Transitional States: Hydraulic History and Architectural Activism

Disaster, suspense, and material loss are often the first results of taking a decided step, either by nations or by individuals.¹

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The question is posed, "there is too much water and also too little, what can we do?" This is the contemporary conundrum. Water is rising, and weather events challenge every boundary between land and sea. Simultaneously seasonal drought parches Silicon Valley, unsubtly mocking technological fixes. Clean water remains a luxury in many of the world's most populous cities, and ancient water-related diseases such as cholera and yellow fever still stalk the globe. Urban rivers offer the potential of remediation and recreation, but also threaten floods and illness. We define water as a resource and a crisis, and hope that we can preserve it and be defended against it. But what can architecture do?

In the face of pressing problems, we naturally turn to the most advanced technology and theory, but what about advanced infrastructural history? Does the past have anything to teach us, particularly about the role of design in crafting water management solutions which thoughtfully incorporate both public health and urban life? Can an active understanding of hydraulic history arm architecture students for careers which will evolve in dialog with pressing issues around urban water, public health, and civic space? Perhaps through the investigation and evaluation of historical design responses to past water crises, students and practitioners can gain the inspiration for designs which are both poetic and political.

A brief assessment of two counter-posed periods in hydraulic history brings into question our contemporary theories of urban water and public health. The first period of large scale hydraulic modernization took place in most American and European cities by the latter half of the nineteenth century, when comprehensive plans were put in effect to remediate water-borne disease through the construction of waterworks, sewers, and parks. Sanitation was the watchword, and civilian and professional corps were organized to restructure and to monitor urban infrastructure and public health. This time period can be posed against our contemporary moment of flexible and green infrastructures, attempts to remediate the nineteenth-century's heavy-handed solutions to urban water management. By paying careful attention to the opportunities and failures of these two moments of hydraulic threat and hopeful remediation, I hope that designers, educators, and students may enter our new era of watery challenges with sufficient insight and boldness to imagine ways of working with water that surpass sustainability. As water has destabilized urban life in the past, each moment of chaos has allowed a transition in thought and the invention of new approaches to infrastructure, public space, and civic life.

TRANSITIONAL STATES

Illness, water, and cities have been closely connected for thousands of years, and have traditionally been the domain of architects. In Book X of *De Re Aedificatoria* (1452), Leone Batista Alberti relates a story from Servius,² regarding a town stricken by plague, which sought advice from Apollo, who commanded them to completely dry up a nearby marsh. Alberti gives great attention to the position of water and marshes in relation to cities and buildings, "for when the Ground is neither well covered with Water, nor perfectly dry, but lies like a Marsh or Bog, it must for several Reasons emit noxious and unwholesome Vapours."³ In this statement, we see some grain of truth even by the standards of modern medicine. Swamps do emit vapors, but more importantly for many of the diseases that still plague urban settlement, such as yellow fever, West Nile virus, or malaria, these liminal watery earthy zones breed mosquitoes. Contaminated waters, if ingested, can also bring typhoid, cholera, and other bacterial plagues. We may also read Alberti's worries about half wet, half dry land as demonstrating what anthropologist Mary Douglas called the danger of "transitional states."⁴

In-between states, whether confusion regarding new information, or the marshes that buffer earth from ocean, may be seen as fertile ground. In her influential work *Purity and Danger*, Mary Douglas examines tribal ritual, modern customs, and Biblical texts for clues to the meanings of pollution and purity. She concludes that inarticulateness, marginal states, ambiguity, and disorder are powerful, in part because they are outside of and potentially destructive to, rational patterns, but also because they contain the raw potential out of which new patterns, or rules of behavior, might form.⁵ Similarly, moments of crisis and chaos are always times in which great opportunities arise for new understandings and new solutions. The way that urban waters have been regarded has changed over time, particularly during the growth of the modern city. What was once dangerous is now desirable. Architects can be educated to accept the current hydraulic chaos as a new type of imbalance, but also to find in this transitional state a new path forward, one in which designers may take a more aggressive role in hydraulic design.

