

CHAPTER 1.

WATER: ACQUA BENE PUBBLICO



Walking through the caked mud, weeds and scattered refuse which litters the Tiber River's left bank, you encounter few tourists, even here, just downstream from the Tiber Island, in the heart of Rome. High above you flows a river of cars, trucks, buses and scooters, one of central Rome's only continuous traffic arteries, but the noise of traffic stays up there, kept at bay by the massive travertine embankment wall as high as a four-story building. Just above you, tourists view the circular Temple of Hercules Victor, the first Roman temple to be made of Greek marble, or the slightly earlier temple to Portunus, the Roman god of keys, gates, and, later, ports. Or perhaps they head to the

8th-century Basilica of Santa Maria in Cosmedin, also nearby, drawn to the *Bocca della Verità* in its portico. Once a drain plate in the form of a face mask, this stone disk now serves as a famously kitsch backdrop for a selfie. But a few intrepid travelers dare to dart through the speeding traffic and gaze down over the thick stone parapet into the slow-flowing, muddy river.

Where they are standing once stood the sloping riparian banks and later, during the early Republic, bustling port facilities replete with docks, warehouses, and a multitude of temples. The last remnants of these vanished in the late 19th century, when the nascent Italian capital, tired of frequent flooding, undertook the massive public works project that would end the flooding forever. At least that was the idea.

Apart from the occasional jogger or fisherman (fishing for what in this dirty water you ask yourself?) you are alone down here at the river's edge. Ducks and cormorants slip through the river grasses; *Saxifraga* and the occasional elm tree grow out of the rocky banks. You may see a nutria, looking something like a large rat or small beaver, a species imported in the 1950s from South America—their meat was thought to be a delicacy, and their fur was used in clothing—then released into the wild when the farms that bred them failed.

The air is humid. As the river rushes around the Tiber Island, a mist often arises from the rapids and small waterfalls on either side. You continue downstream past the remains of the *Pons Aemilius* (later called, for obvious reasons, *Ponte Rotto*, or broken bridge), and then under the high iron trusses of the *Ponte Palatino*, and before long a section of the path you are on *itself* becomes a bridge. Below you, through a gap in the luxuriant vegetation in the embankment wall, you spy a heavy yellowish-grey stone arch. You have stumbled upon the outlet of ancient

Rome's first permanent engineered structure, the sewer main known to us as the *Cloaca Maximus*.

If it has rained recently you will see water gushing from the stone arch into the river. In the dry summer months, when this is reduced to a trickle, the cavernous opening in the embankment wall becomes an impromptu homeless shelter. It is common to see laundry drying on the fence protecting the drain, or t-shirts and tattered sleeping bags draped along this monument to Roman engineering.

Most people expect the first monument of Rome to have been a temple or a palace or perhaps a defensive wall, but the *Cloaca Maximus* is little more than a mundane sewer pipe. Since its inauguration in the 6th century BCE it has been channeling storm water and runoff from the low-lying wetlands into the Tiber River. The original cutting for the Cloaca in the 6th century BCE, John Hopkins writes, was part of a larger landfill project “intended to change Rome’s urban space in a monumental fashion.¹” The open drainage channel was covered in the 2nd century BCE by massive arches of local tuff stone, nearly 5 meters in diameter.

Lewis Mumford has calculated that, were the initial cost of the Cloaca to be amortized over its 2,000 year (and counting) useful life, it would prove one of the world’s most cost-effective public works projects.²

Going Underground

Unlike some enterprising, fortunate or foolhardy friends of mine, I have never put on scuba equipment to explore the ancient tunnels of the Cloaca Maximus. My friend Paul Bennett, who investigated the great drain for an article published in *National*

Geographic, describes the odor as...”a mélange of urine, diesel, mud, and rotting rat carcasses.³” I don’t regret sitting out that adventure.

I have, however, crawled through the much smaller drainage channels hidden below the Roman Forum in the area of the Temple of Castor and Pollux. As the primary architect for the *Post Aedem Castoris* project in 2004, I was quick to volunteer to explore them. The project was jointly conducted by a team of archaeologists from Stanford and Oxford universities, and a non-profit organization I had cofounded.

Our purpose then was to explore theories about the location of the Temple of Augustus, which touched in turn upon a larger question about Caligula’s palace. Students of Roman history have long questioned whether the historian Seutonius was serious when he wrote that Caligula had “built out a part of the Palace as far as the Forum ...making the temple of Castor and Pollux its vestibule.” Given they were not the most modest rulers, but what emperor would go so far as to requisition one of Rome’s most venerated sites for his front door? And what of the paved street that sources describe as separating the temple from the hill before Caligula’s reign (37-41 AD), part of which Giacomo Boni unearthed in hasty excavations a century ago?

