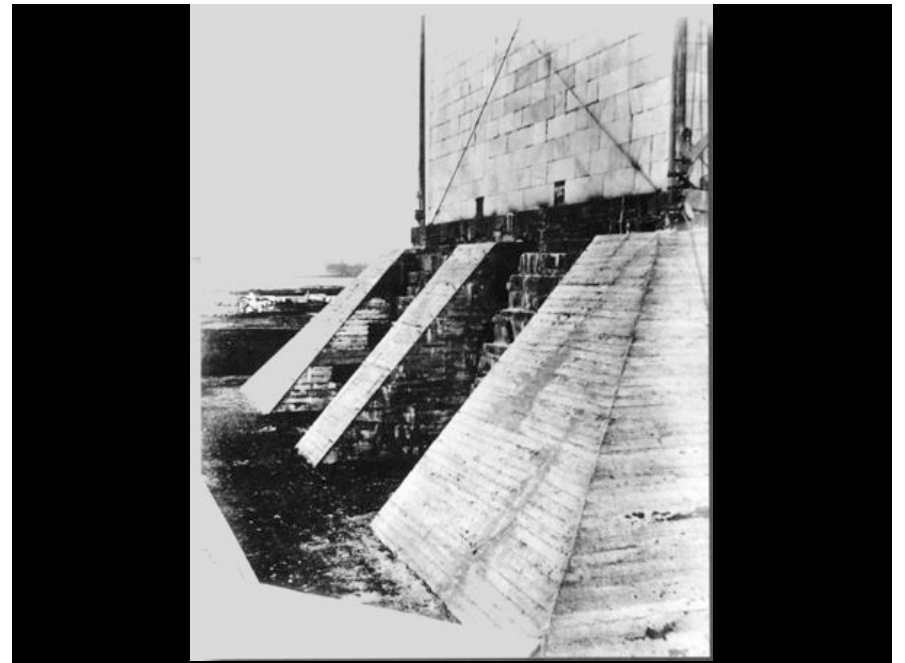
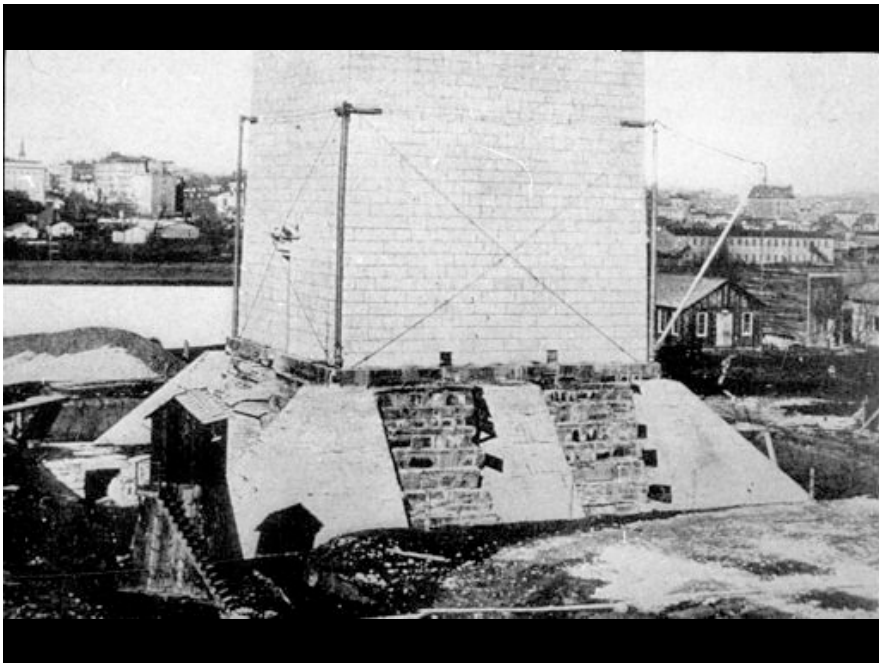
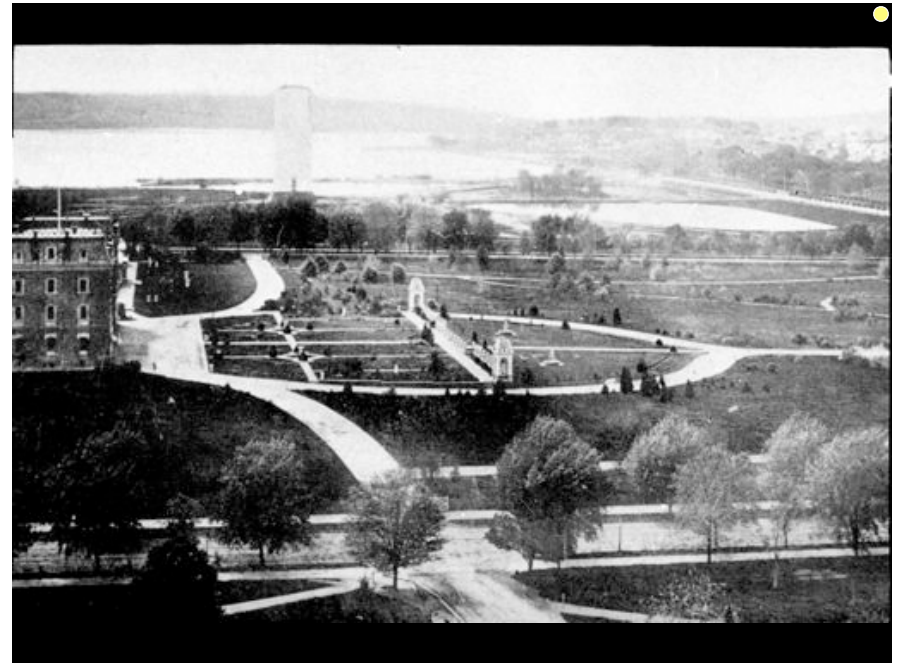