The ideas of imbalanced states called miasmas gave birth to very specific notions of urban form with the expansion of the modern industrial city. Faced with crowding, pollution, and disease, motion of air and water were considered the keys to sanitation during the nineteenth century. Wide straight avenues and large green parks were valued for their ability to pass clean air through the body of the city, and to cool it. The system was not based on bacteriology, but rather on traditional as well as more recent ideas concerning the salubrity of motion, balance, and equality. As Alain Corbin has pointed out, the idea of water flushed sewers was based on a British idea of "kinetics." According to Corbin, "the champions of movement and dilution stressed the egalitarian virtues of their scheme."⁶ A rising class of hygiene specialists and sanitary documentarians were inventing what we now know as public health. Villermé, Parent-Duchatelet, Chadwick, Mayhew, and legions of annalistes went high and low in London, Paris, and in America's great cities, documenting in vivid detail everything they saw—and describing the morality and health of the city in spatial terms. Adequate space, between bodies (living and dead), and between buildings became the foundations of health.⁷ Even the closeness of the "'family atmosphere'" could have dangerous effects due to its "'gaseous detritus'."8 The city was seen as a body to be treated, the home a series of cells to be dispersed to limit contagion. Ailments were laid out according to a "topography of wells, cesspits, manure piles, wash houses, and other sanitary nuisances."9

Miasmas, the dangers inherent in foul airs and bad smells, were found in ambiguous border zones outside, or underneath, the new middle class consciousness, and the city was arranged to manage this newly discovered crisis. In Paris, after the revolution and the Napoleonic wars, social order was key, and threats lingered everywhere. Haussmann's plan for Paris was a series of spatial moves meant to cleanse the civic body, to allow fresh air and sunlight to penetrate. Haussmann's impressive sewers were not connected to privies or cesspools until the early twentieth century, and yet served as rich fodder for literary nightmares about subterranean illicit admixtures. Again, this returns to Douglas's ideas about the logical equation of filth and disorder. As France, England, and America transitioned to rational industrial republics, the body of the city supplanted the body of the king as an emblem of national health. In this body, the sewers circulated underfoot, containing all that couldn't exist in the new, bright cities. Below ground, the sewer became hidden circulation for a new civic body, forcing urban wastes into what Victor Hugo called, a "close intimacy."¹⁰



SANITATION AND CULTURE

The role of the sewer, as a subterranean metaphor for urban fears, and as a literal channel for all of the effluent of the city, was significant in determining the configuration of modern urban living. The dangerous potential of the sewer exploded with the advent of the modern flush toilet and bathroom. Although the word "bath room" first appeared around 1888 in Britain, the modern bathroom, with standardized sink, tub, and toilet was a thoroughly American idea, which caught on quickly after 1920. Between 1921 and 1924 the number of bathrooms doubled in the United States. By the late 1920's, 71% of urban, and 33% of rural homes had bathrooms.¹¹ Prior to this time, there were a variety of competing versions of pans, hoppers, water closets, privies, and cesspools. By 1928, 27 % of the American population still lived without bathrooms. In many rural areas, the automobile was a higher immediate priority—as one rural woman pointed out during the 1920's, "'you can't go to town in a bath tub!'"12 Adolf Loos, impressed by American domestic and sanitary arrangements, complained that Vienna's village inns were far less clean than the New York City homeless shelters, because with the American use of water "not the slightest odor is apparent, even with the greatest crowding." His conclusion, naturally, was that, "increasing water usage is one of the most pressing tasks of culture."13

The nineteenth century was a time of deadly and poorly understood diseases, so it is natural that advances in hygiene were celebrated as landmarks of culture, and that architects incorporated sanitary fixtures that rapidly increased the water use and waste produced by every metropolis in the world. During the late 1800's the conflation of sanitation with culture