The absence of any visible remains of Caligula’s palace—if indeed such a structure existed—is hardly surprising, however. No emperor, it is commonly acknowledged, deserved less to be remembered than the one whose depravities, Seutonius wrote, included fratricide, incest, and ruthless killing of anyone who piqued his wrath. The list Seutonius made of instances of Caligula’s “innate brutality” is long, but one stands out: “He had the manager of his gladiatorial shows and beast baitings beaten with chains in his presence for several successive days,

and would not kill him until he was disgusted at the stench of his putrefied brain.” Nice guy, this Caligula, and not surprising that his successors recalled his reign with less than a warm heart. The Roman Senate instead passed a *Damnatio Memoriae*—an official condemnation and erasure of his name from history.

But erasing all visible traces of Caligula’s hated palace didn’t include the invisible: buried below the surface, the perimeter drains remained and are now clues as to what may have been above.

As I crawl on all fours through them, the narrow, labyrinthine tunnels are just wide enough for my shoulders. And so low that I keep banging my hard-hat on the *bipedales*, the over-sized bricks set in pairs to form a simple but functional, peaked ceiling. After thousands of years I expected the system to be filled with rubble and vegetation, but I found only small animal and bird bones crunching under my hands and knees. During the rainy season, the very flow of water keeps this system clean, pushing the city’s detritus out to the Tiber and from there on to the sea. Another instance of Roman pragmatism I must pause to salute, and I have encountered many in my years in Rome. The channel is built to last, slightly oversized to anticipate future expansion and weather extremes but with the assumption that future generations would build with comparable common sense. If water is to be mastered we must respect it and, with a proper understanding of its properties and limitations, channel it in the direction it wants to go. From the earliest archaeological evidence we have, the primitive cabanas on the Palatine hill, the so-called hut of Romulus, perimeter drains are in evidence. And it was not much later that they began to channel rain water into cisterns for civic use. Even long after the buildings above ceased to function, water continues to flow through these drains (except,

thankfully, in the dry summer months when our investigation took place.)

I continued my sewer crawl, trying to construct a rough map in my head as the channel twisted and turned a few times and the sounds of the Roman Forum became ever more distant. My hopes of finding a space wide enough to turn around dimmed and the anticipation of backing all the way out — not to mention irrational fears of flash floods or earthquakes — began loom over me. I soon stopped, took a deep breath, and reversed my direction. With perseverance and proper equipment — and more courage than I could muster — I might have followed a course through the gradually widening channels until emerging into the sunlight at the Tiber's edge, where our story began.



Biking along the Tiber riverfront

Off-site, Out of Mind

Italy is filled with such conduits, though none are so historically loaded. In Tuscany, under the Etruscan town of Chiusi, there is an extensive network of tunnels, called the Labyrinth of Porsenna, which you enter through a garden along the medieval town walls. You eventually find yourself in a tall Roman cistern, from which you ascend by means of a seemingly endless spiral stairway until you emerge, breathless, onto the vertiginous bell-tower of the town's cathedral. The cavernous tunnels are a bit like Rome's Christian catacombs, but made to hold water, not the remains of martyrs.

They made me think of William Mitchell's description, in his book *Me++*, of the tangled mess of metal and plastic that snakes beneath the contemporary metropolis. "Water supply and sewer networks," he writes, "have become geographic extensions of my alimentary canal, my respiratory system, and associated organic plumbing."⁴ The labyrinth below Chiusi can induce a similar hallucination: you begin to wonder if you've shrunk to Lilliputian size and are somehow wandering around inside Gulliver's biological plumbing. You snap to, however, as you realize that our cities have indeed long since developed plumbing systems not unlike those of living organisms, though probably less resilient.

The perimeter drains I explored in 2004, and the ones under Chiusi, were originally covered. They had gratings through which water could pass and entrances for maintenance workers. But the Cloaca Maxima was an open-air canal whose primary aim was to create firm ground out of former wetlands by separating wet from dry.