Pantheon

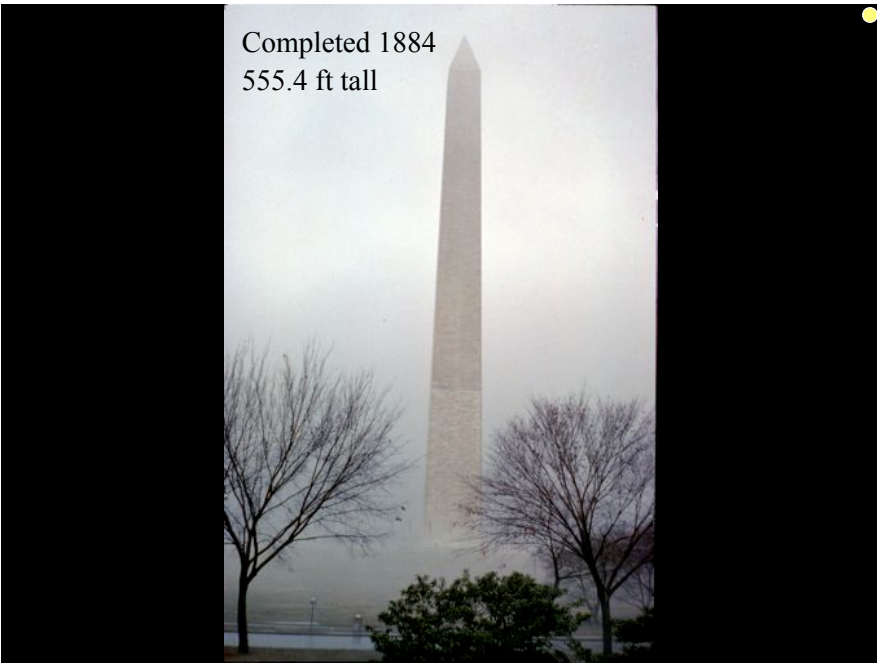
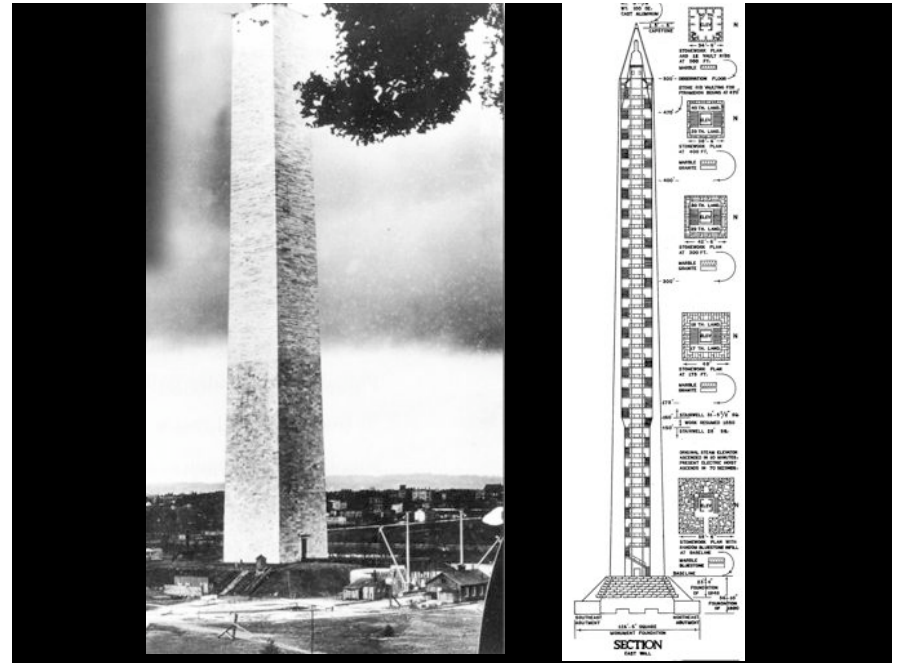
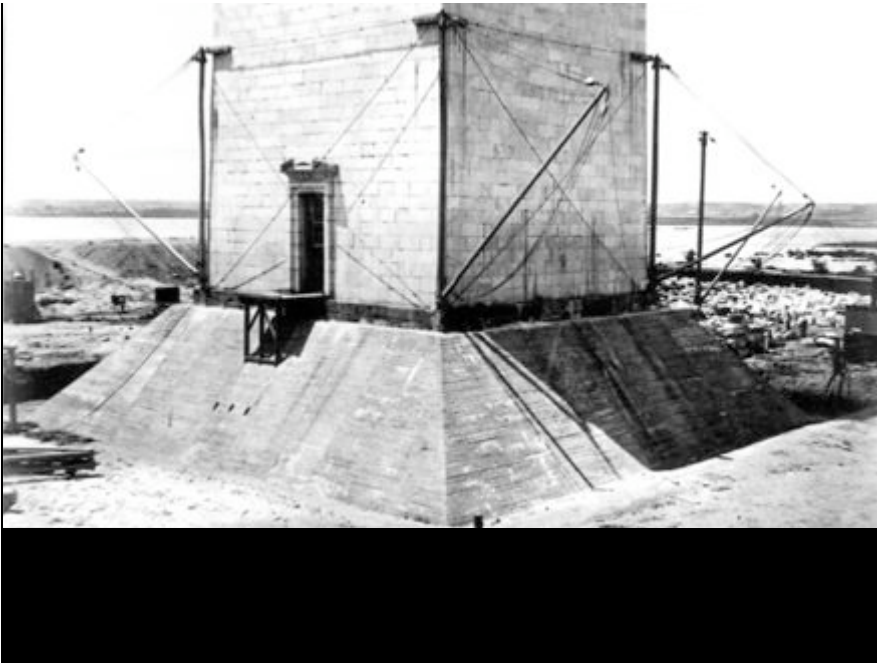


