Legacy and heritage: who's our Hippocrates?

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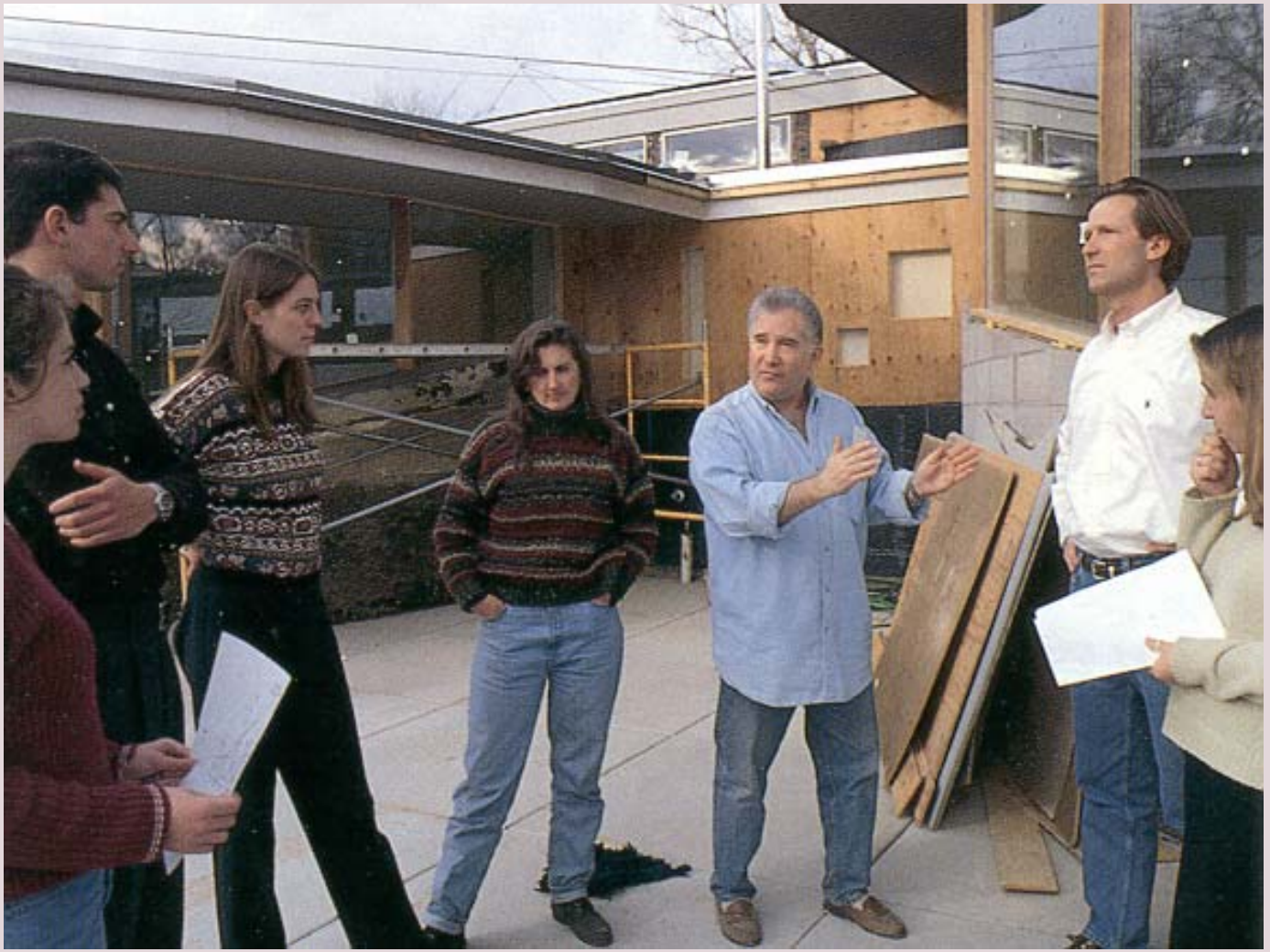
Congratulations Susan and Shayne