Today we hide our infrastructure, letting it do its work silently

in the background as we slip into ignorance of the resources on which we depend. Our waste quickly disappears out of sight at the push of a button, only returning to plague us when the technology breaks down. Normally, the contaminated byproducts of our consumptive lifestyles are shipped away to distant destinations, out of sight, out of mind. Where does your water come from? Where does your waste end up when you flush, and where is this place called “away”? In ancient Rome, and in many other early cultures, people knew, and their answers were often quite specific. Indeed these essential solutions were celebrated—not hidden. When early Rome’s dirty waste water passed in full view (and in a fully odiferous state) through the city, the ecological impact of its inhabitants was much harder to ignore. As William Mitchell reminds us, central plumbing, for good or ill, is invisible plumbing. The well and the outhouse, once outside our homes, are now replaced with sleek plumbing that is largely indistinguishable from the rest of our homes. “The large scale construction of these intestinal extranets,” he writes, “and the integration of their interfaces into architecture were among the most heroic projects of early modernism.”⁵ Awareness of the importance of making the structural innards visible, even to the point of making it a fetish, informed projects like the Pompidou Center in central Paris. Designed in 1977 by the then-young architects Renzo Piano and Richard Rogers, the expressive high-tech building boasts exposed and colorfully highlighted ductwork. Yet the real revolution in our technology will be in its miniaturization and dematerialization. Despite noble (or at least theatrical) efforts to make visible the obscure systems which drive our cities, our infrastructure has again gone underground.

Navigating the Tiber and its Bureaucracy

In central Rome’s vast waste removal system, the Cloaca Max-

ima is but one segment of its quintessential drain—the Tiber itself. Especially since the creation of its tall embankment walls at the end of the 19th century, Rome’s river has been treated like one large sewer and its outlet, at the port of Ostia, has been increasingly polluted in recent years. The effects of Rome’s river and others on the Mediterranean in turn threatens the aquatic ecosystem and Italy’s fishing economy.

The Tiber River barely exists in the minds of most Romans, and yet it is *the* historic river of Europe, and where the city of Rome began. Specifically, it was at on its then-natural banks where the river winds past the base of the Palatine Hill, that the infant twins, Romulus and Remus were said to have washed ashore in a basket and been adopted by the legendary she-wolf. The city’s official — though of course mythical — foundation by the now adult Romulus came in 753 BCE (April 21 to be precise) and since that day the history of Rome has been inextricably tied to the Tiber. The river served as a boundary, separating the north-western Etruscan tribes from the Latins in the southeast. Across the Tiber Island the first bridges were once built, first in wood and later in stone; one of them, the first century BCE Ponte Fabricio, still survives today. The river provides a connection to the sea, close enough for shipping but far enough upstream to prevent hostile incursions.

Watching the Tiber River as it snakes slowly through central Rome on its way to the Mediterranean, it is hard to conceive of the fuzzy web of interests and regulatory bodies at play. Shared amongst multiple authorities— a minimum of 16 administrative offices have a say in the river — the responsibilities often seem so contradictory and overlapping as to make any proposal for the river a daunting enterprise.

The *Regione Lazio*, one of the twenty regions of Italy, extending

southwards half-way to Naples and towards Florence in the north, is responsible for the river and its banks, specifically under the management of ARDIS, *l'Agenzia Regionale per la Difesa del Suolo* (a regional agency for land management). But the Tiber doesn't stop at the city's edges, nor at those of the Lazio region. The river begins as a natural spring, bubbling out of the ground at Fiumarolo, in the Emilia Romagna region and gathering force as it winds through Umbria and Tuscany before entering Lazio, and each region along the way has a voice in its management.

The greatest overall responsibility for drafting and implementing an overall environmental plan (*Piano Paesistico*) for the entire river ecosystem is borne by the *Autorità di Bacino del Fiume Tevere*. Based near Rome's Termini Station, in (describe building), this authority drafted the current in 2003 plan and is currently overseeing its implementation. Any projects with potential impact on the Tiber River ecosystem must pass through these offices and receive, literally, a stamp of approval.

In case of hydrological emergencies still other authorities are called into play, coordinated by the national civil protection agency, *Protezione Civile*. La Polizia Fluviale, based strategically on the Tiber Island, sends two small boats up and downstream to check water levels and the condition of the embankments. The Capitaneria del Porto also plays an important role, especially at Fiumicino and Ostia, where the river enters the sea. Finally, because any interventions along the river may be architectural, environmental, cultural, recreational, or even social in nature, multiple commissioners are called upon to express their opinions.

One cultural and social engagement project, launched in the early 2000s by the nonprofit organization Tevereterno Onlus, is

aimed at revitalizing the urban riverfront by creating a public space dedicated to site-specific contemporary art. Supported by various international constituencies, from the art world to designers to environmentalists, this catalyst project has nevertheless struggled to gain recognition by administrative authorities. The river, instead, continues to lie forgotten beneath its tall stone walls, nearly abandoned but overflowing with potential as a public place.