reinforced concrete (1932)

masonry (1791)









washingtonpost.com

## Here's Looking At You, America

A Washington landmark is put to work for Big Brother.

Sunday, February 15, 2004; Page B08

Tomorrow America will celebrate the life of George Washington and other American presidents. On Sunday, although few people may realize it, it also will mark the anniversary of the monument built in Washington's name, which has become one of our nation's most cherished landmarks.

A few years ago the Washington Monument underwent a multimillion-dollar renovation, which included cleaning and repairing the exterior marble; refurbishing the memorial stones lining the interior; installing a new elevator; and improving the observation deck at the 500-foot level. All this work was done with much fanfare.

Done much more quietly was the more recent addition to the monument: surveillance cameras.

Last year the U.S. Park Police installed video cameras in four of the monument's eight windows to keep watch on the people on the Mall below -- a purpose never envisioned by the monument's designers and builders.

[http://farm1.static.flickr.com/2267/2913488653\\_234621650\\_aj.jpg?v=1](http://farm1.static.flickr.com/2267/2913488653_234621650_aj.jpg?v=1)

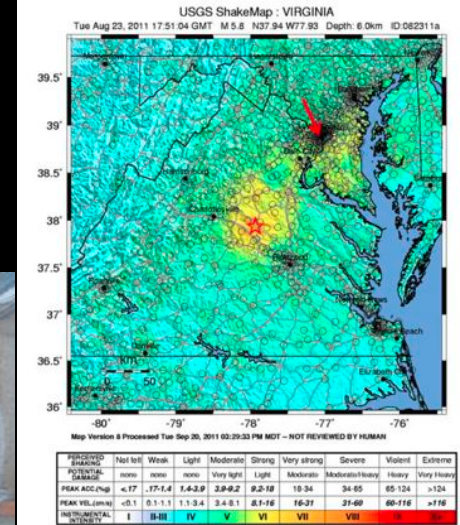


Figure 7. USGS Shake Map of August 23, 2011 for the Mineral, Virginia earthquake. Arrow shows WAMO site.

Washington Monument Post-Earthquake Assessment, Tipping-Mar, WJE

## Washington Monument

Scientific: Efficient form of a masonry column, tallest masonry structure to date (challenged by lateral loads if high)

Social: An enclosed trip in which you look out over the city (4/8 windows lost to security cameras)

Symbolic: An elegant example of a pure form which makes a grand landmark for the city with a unique view of formal Washington