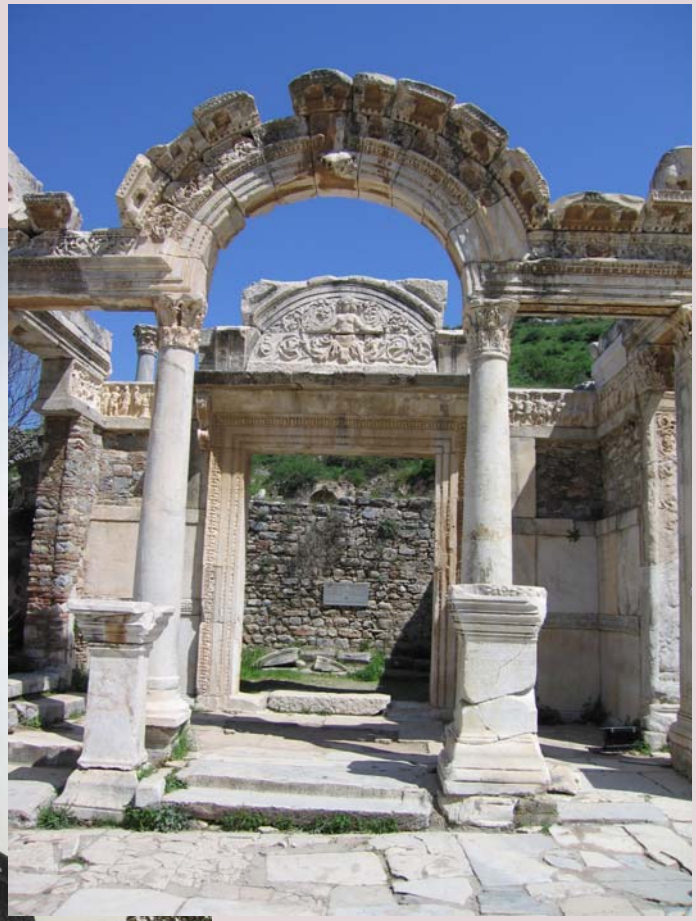
Legacy and heritage:
who's our Hippocrates?

