

## Lecture #8: The Flow of the River: Urban-Industrial Revolutions

### Suggested Readings:

Louis Hunter, *Water Power* (1979); *Steam Power* (1985); David Soll, *Empire of Water* (2013)  
Theodore Steinberg, *Nature Incorporated: Industrialization and Waters of New England* (1989)  
Charles Rosenberg, *The Cholera Years* (1962); Martin Melosi, *The Sanitary City* (1999)  
Ari Kelman, *A River and Its City: The Nature of Landscape in New Orleans* (2003)  
Craig Colten, *An Unnatural Metropolis: Wrestling New Orleans from Nature* (2004)

### Outline:

#### I. Bringing the World to the City's Door: Harbors, Rivers, Canals

note role of cities like Fort Orange (Albany) & New Amsterdam (NYC) in colonial fur trade  
cities as focus of emerging market relationships that were proliferating across landscape  
all major colonial cities (Boston, NYC, Philadelphia, Baltimore, Charleston) oriented toward ocean:  
Atlantic ports as *raison d'être*; Boston early dominant, then Philadelphia, finally NYC emerges  
as economic metropolis of continent  
many reasons, but geography very important: location at end of Hudson-Mohawk corridor as  
easiest access across Appalachians to potential markets in interior (note probs of  
geographical determinism: how much of this is geography, how much historical market?)  
transport innovations extend rural-urban linkages: Robert Fulton's Clermont steamboat in 1807,  
1817-25 construction of Erie Canal consolidated NY's hegemony

#### II. The Power of Falling Water

falling water the source of energy for nation's first industrial revolution: solar energy  
sawmills and gristmills among earliest businesses in frontier areas: market centers  
millwrights among most skillful mechanics and inventors, pointing way toward technological  
innovations in use of natural resources: cf Oliver Evans' "Improved Mill," with inventions to use  
single drive train in grinding, sifting, lifting, sacking flour  
by early 19th c, investors looking for more capital/energy-intensive forms of production  
Francis Cabot Lowell's Boston Mfg Co. at Waltham, 1813: Waltham System as cotton cloth  
manufacture organized and managed by single corporation, powered by water  
more extensive still: Patrick Tracy Jackson's associates at Lowell, MA, using power from  
Pawtucket Falls of Merrimac River, Middlesex Canal delivers power to factories  
integral linkage of town, residences, factories, with proliferating canal network  
at very moment that town and country are thus being tied ever more closely together, emergence  
of town as social and iconic space separate from country: paradox of early pastoral images of  
Lowell standing in contrast to regimentation of factory architecture, boarding house life, time-  
clock discipline.  
New England factories predicated on labor force migrating from country to city (farm girls, Irish  
immigrants): Winslow Homer's "Morning Bell"  
note technological & environmental problems of water power: need to run all machines from limited  
number of drive shafts, proliferation of belts, unsafe working conditions  
also: note flood danger is omnipresent, as at river transportation towns

#### III. Steam and Fuel

in face of emerging competition from steam, water power factories gradually abandoned  
steam engine evolution: from Thomas Newcomen's single cylinder in 1705 to James Watt's  
condenser in 1765, increasing efficiency, higher pressures: more flexible power source  
early fuel often wood, esp. for steamboats, but coal industry emerged quickly where trees scarce;  
anthracite industry in Pennsylvania fuels eastern factories & towns  
steam power meant factories no longer geographically limited to sites with significant heads of  
water; coal and water could be moved to any factory site with adequate transportation (railroad  
would liberate system from spatial limits still further)  
long-term effect: factories freer to concentrate in urban centers

#### IV. Fire

note city's other relationships to water: drinking, bathing, manufacturing, fire-fighting  
wooden cities of 19th century North America seriously threatened by fire: NY fire of 1776 burned  
down 1/4 town, 1835 fire consumed 500-700 stores, \$20-40 million damages  
increased pressure for more powerful water supply systems: Philadelphia's Fairmount Works,  
1822, NYC's Croton Aqueduct, done 1842. steam & water power deliver greater volumes  
great urban fires (NYC 1835, Chicago 1871, San Francisco earthquake 1906) all prompted greater  
concern re municipal water supplies (Hetch Hetchy conflict would link to this)  
improved supply meant healthier water, but only to those who could afford; pumps persist

#### IV. Death Too Comes over the Water

water-borne diseases another link in chain connecting city back to natural world

cholera reaches Europe for first time 1831, arrives Montreal June 7, 1832, NYC June 26

symptoms: intestinal convulsions, diarrhea, vomiting, death from dehydration (modern discovery: simple treatment with salty water means most can survive!)

theory of disease shaped treatment, as Rosenberg's *Cholera Years* shows: notions that bad air or bad morals caused disease didn't necessarily lead to appropriate prophylactic measures.

chief early responses: quarantine, closing of immigration, flight

with emergence of germ theory, effective response possible, ending chain of infection

Note that defenses against disease began to emerge from several different directions

1798, Edward Jenner publishes news that lymph from cowpox postulates vaccinates for smallpox  
vaccination manipulated internal environment against disease; other diseases, like cholera, most effectively combatted by manipulating external environment

cf yellow fever: mosquito vector (*Aedes aegypti*), disease endemic in tropics, repeatedly epidemic in more northern areas; introduced from Africa via Caribbean, repeatedly epidemic in southern cities, especially as non-immune population immigrated

standard defenses--quarantine, fires, etc.--ineffective because vector not understood

1895 Ronald Ross finds malaria protozoan in mosquito gut (anopheles); after Spanish-American War, US troops occupying Cuba dying from yellow fever, Army commission headed by Walter Reed confirms mosquito vector, controls by eliminating mosquito habitats

New Orleans, 1905: epidemic fought by sulphur fumigation, drainage >> last epidemic in US

SUM: note linkages in all this to water and cities: transport; power via falls; power via steam; water supply for drinking, cleaning, manufacture; water as vector for disease, water as habitat of insect disease vectors. Managing water key to emerging landscape.

urban environments of nineteenth century a story of proliferating *connections*: between market centers, between city and country, between falling water and industrial markets, between coal fields and steam engines, between thirsty masses and rural water, between diseases and people, between markets of supply and demand