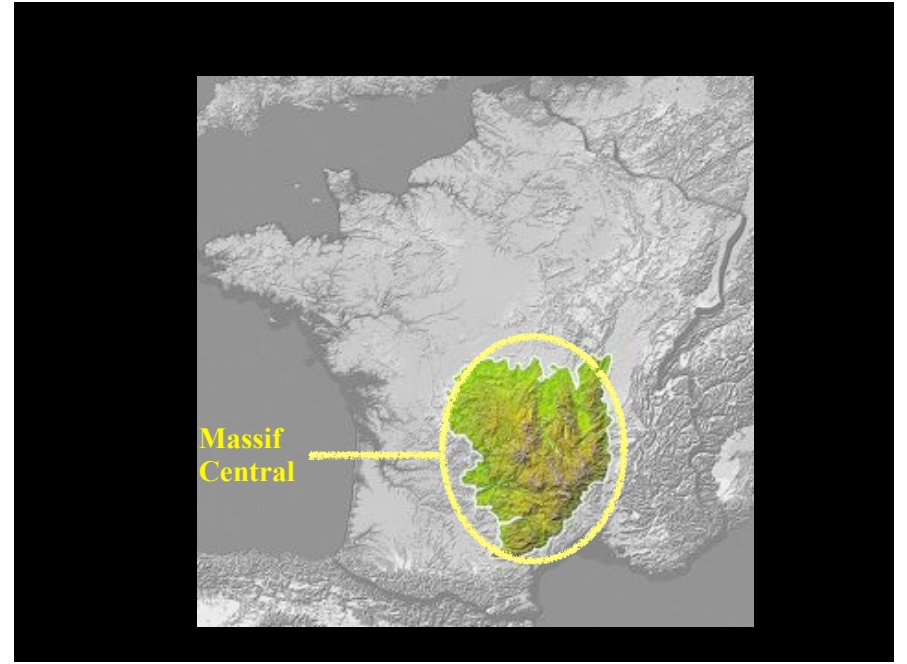
## Washington Monument

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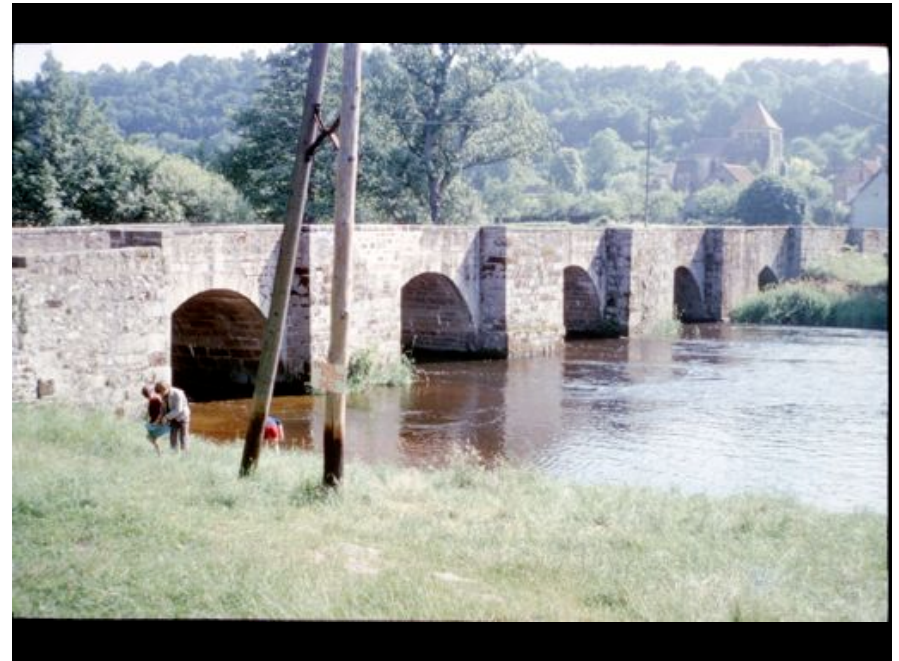
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Symbolic: An elegant example of a pure form which makes a grand landmark for the city with a unique view of formal Washington

**Q**: What would we need to know to take these further? What other items should be added to this breakdown?







Busseau viaduct



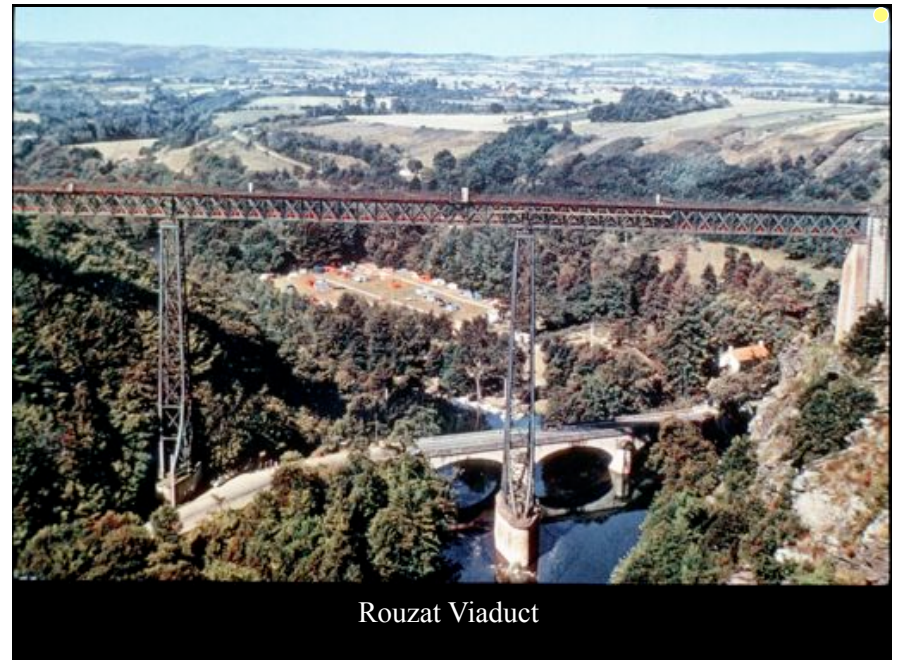








Busseau "towers"  
*Perspectives*  
scientific, social and symbolic  
*scientific*: light with new material; taper to resist wind  
*social*: efficient transportation in remote area  
*symbolic*: early expression of lightness in metal