Legacy

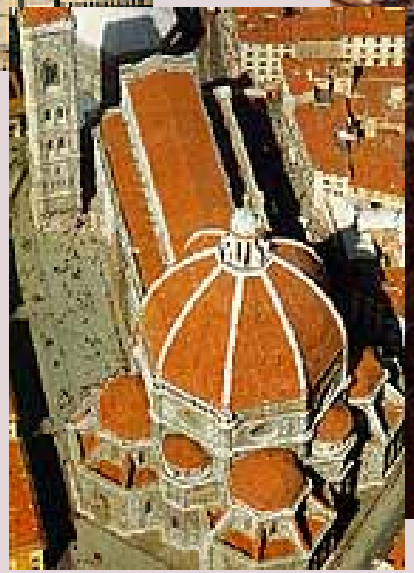
Another Legacy



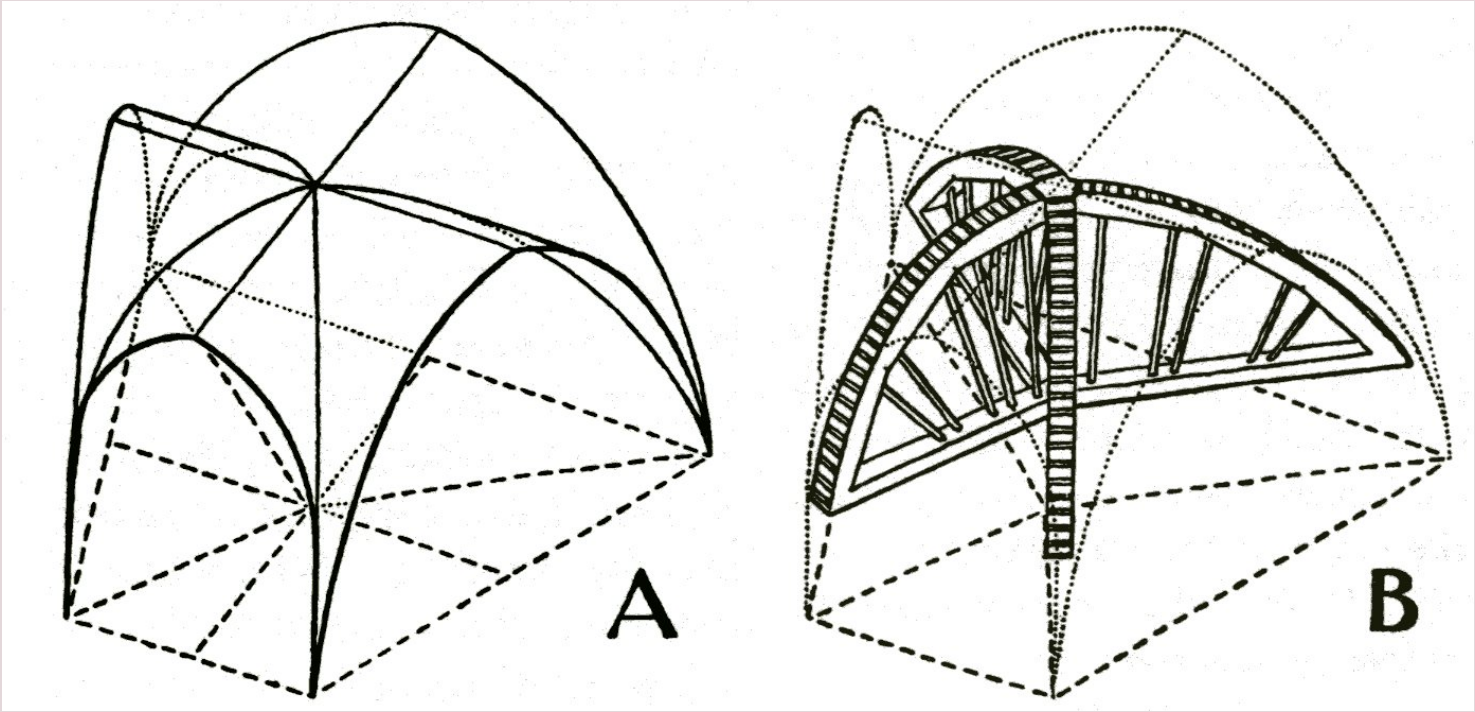
And our heritage



Brunelleschi's Dome



Centering for vaults and domes



Brunelleschi's innovations

- **Design**
- **Equipment**
- **Productivity Mgmt**

Work site canteen – Empire State Building

Learning from the past

- What other innovations lie buried in the historical record?
- How often have the actions of past master builders, designers, and constructors anticipated our current construction practices?
- What should universities be telling architecture and engineering students about their intellectual and professional heritage?
  - Can the understanding of our construction heritage encourage appreciation of modern construction practices?
  - Can the understanding of our construction heritage promote new innovations?

"Who knows only his own generation remains always a child" (1917)