Figure 1: Buildings of the Great Central Fair, in aid of the U. S. Sanitary Commission Logan Square, Philadelphia, June 1864. / Drawn from nature & on stone by James Queen. (*Philadelphia: Printed & Lithogrd. by P. S. Duval & Son, 1864*). Courtesy of the Library Company of Philadelphia. reached its highest fruition in worldwide "sanitary expositions." Philadelphia's Sanitary Commission staged a fund raising exposition in 1864. The fair, housed in a huge glass and iron building enclosing Logan Square,¹⁴ raised \$1,000,000 for the commission.¹⁵ A sanitary exhibit at Croydon, England, in 1877 was host to pitched battles between proponents of the competing toilet designs.¹⁶ Colonel William F. Morse demonstrated the Engle Sanitary Garbage Cremator, which served as "infrastructure and exhibit," during the 1893 Columbian Exposition.¹⁷ During a lecture the same year, Morse explained that incineration would solve New York City's curbside trash problems, burning "infected bedding, clothing, furniture, and hospital waste from patients ill or dead with infectious disease, such as diphtheria, smallpox, typhus, and cholera, with no chance for the escape of the germs of the disease or any fumes of nuisance or smoke."¹⁸ In Paris's Universal Exposition of 1900, the sanitary police and their mobile steam disinfection truck were on prominent display.¹⁹ With the increase of bathrooms and water use, simultaneous to the expansion of coal-powered industry, urban rivers became increasingly polluted. Progress and personal cleanliness brought urban pollution.



The most loved and lasting of the nineteenth-century sanitary interventions are the many public parks designed to be the lungs of industrial cities. Frederick Law Olmsted's designs are perhaps the most well known in this country. If his work exceeded that of other designers in quality as well as quantity, Olmsted's ideas about health were typical of the time, and arose from a collision of ancient ideas about balanced airs with modern fears about industrialization. These pre-industrial speculations on the ways in which motion, airs, waters and trees could cleanse and cool cities were developed according to a limited understanding of the processes at work, and yet were not unseated with the advent of modern science, engineering, and industry. Speaking in 1870, Frederick Law Olmsted expressed his concern for the health and morals of city dwellers on several registers. His first concern in this matter was the quality of the air. Olmsted noted that the tarnishing of metal in cities is a sign of the, "corrupt and irritating matters, the action of which tends strongly to vitiate all or sources of vigor." He also echoed what Thomas Jefferson and others had suggested over a century before, that wide city streets in a regular grid were a means of allowing a healthy flow of air. Finally, Olmsted proposed that air could be, "disinfected by sunlight and foliage."²⁰ Of course in the age before the discovery of bacteria, infection was another word for the miasmas, the dense, fermenting, stagnant airs which corrupted health.

Olmsted's assumptions about natural elements and motion as healing forces were not new, yet his enthusiasm for technological systems of motion and communication foreshadowed the exuberance of contemporary urban theories. Olmsted, began his talk entitled, "Public Parks and the Enlargement of Towns," with excited observations on the growth of cities. "See how rapidly we are really gaining, and what we have to expect," he declared. Olmsted understood the gains of the city to be built on a catalog of infrastructures. He forecasted that the streetcar network would expand; railroads would be improved; and Macadam surfacing would allow greater speed, smoothness and silence for carriages. He speculated that conduits filled with hot air might condition the city, while pneumatic tubes might replace telegraphs so that not only information, but also packages could cross large distances. He saw

Figure 2: Frederick Law Olmsted and Calvert Vaux, *Greensward Plan*, 1858. Central Park Arsenal. the expanding network of sewer, water, and gas pipes as essential to urban development and health.²¹ Olmsted's hopes for urban growth and improvement were based on new, mobile infrastructural technologies. In this his imaginings were not too different from those of today, though now we base our urban fantasies on the possibilities of invisible data and capital, rather than on hot air and packages speeding though underground tubes.



DOMINATION AND HYDRAULIC HEALTH

Systemic control and hydraulic infrastructure are necessarily intertwined, and equally implicated in the successes and failures of the cities we have inherited from the nineteenth century. If architects were enthusiastic about the cleanliness and efficiency of new fixtures and materials, and praised more water use as essential to modernization, engineers, often still trained as part of the military corps, drove large scale reconfigurations around water. Colonel George E. Waring, chief drainage engineer for Olmsted's New York Central Park, was also a member of the military, a Colonel of the Cavalry during the Civil War. His training manual for farmers borrowed its epigraph from Roger Bacon, "The effort to extend the domination of man over nature is the most healthy and most noble of all ambitions."²² This motto certainly fit the approach to the infrastructural growth of cities continuing through most of the twentieth century, in which military precision and domination was taken as the task of urban remediation.