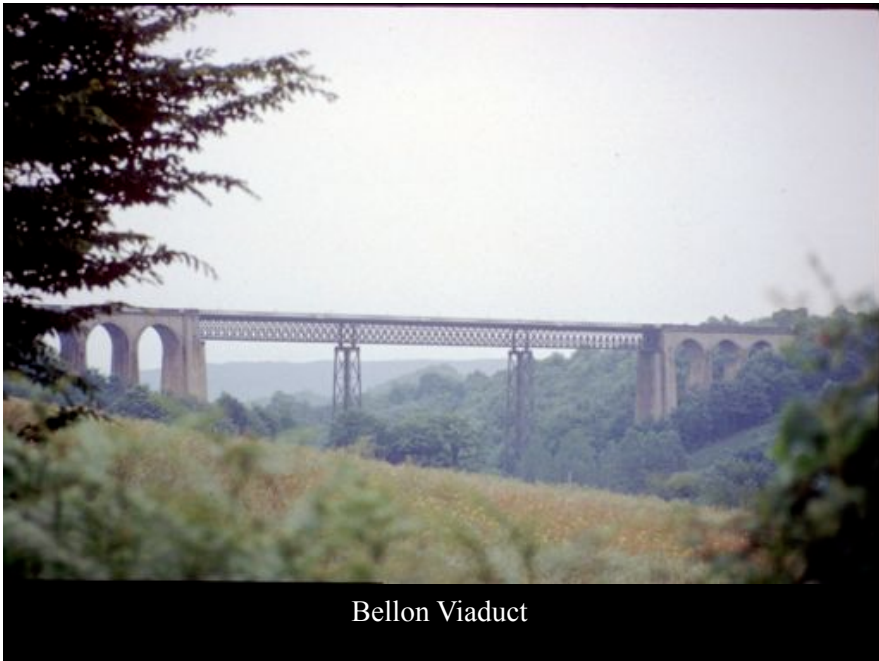
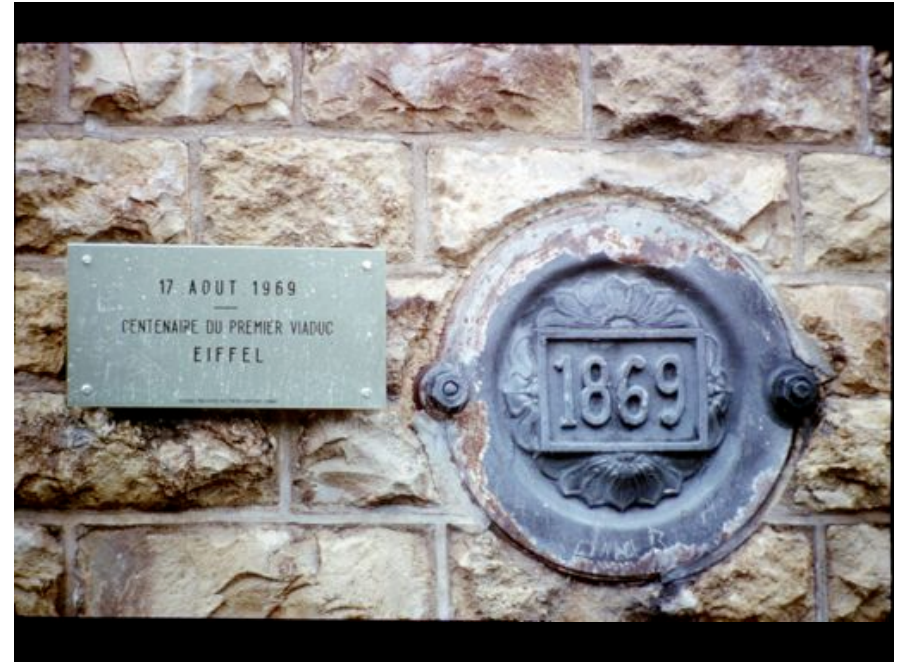


Rouzat Viaduct





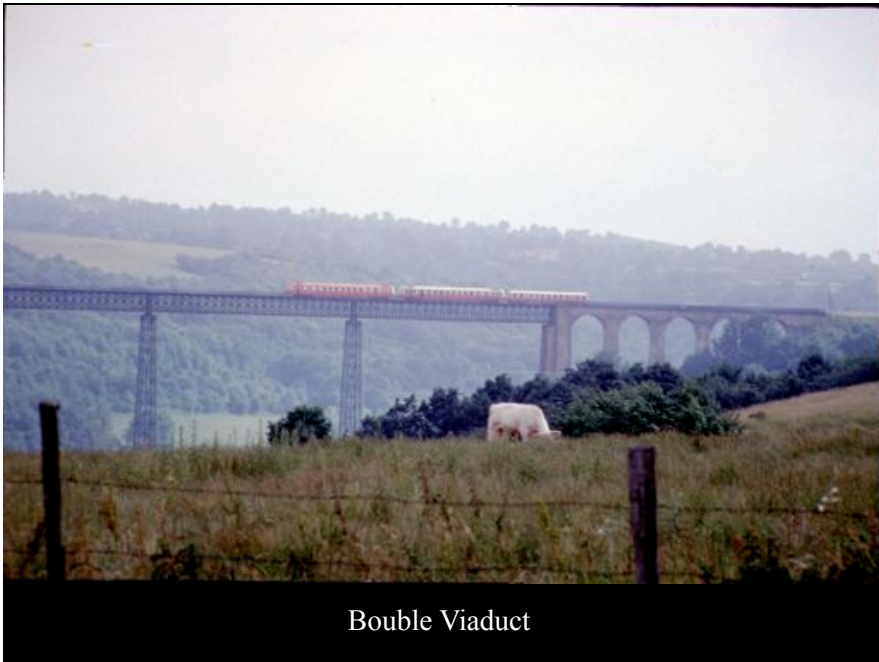
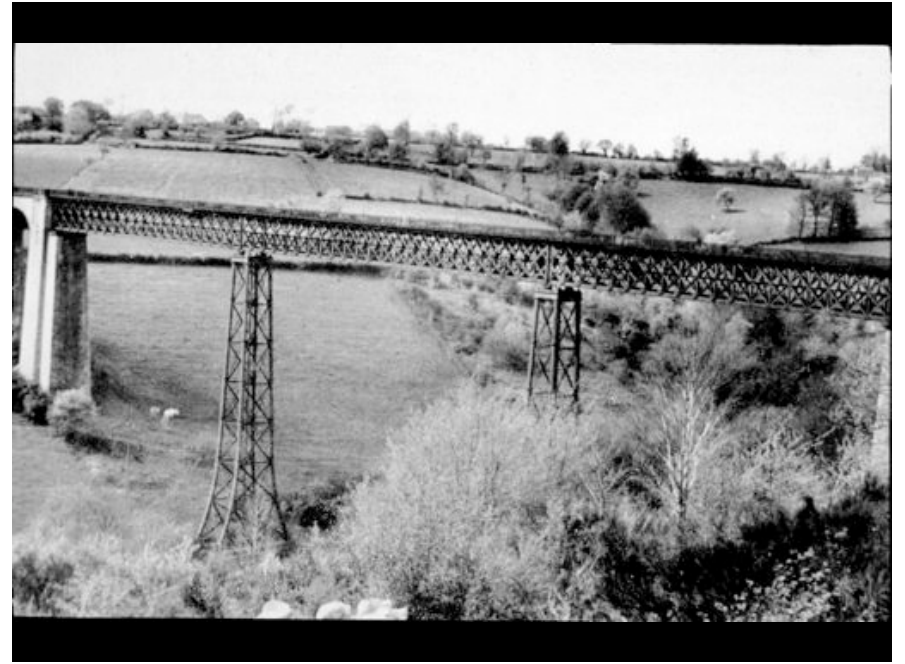