George Norlin

President – University of Colorado

It's a big world with a long history

REGIONS

- EUROPE
- ASIA
- MIDDLE EAST
- AMERICAS

TIME PERIODS

- ANCIENT
- MEDIEVAL
- RENASSIANCE
- INDUSTRIAL
- MODERN

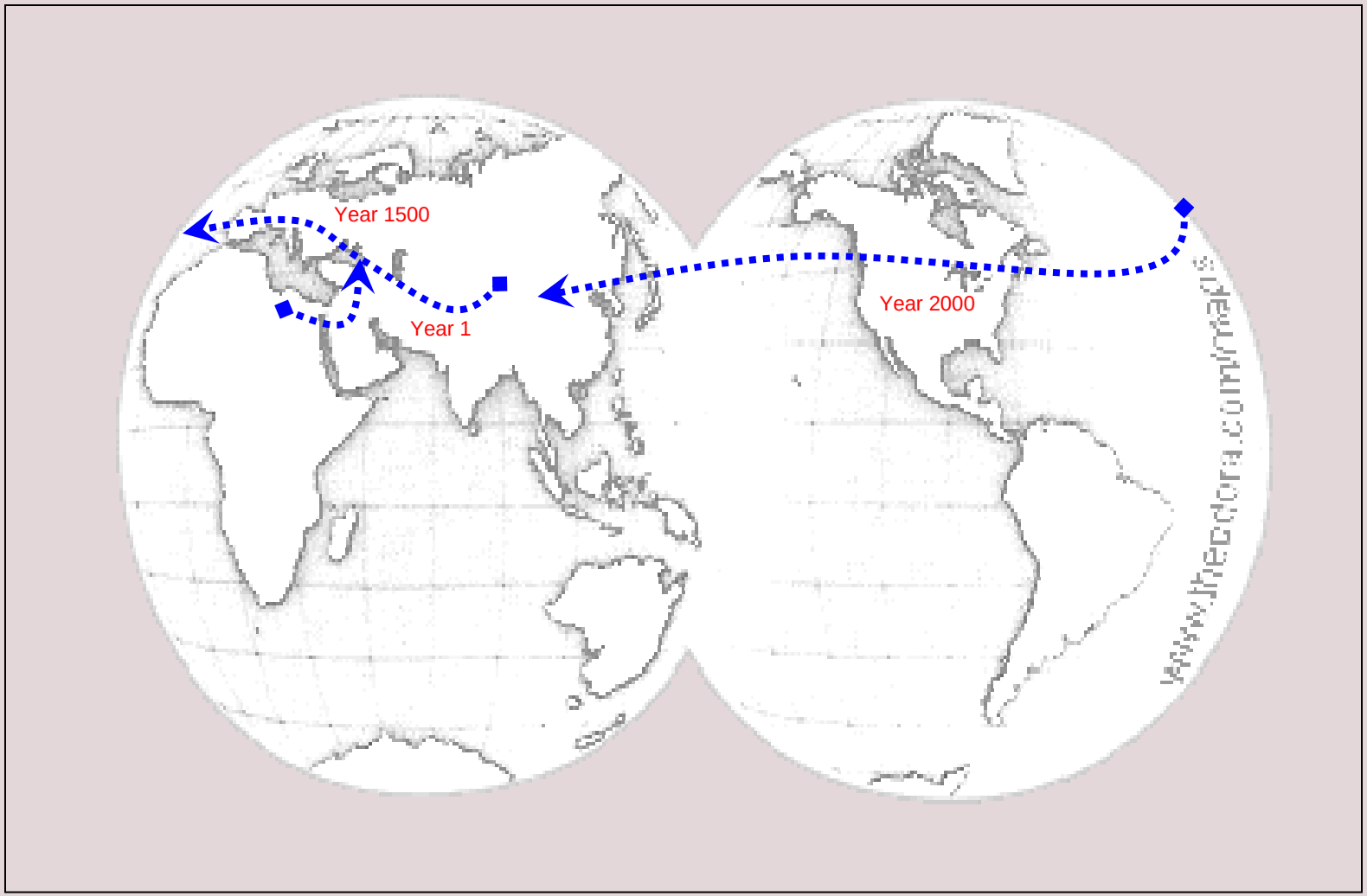
PROJECTS

- CIVIL/ MILITARY
- RELIGIOUS
- BUILDINGS/ MONUMENTS

So many projects – so little time

Region	Project Type	Time Periods				
		Ancient	**Medieval**	**Renaissance**	**Industrial**	**Modern**
Europe	**Civil/Military Works**	Roman Aqueduct, Italy		Ponte Vecchio, Italy	Tower Bridge, U.K.	Chunnel, U.K. – France
					Forth Rail Bridge, U.K.	StorBælt Bridge, Denmark
	Religious	Pantheon, Italy	Chartres Cathedral, France	Santa Maria del Fiore, Italy	St. Paul's, U.K.	
		Parthenon/ Acropolis, Greece	Salisbury Cathedral, U.K.	St. Peter's, Italy	St. Mark's Basilica, Italy	
	Building and Monuments	Stonehenge, U.K.		Versailles, France	Eiffel Tower, France	La Defense, France
		Coliseum, Italy		Alhambra, Spain	Hermitage/ Winter Palace, Russia	Pompidou Center, France