High Water

Ever more frequently, the Tiber reaches upwards as heavy and continuous rainfall fills its delta, causing bridge closings and warnings by the city's mayor to stay home and providing gripping video clips for climate-change activists. On a recent day the water rose 5 meters in 2 days to surpass the springing points and start to fill the arches of ancient bridges such as Ponte Milvio and Ponte Fabricius. Boats moored near St. Peter's came loose and were washed into Ponte Sant'Angelo where they piled up and further obstructed the flow, threatening a structure that dates its founding to the time of Hadrian.

The Tiber has always flooded and it would be simplistic to point to this flood in particular as evidence of the worsening effects of global warming or even excessive urbanization of the river basin. Deforestation and subsequent erosion and flooding are as old as the Colosseum and plans for artificial diversion and channeling of the river go back to the time of Caesar.

Caesar's scheme would have involved cutting a canal from a point upstream and bypassing Rome to the east and south until emptying into the sea at Ostia. This project was again proposed in the 19th century, this time advocated by none other than the general and war hero, Giuseppe Garibaldi. A contemporary

American newspaper article noted: “The project is practicable, and would be of great utility if carried out. But there is no capital to be found here for its execution.⁶” The hope of attaining foreign investors to fund the canal was never realized.

Instead, a Roman engineer named Raffaele Canevari proposed the embankment or *muraglioni*, a costly public works project which would result in the expropriation and demolition of many buildings and public spaces and the redesign of the entire urban waterfront along the Tiber banks. Dismantled and buried in the process were the *Porta di Ripetta*, Rome’s most elegant river port (designed by Baroque architect Alessandro Specchi in the 18th century), the vibrant *Porta di Ripa Grande* in Trastevere and the entire former Jewish “Ghetto.” Historic bridges such as *Ponte Fabricio*, *Ponte Sisto* and *Ponte Sant’Angelo* were trimmed to fit the narrower course of the Tiber. The solution worked, and has kept the river within its walls, but typical of the heavy-handed approach of the 19th century, it had a negative impact, separating the city from its river.

Today the problem of flooding derives less from the river and more from the impermeable surfaces which can translate heavy rains into flash flooding. There is no linear causality but rather a web of connectivity, but if we incorporated green space into our city-building, rains like this would be absorbed and enrich the aquifers, rather than overflowing into rivers. Likewise, our dependence on automobiles traps us in rising floodwaters, blocking emergency vehicles and public transit, effectively shutting down the city in situations where were we on foot, living close enough to our daily needs to walk, we might get wet but still function. During a recent summer storm, for example, I biked to work as usual (actually better than usual because the clogged

traffic meant that for once I wasn't a target of homicidal drivers). I simply brought dry clothes and changed when I got to work.



Ponte Rotto and the Tiber island during the 2012 floods

When the floodwaters of the Tiber subside after the rainy season, plastic bags, bottles, shredded packaging materials, and other detritus draped from trees remind Romans and visitors of the forces of nature but also of our throw-away culture. Some might see in this display a valuable message. Non-biodegradable trash that is usually hidden from view in landfills to secretly intoxicate our land here hangs visible to all in all its ugliness, a glaring reminder of our wasteful society. Flushing the city's waste away is today a greater challenge than it was in antiquity, and this could provide a needed wake-up call.

Bringing in the Water

Centuries after resolving the problem of the elimination of unwanted groundwater with the Cloaca Maxima, Roman engineers applied the same logic, and the same laws of gravity and fluid dynamics, to the procurement of fresh water. Like the Cloaca, the majority of the aqueducts' extent is underground, only partially explored and excavated. The first aqueduct in Rome was the Acqua Appia, built in 312 BCE by the same Appius Claudius we will encounter later as the engineer of the first Roman highway. By the year 95, Sextus Julius Frontinus describes "nine aqueducts from which water converges into Rome," and by the time two others are added there would be a total of 470 kilometers of aqueducts, all but 70 km of it underground, carrying almost a trillion liters of water into the capital each day. The increase in potable water was paralleled by an increase in population.⁷ As Rome grew from a small city to a metropolis of over a million residents by the 3rd century, its water consumption reached an estimated 12,000 liters/second, a record not surpassed until the late 20th century, by which time its population had doubled. Of course, in between the fall of Rome and our own times 10 of the 11 aqueducts ceased to function and the population plummeted. The wellbeing of the city's residents was clearly tied to the supply of clean water.