As cities expanded, large concrete structures were constructed to contain and separate waters, simultaneously dominating and decimating natural resources. The population of the United States quadrupled between 1850 and 1920, with 50% of the population residing in urban areas.²³ In this pressed and pressing crisis of pollution, density, and illness, battles ensued between engineers, scientists, politicians, and health officials. Architects became increasingly marginal to decisions around water, cities, and health. Statistics, economics, and quantity surveying determined decision-making as urban conditions worsened. Industrial interests often trumped public health, and systems of political patronage hampered radical change.²⁴ Rather than curbing the growth of industry, protecting urban rivers, or treating

Figure 3: The Watershed Project, Bonnet Carré Spillway, St. Charles Parish, Louisiana. http://watershed-project.com/ blog/2013/02/27/bonnet-carrespillway-mississippi-river/ sewage outfalls, most cities began filtering and chlorinating drinking water drawn from urban rivers during the early twentieth century. Riverfronts died, and urban life was pushed far from fresh running water.

In New Orleans and the lower Mississippi delta region, this war on water wages with massive volumes of concrete has been aptly described by John McPhee in his famous 1987 New Yorker essay, "Atchafalaya." In it McPhee narrates the construction of the massive levee system which has famously increased the depth and speed of the Mississippi River, and prevented the seasonal flooding that once allowed silt to be distributed, building new land. As land is lost, the place of man and his structures is increasingly tenuous. McPhee explains through historical research and personal interviews the difficult position of south Louisiana, which relies on these levees for protection, even as their reinforcement ensures their future failure. McPhee includes the words of engineer James B. Eads, a naval architect during the Civil War, who asserted that "Every phenomenon and apparent eccentricity of the river ... is controlled by law as immutable as the Creator, and the engineer need only to be insured that he does not ignore the existence of any of these laws, to feel positively certain of the results he aims at." In light of events during the floods of 1927 and 1973, and more recently during hurricane Katrina, Mark Twain's assertion that "ten thousand River Commissions, with the mines of the world at their back, cannot tame that lawless stream, cannot curb it or confine it," has proven more apt.²⁵



REVISIONS AND REVULSIONS

If the nineteenth-century was a time in which engineers took the lead in urban design around water, what is the role today for architecture in remediating these massive structures that still underlie and surround our cities? And how can we train architecture students to their responsibility, as professionals tasked with bringing radical imagination to real world problems? A recent attempt to teach the lessons of the war on water in a Baton Rouge classroom demonstrated the difficulties and the opportunities architects now face. After a reading of McPhee's "Atchafalaya," and a study of the Army Corps of Engineers' history of levees and other mechanical control structures, most students wondered what it would be like if the river was allowed to run its natural course. These students were primarily from Louisiana, and recognizing the difficulty of controlling the river, expressed interest in diversions and reductions to the containment of the river. Many argued that

Figure 4: Waggonner & Ball Architects, "Filmore Canal Networks," *Greater New Orleans Urban Water Plan*, 2013.

ENDNOTES

- George E. Waring, Jr., Report on the Social Statistics of Cities: Part I, The New England and The Middle States (New York: Arno Press & The New York Times, 1970) 796. First published in 1886 by the Secretary of the Interior as part of the Tenth Census of 1880.
- Servius Tullius was the Roman king during the mid-6th century BCE. Interestingly, he argued against swamps and also took the first census—a measurement and documentation of society. His was an early example of military order as a model for city building.
- Leone Batista Alberti, The architecture of Leon Batista Alberti. In ten books. Of painting. In three books. And of statuary. In one book. Translated into Italian by Cosimo Bartoli. And into English by James Leoni, ... Illustrated with seventy-five copper-plates, engraved by Mr. Picart. In one volume. (London : printed by Edward Owen, for Robert Alfray, 1755), 211.
- 4. Mary Douglas, *Purity and Danger* (New York: Routledge, 2002), 119.
- 5. Douglas, 117-20, 47-48.
- Alain Corbin, *The Foul and the Fragrant* (Cambridge, MA: Harvard University Press, 1986), 225-226.
- David S. Barnes, The Great Stink of Paris and the Nineteenth-Century Struggle against Filth and Germs (Baltimore: Johns Hopkins University Press, 2006), 66-101.
- 8. Corbin, 163.
- 9. Barnes, 120.
- 10. Victor Hugo paints a vivid fantasy of the improper entanglement of filth beneath the city streets:

"...the spittle of Caiaphas encounters the vomit of Falstaff, the gold piece from the gaming house rattles against the nail from which the suicide hung, a livid foetus is wrapped in the spangles, which last Shrove Tuesday danced at the Opera, a wig which passed judgment on men wallows near the decay which was the skirt of Margoton. It is more than fraternity, it is close intimacy.""

Victor Hugo, *Les Misérables*, trans. N. Denny (Harmondsworth: Penguin, 1980) 2:369.

- Ivan Illich, H2O and the Waters of Forgetfulness: Reflections on the Historicity of "Stuff" (Dallas: The Dallas Institute of Humanities and Culture, 1985), 66, 73.
- David J. Eveleigh, Bogs, Baths and Basins: The Story of Domestic Sanitation (Gloucestershire: Sutton Publishing Limited, 2002), 166-168.
- Adolf Loos, "Plumbers," Plumbing: Sounding modern architecture, eds. Nadir Lahiji and D.S. Friedman (New York: Princeton Architectural Press, 1997) 17, 19.
- 14. Ironically, the location of the health fair in Logan Square had previously been used for public executions. See *Waring Report on the Social Statistics of Cities*, 817.

a return to temporary housing and a less stable form of economy was desirable, and that community-based construction of small levees and diversions was preferable to large-scale engineered control.

Next, students examined several vision plans for New Orleans that have been developed since the ruin of Hurricane Katrina. The Greater New Orleans Urban Water Plan and the Lafitte Greenway are examples of a vision document and an active project that mitigate the subsidence and flooding of the city through a complete infrastructural revision. The plans incorporate the slowing, storing, and use of water through soft infrastructures, and promote the interaction of citizens with the hydraulic cycles of the city. This idea of bringing urban recreation and civic life in contact with city waters is by no means new, but these plans represent a radical rethinking for New Orleans.

The students rejected these plans quickly, and even found grounds for revulsion, despite the aesthetic appeal of the renderings. The areas of friction represent target areas for design education and intervention. It seems that areas of friction tended to fall in two directions, either towards politics or personal comfort. Students wondered if the greenscapes would actually work, and also doubted that they would be maintained by local government. Students worried about smells, alligators, trash and other nuisances. The issue of abandoned grassfields adjacent to poor and crime-challenged neighborhoods also raised safety concern charged with other fears, which were harder for students to discuss.

Revisions and revulsions point the way towards a necessary expansion of design work and architectural education in order to engage more intelligently around water. If students and practitioners understand the construction of site around green infrastructures and hydraulic modifications, they may develop more innovative and pleasing solutions than are now available. When architects take ownership of their responsibility, and gain literacy in issues of infrastructure and public health, we will be ideally situated to mitigate between large-scale scientific solutions and radical revisions to the way we live in cities. A resilient architecture of water must be designed towards social justice, rather than superficial remediation.

During the first wave of the water wars during the nineteenth century, public health officials documented "forlorn dwellings," describing cellar tenements and "the debased character of their inmates, the crying sanitary evils abounding therein." These experts judged that the residences of the poor favored "disease of a malignant type, proving destructive of morals, but fruitful sources of depravity and crime—the whole constituting repulsive excrescences upon the body politic." In the same report, sanitation officials admitted that industrial pollution, often adjacent to poor neighborhoods, might be "indirectly dangerous to health." This issue was, however, ignored. As one report of 1860 explained: "it is not the policy, much less the disposition, of this department to interfere with or hinder its prosperity, or interpose a power that would crush a legitimate manufacturing interest, and embarrass those who, at the sacrifice of time, money, and labor, have considerably improved it."²⁶ This quotation demonstrates the complexity of the situation at the time. The urban poor were acknowledged as part of the civic body, but were condemned by their poverty to live as "excrescences," beyond the scope of assistance. The forces of industry were only mildly chided, because it was acknowledged that they were necessary to the city's future.