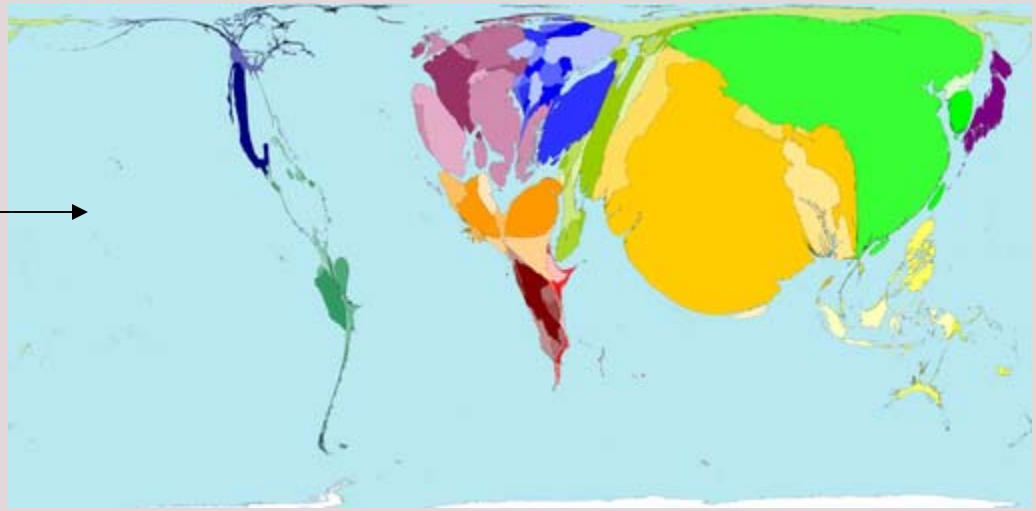
Historical construction activity

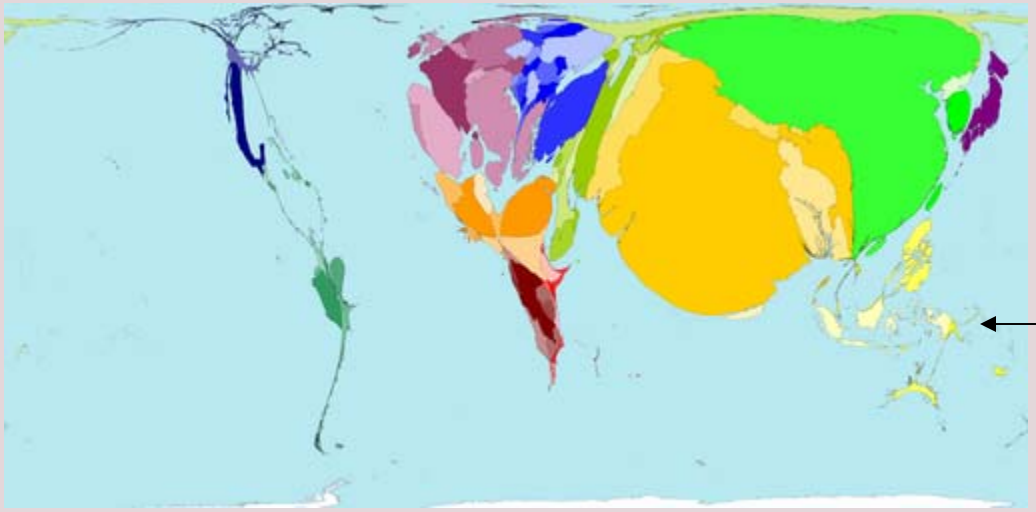


From thedora.com

World population & wealth year 1 C.E.

Population



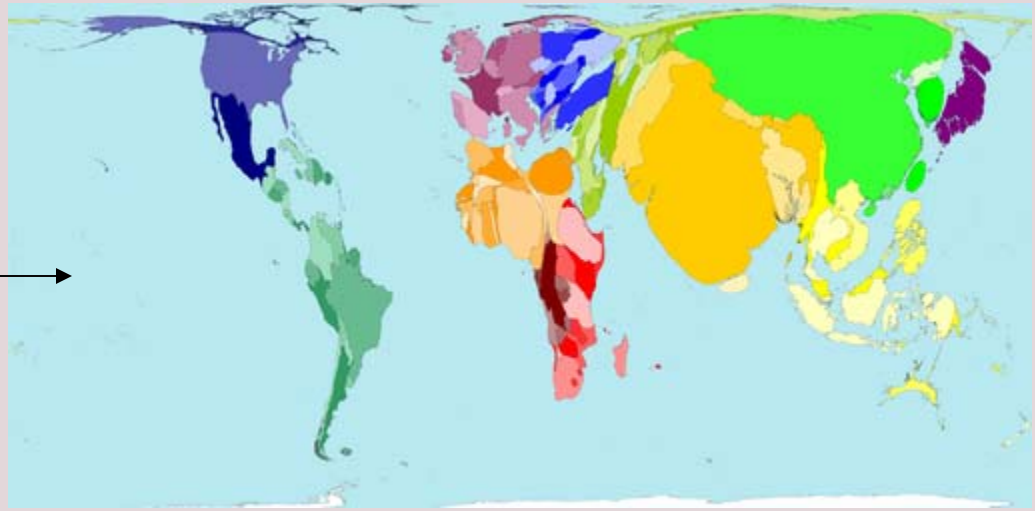


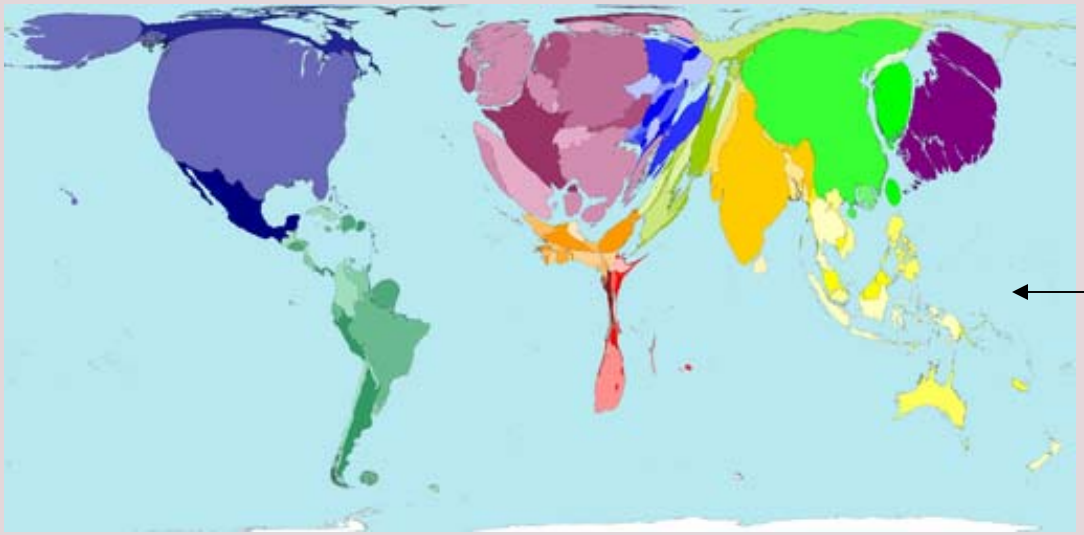
Wealth.