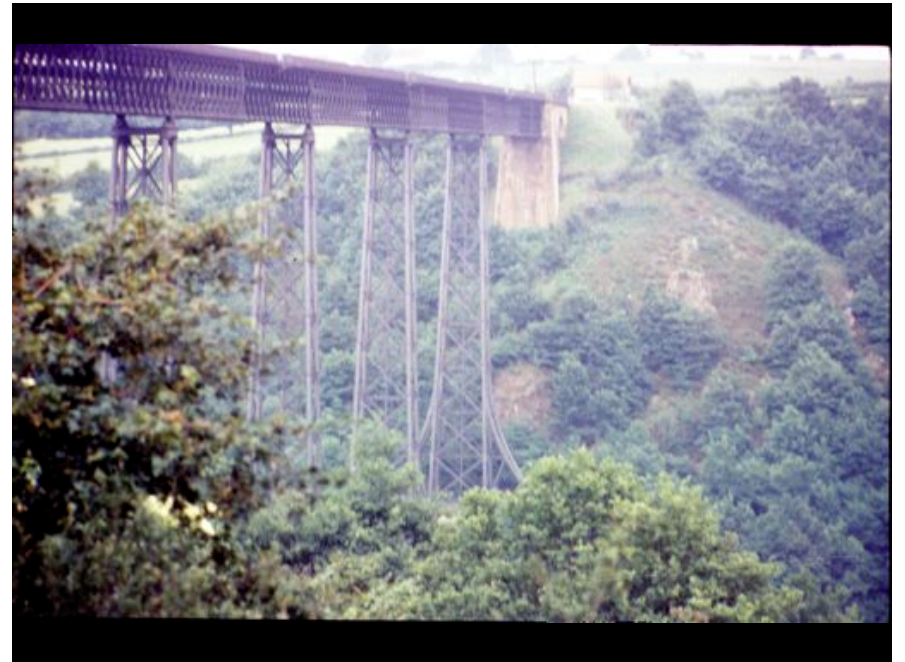
Bellon Viaduct







Boule Viaduct











Busseau (1864)



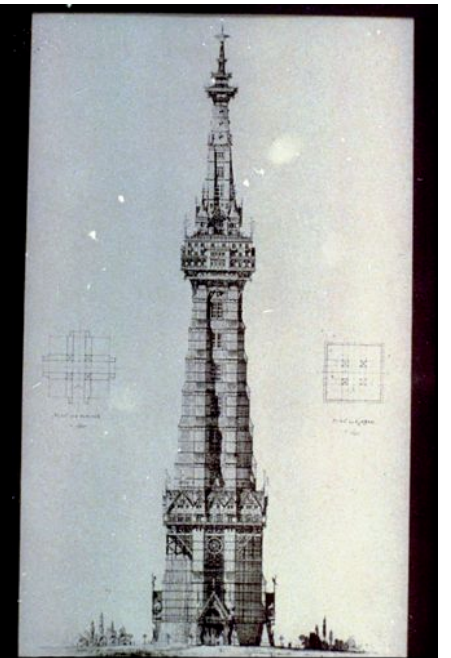
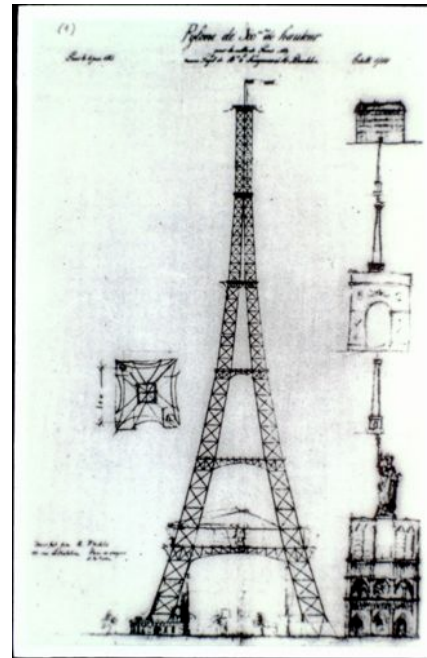
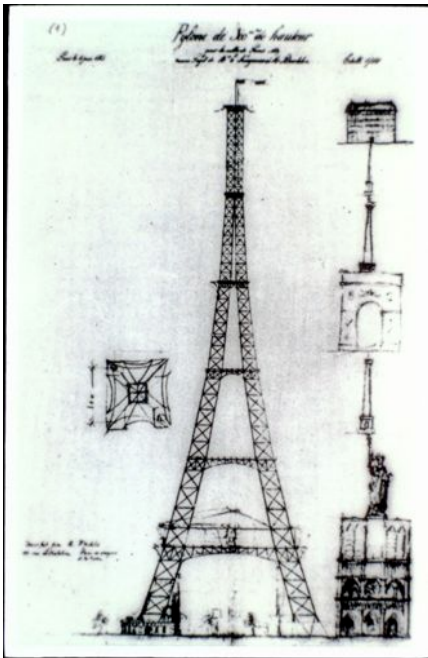
Bellon (1869)