The responses of this board of health to the sickening uncertainty of the modern city are instructive, not just in their areas of blindness, but in their areas of vision and in what they tell us about today's path for design around water. While a total engineering solution for the city once seemed like the best course to guarantee a healthy, egalitarian, odor-free environment, we can see in retrospect that the progress of industry was valued over the health of all citizens. Architecturally designed interventions, such as the parks of Frederick Law Olmsted, or the great public libraries, museums, and train stations of the nineteenth century, which left

a lasting positive mark on the civic life of industrial cities. Why not encourage better civic design around water today?

The uncertainty of our time may be an opportunity for radical revisions to how we use, display, and imagine water. This chaos can be seen in the terms established by Mary Douglas as a fertile moment, despite its terrors. If military control and concrete went to war against water in the past, decentralized local solutions may be the best antidotes to contemporary challenges. Architecture grounded in politics and place will be one of the most effective tools in reimagining and renovating urban water and waste systems. Moving forward, it will be important to remember that "sustainability" as a totalizing system, based on a general quantitative logic or vague aesthetic, cannot succeed better than previous plans.

The basis of my argument is that contemporary areas of hydraulic conflict are places of opportunity, and that in order to engage these watery in-betweens, each design argument must be grounded in the precise geography, politics, construction, and culture of its place. I cannot define what shape the new hydraulic architectures will take, but it is clear that their scope and scale will vary from city to city. In order for future designs to surpass the vague aesthetics typical to many green infrastructure proposals, we will need to rethink education and practice. How do we train architects to promote decentralization; to engage with the politics of water; and to arrive at, and assist others in embracing, a level of comfort with uncertainty? How can we promote positive and egalitarian engagement with water? Local initiatives, such as Ripple Effect New Orleans, are laying the groundwork for new thinking, by enlisting multidisciplinary teams to integrate water and design literacy with the public school curriculum. [http://rippleeffectnola.com/] We must create innovative ways to work with others, in order to create civic designs which promote the preservation of urban hydraulic health. To move forward instead of repeating the past, we may need to give less credence to scientific and industrial solutions, and more to local conditions and knowledges. There is less certainty and homogeneity in this way of thinking, but we have the chance to invent specific responses more nuanced than those that have marked our urban past.

- 15. Waring, Report on the Social Statistics of Cities, 810.
- 16. Eveleigh, 33.
- 17. Susan Strasser, *Waste and Want* (New York: Henry Holt and Company, 1999), 131-132.
- W. F. Morse, "Let Refuse Be Burned: Our present method of disposal menaces health," *New York Times*, Feb. 20, 1893.
- 19. Barnes, 146.
- Frederick Law Olmsted, "Public Parks and the Enlargement of Towns," in *Civilizing American Cities: Writings on City Landscapes*, ed. S.B. Sutton (New York, Da Capo Press, 1997), 65, 70.
- 21. Olmsted, 61, 62.
- George E. Waring, Jr., The Elements of Agriculture: A book for young farmers, with questions prepared for the use of schools (New York: D. Appleton and Company, 1855), front matter.
- Steven J. Burian, Stephan J. Nix, Robert E. Pitt, and S. Rocky Durrans, "Urban Wastewater Management in the United States: Past, Present, and Future," *Journal of Urban Technology*, Vol. 7, no. 3 (New York: Routledge, 2000), 46.
- See Michal McMahon, "Makeshift Technology: Water and Politics in 19th-Century Philadelphia," Environmental Review: ER, Vol. 12, No. 4 (Winter, 1988), pp. 20-37 Stable URL: http://www.jstor.org/ stable/3984076
- 25. John McPhee, "Atchafalaya," in *Control of Nature* (New York: Farrar Straus Giroux, 1989), 39.
- City of Philadelphia, Report of the Board of Health of Philadelphia for 1860 (Philadelphia: King & Baird Printers, 1861), 41–42, 45.