From Worldmapper.org

World population & wealth year 2000 C.E.

Population





Wealth.

From Worldmapper.org

Role of prevailing culture: What was the relationship between the building culture and society?

What were the major institutions of the day?

- Kings, princes, and bishops
- Master builders and guilds
- Developers, public agencies, and regulators
- Designers, contractors, and unions

What were the major human roles in the building culture?

- Designers
- Builders
- Trades/Crafts
- Material Suppliers
- Financiers

What was the building operation itself like?

Some specifics about:

- Project Organizations
- Workers
- Labor Organization
- Designs
- Designers
- Innovation

Project organizations

- Pyramids — 2000 B.C.E
- Coliseum — 1st Century
- Notre Dame — 12th Century
- St. Paul's — 17th Century
- Suez Canal — 19th Century

- Chief Architect
- Separate prime contractors
- Owner's Reps
- Specialty Contractors
- International Joint Venture

Construction labor –

- 2000 B.C.E.
- 12th Century
- 13th Century
- Worker's Camps
- Women in the workforce
- Traveling Workers (Boomers)

Labor organizations
Work rules

- France 12th Century
- Europe 12th Century
- France 13th Century
- England 14th Century

- 1st Artisan Guilds
- Guilds set work rules but not wage
- 14 hour work day summer and 12 hours winter
- One hour lunch and 15 minute afternoon break

Labor organizations

wages

- Guildsmen wages determined by skill AND bargaining power
- Both hourly pay and piecework were common
- Guilds were tightly closed
- Master mason paid 6x normal mason

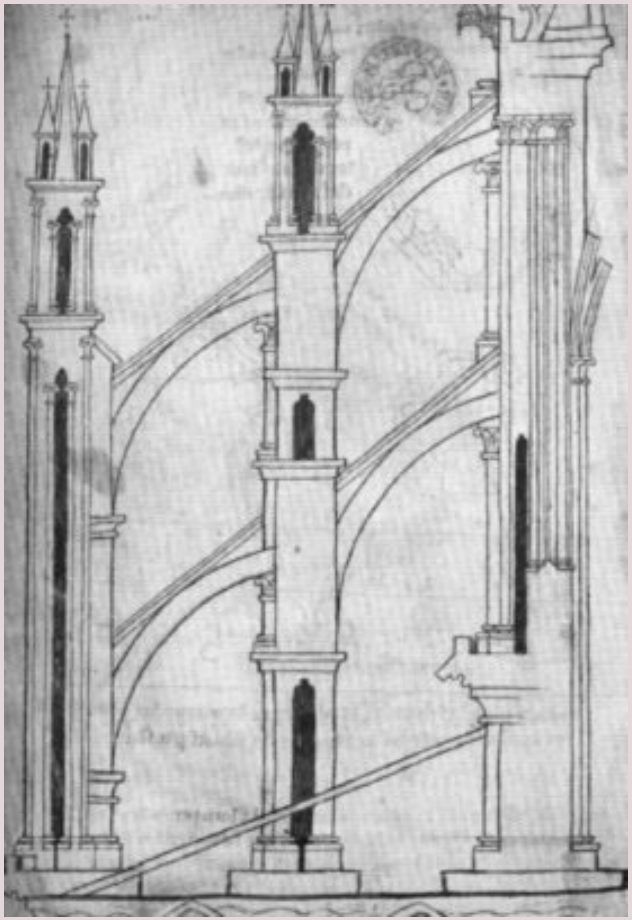
Labor organizations
Guilds abolished by decree

- France 1791
- Rome 1807
- England 1837
- Spain 1840
- Austria 1860
- Germany 1860
- Italy 1864