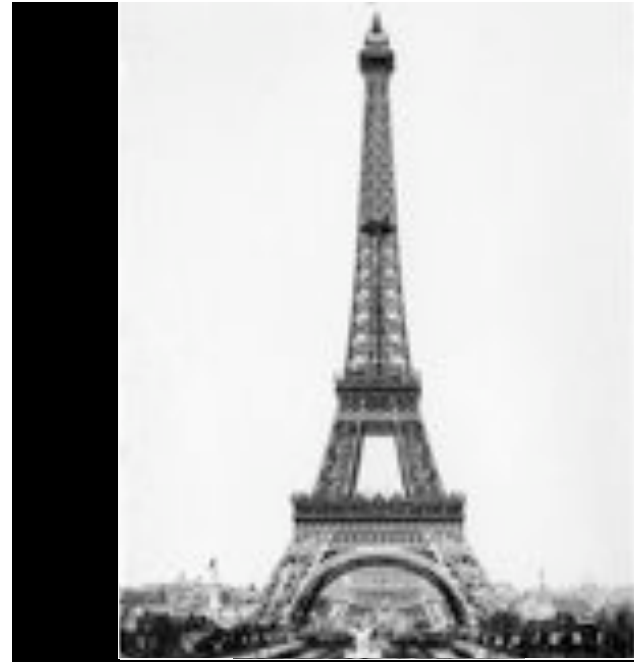
Rouzat (1869)



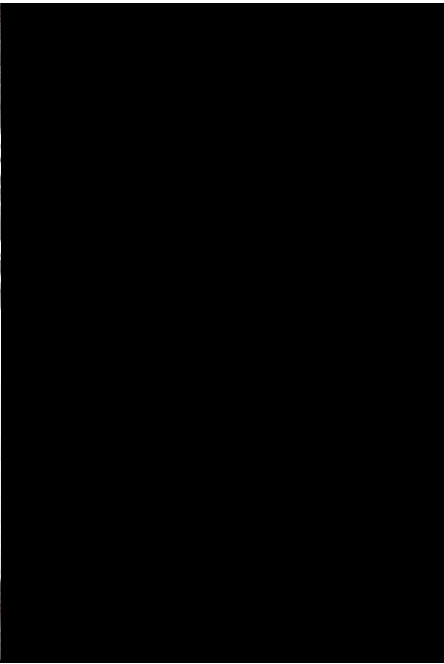
Bouble (1873)







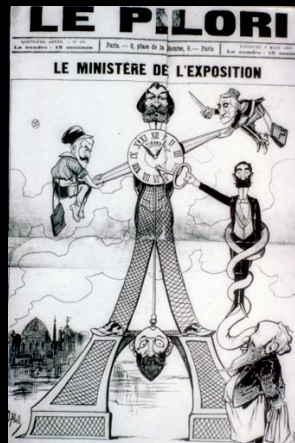
May 1888  
July 1888  
September 1888  
May 1889



Completed  
1889

## Nineteenth Century World's Fair Attendance

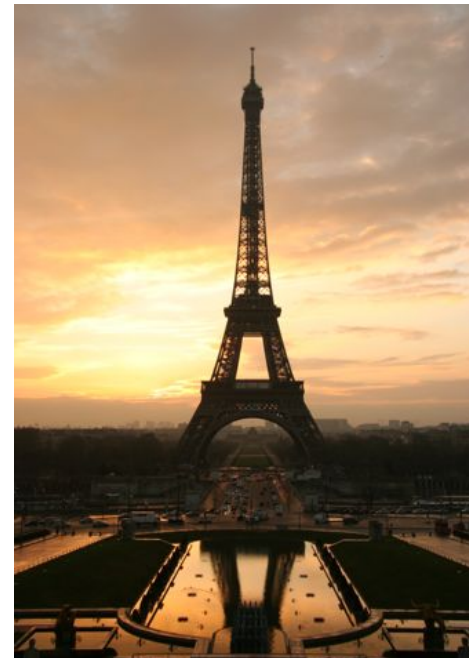
Londres	1851	6 000 000	environ
Paris	1855	5 160 000	
Paris	1867	11 000 000	environ
Vienne	1873	7 255 000	
Philadelphie	1876	10 165 000	
Paris	1878	16 100 000	
Paris	1889	25 750 744	<sup>1</sup>