Designers
from here to there and back again

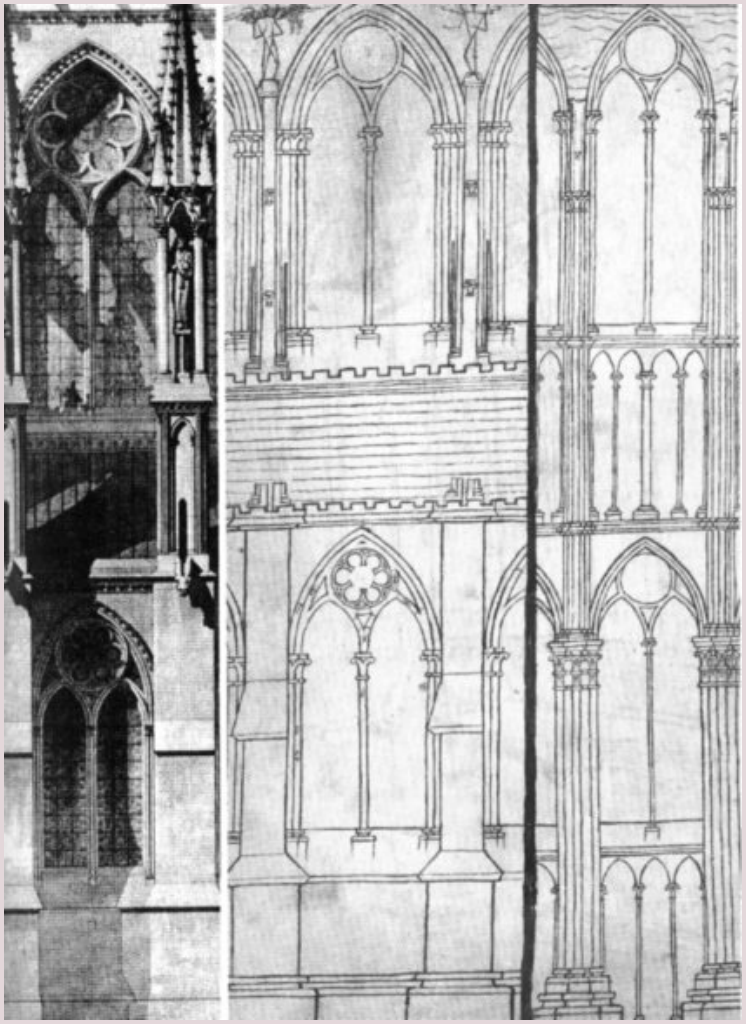
- Early Designers - Little Known
- From Master Builder to Specialization
  - And Back Again
- Codification of Experimental/Empirical Knowledge
  - Brunelleschi Conference (15th Century)
  - School of Roads and Bridges (Paris 1747)

Designs
Growing professionalism



- Design
  - separate from execution
- Recording designs
  - Drawings and models
- Size and complexity

Designs – drawings & models



Process innovation
the more things change…

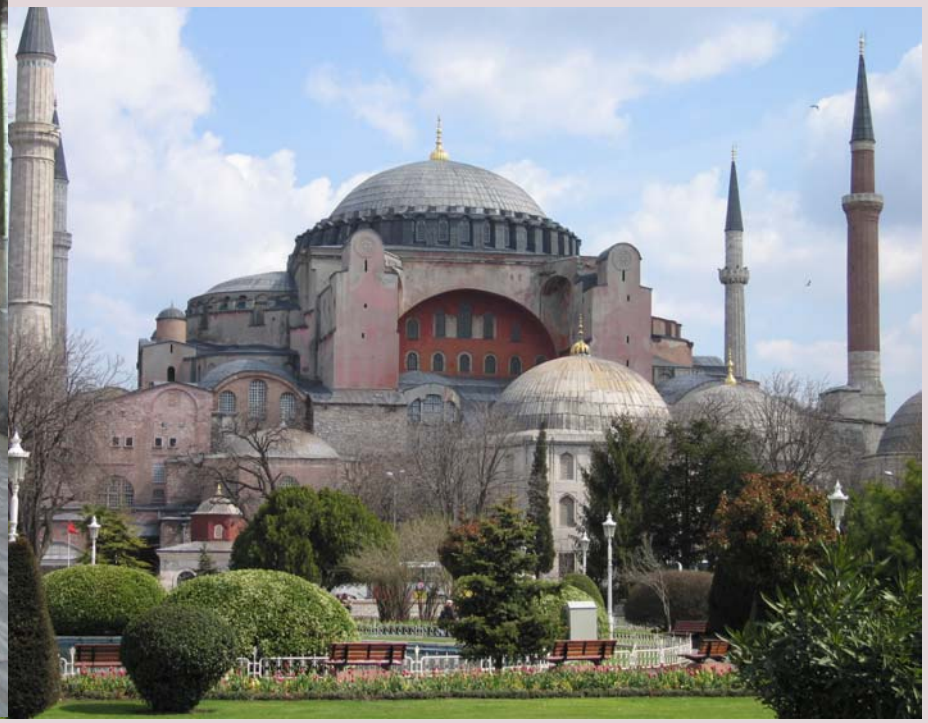
- England 15th Century
- France 16th Century
- Italy 16th Century
- England 17th Century

- Payment bonds and liquidated damages
- Toll roads/PPP
- Expert witnesses/ Peer design reviews
- Lump sum, unit price and T&M contracts

Technical innovation
Du Jiang Yan Irrigation Project

Project innovation
Rock gabion

Hagia Sophia



Project innovation
Building instrumentation

What have we learned?

- What other innovations lie buried in the historical record?

Many, Many, Many

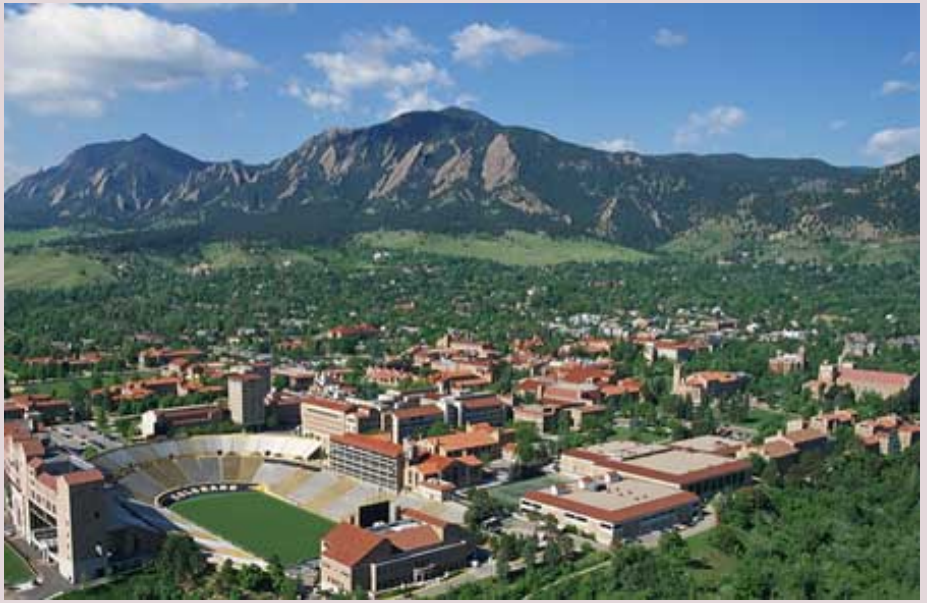
What have we learned?

- How often have the actions of past master builders, designers, and constructors anticipated our current construction practices?

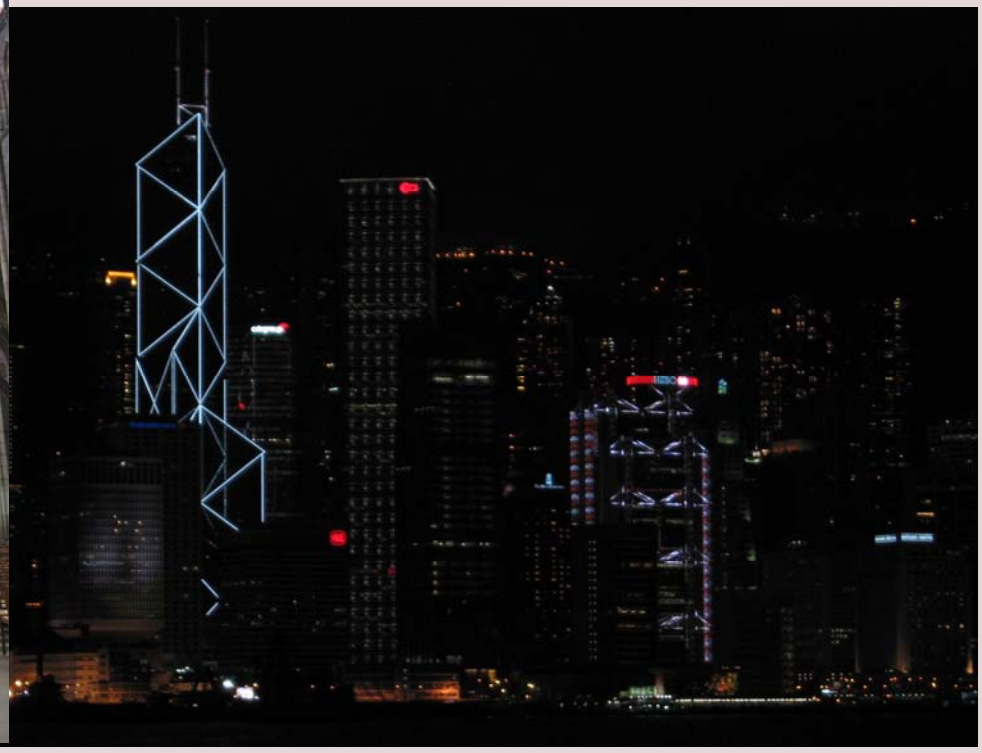
Often, Often, Often, Usually?

What should we tell our students (and ourselves) about our heritage?

- On one hand – it seems there is nothing new under the sun, it's all been done before!
  - A dispiriting message to be sure
- On the other hand…



Old or new



Near or far

From ASCE.org

Remarkable beauty

Remarkable accomplishments

Remarkable projects and remarkable builders are both our heritage and legacy