Construction had hardly begun when there appeared in the pages of *Le Temps*, in the issue of 14 February 1887, the famous "Artists' protest against Mr Eiffel's Tower". Amongst the forty or so signatories were a number of leading names, including Charles Gounod, Guy de Maupassant, Alexandre Dumas the Younger and others less favoured by posterity. These defenders of the "beauty of Paris, until now intact", wished to protest "in the ignored name of French taste, in the threatened name of French art and history, against the erection in the very heart of our capital of the useless and monstrous Eiffel Tower, which popular ill-feeling, so often an arbiter of good sense and justice, has already christened the Tower of Babel. Is the City of Paris any longer to associate itself with the outlandish, mercenary fancies of a constructor of works of engineering, thereby making itself irreparably ugly and bringing dishonour? Because the Eiffel Tower, unwanted even by commercial America, is, no doubt about it, the dishonour of Paris." The protestors concluded by denouncing this "ridiculously vertiginous tower, dominating Paris like an enormous black smokestack" and casting "the odious shadow of its odious column of bolted metal like an ink stain" across the whole city.

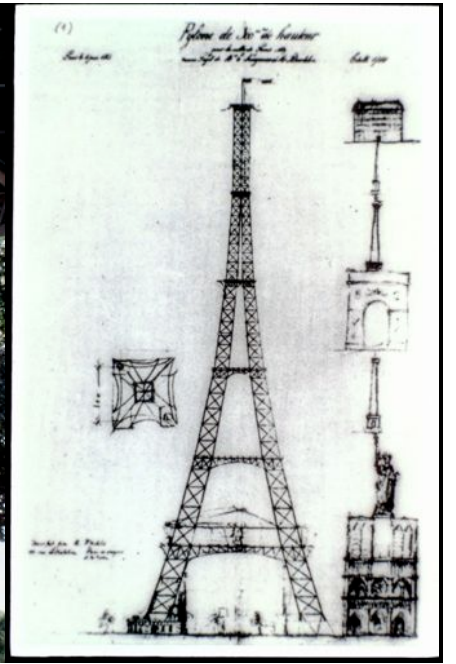
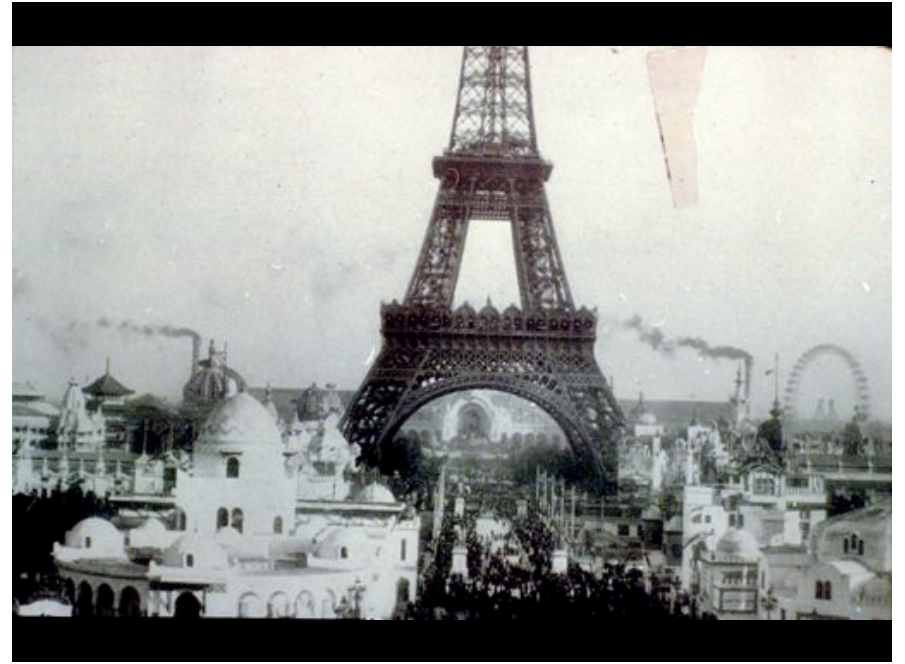
Other pamphleteers carried the violent diatribe even further, hurling insults like "this truly tragic street lamp" (Leon Bloy) "this belfry skeleton" (Paul Verlaine), "this mast of iron gymnasium apparatus, incomplete, confused and deformed" (Coppee), "this high and skinny pyramid of iron ladders, this giant ungainly skeleton" (Maupassant again), "this hideous pylon of iron bars, this funnel-shaped grill" (Joris-Karl Huysmans).

source: Bertrand Lemoine



Wash. Mon.	Eiffel Tower
Column	Cantilever
81000 tons	9100 tons
555 feet	960 feet













## Eiffel Tower

Scientific: Efficient form of an iron cantilever

Social: An enormously popular trip upwards in a park

Symbolic: An elegant example of a pure form which engages both from near and far



## Day 1 warm-up exercise

- Who are we?
- Pair off (2 people)
- Introduce yourself to your neighbor and record your neighbor's name, class year, major, and any structure that piques their interest.
- Be prepared to introduce your new colleague to the whole class.

[www.ce.jhu.edu/perspectives](http://www.ce.jhu.edu/perspectives)

BB site for grades... (JHU)

Moodle site for grades/journals (UMass)