Frontinus' text, *De Aquaeductu Urbis Romae* is the most authoritative voice regarding aqueducts to have survived and, together with extant structures, it is not hard to understand the functioning of ancient Rome's plumbing. For example, each aqueduct terminated in a Castellum, a sort of distribution tank from which smaller channels would continue to feed public fountains, public baths, and private homes or baths (in that order, so in the event of water shortage, the private users would be the first to suffer).

Frontinus makes it clear that water was used for more than just drinking and bathing. Vitruvius, writing almost a century earlier his own treatise about architecture in general, stated “without water, neither the body of an animal, nor even food itself can be raised, preserved, nor provided.” As Vitruvius observed, “water is of infinite utility to us, not only as affording drink, but for a great number of purposes in life; and it is furnished to us gratuitously.” Water irrigates our plants, and Rome then and now was a heavily agricultural society with an intimate awareness of the importance of water supplies on crop cycles. Water cleanses us, and flushes our cities of their waste, carrying dangerous toxins out to sea. The movement of water provides power for work such as the grinding of grain and, later, the production of electricity. Water also generates microclimatic conditions that benefit human inhabitation: the Mediterranean climate exists thanks to the thermal mass of the nearby sea, which reduces temperature extremes. At a localized level, water can serve for evaporative cooling or for heating. And, of course, water is a beautiful, sensual presence in our lives. It is no surprise that Frontinus said “springs are revered for their sanctity, and their water is thought to bring health to sick bodies.” Today, in a world devastated by environmental injustice, the abundance of free, clean public water is one of Rome’s most striking assets.

Nymphaeum

Romans nearly worship their water, as I learn on a hot summer day sometime in the early 1990s, when I first seriously explore the Roman countryside in search of water. As I bicycle out along the old Appian Way with my friend Edoardo, we find ourselves, though still well within the administrative confines of the now sprawling capital, in the countryside. It is not, however, quite the soft, rolling hills and sunflowers of Tuscany. Rather it is arid and

lush. Thorny brambles, fig trees, and the odd holm oak spring from dry, rocky soil. Here and there are cleared fields with artichokes or *ortaggi* (*wild greens and vegetables*). Except for those that built the occasional fence to keep sheep in or out, no hand has constrained this landscape, though many have painted it. Poussin, Fragonard, and countless other artists were drawn to the timeless ruins to be found amid the overgrown vegetation and the local farmers' and shepherds' blithe disrespect for the ruins charmed them even more.

Edoardo, I have found, knows (more or less) where the city's best-kept secrets are hiding, and, sure enough, he is leading me toward one with great conviction, if not absolute certainty. I begin to doubt his powers as he repeatedly mumbles "it's around here somewhere" and doubles back to look more carefully. But then we finally spy it, barely visible below riotous vegetation: a spring, in the form of a sunken, overgrown pool of greenish water, partially enclosed by an apse-shaped indentation in the hillside. I hear the sound of water and see where it springs from the wall, beneath an aged statue of a female figure. Edoardo explains to me that this is the goddess Egeria, one of the female deities Roman's believed presided over woodland springs, and that it was made at some point in the late Roman Empire. Had I been better prepared I might have recognized the place from Giovanni Battista Piranesi's 18th-century etching, one of many etchings the great Venetian architect made of the Roman countryside. But this was a spontaneous outing, not a research trip. Later I would learn that the mountain nymph was most often associated with groves of trees and water and that this source of water in particular, a spring that fed into the Almone River, was sacred to early Romans. It was, famously, the only place where the Vestal Virgins could fill their vessels.

It makes sense that Romans would imbue natural resources with godlike qualities, as the Greeks and other civilizations did before them. Deifying precious natural resources—the seas, forests, earth, and sun—had long proven an effective way to prevent pollution or abuse. How better to ensure the purity of water and the integrity of a forest than to appoint a deity as protector?

Today this site is more accessible, maintained within a new public park, the *Parco della Caffarella*. Nearby, on the modern road, stands the Acqua Egeria bottling plant whose logo depicts the overgrown spring under the slogan “*Acqua Santa di Roma,*” Rome’s Holy Water. Romans drive out with crates of empty bottles in the back of their Fiats and, for a small fee, fill them with water from stainless steel spigots labeled *frizzante* and *naturale*. They may not know the full story of the ancient nymphs, but they certainly recognize the importance of good water.

Leaving the Parco della Caffarella we head across the no-man’s land that is Rome’s *periferia* or suburban sprawl, to another nascent urban park which defines the edge between city and countryside: *il Parco degli Acquedotti*. I recently found, in an old sketchbook of mine, a photo-montage I once created to capture a fleeting moment in the park. It was the view, from the Naples-bound train, of the tracks intersecting a double row of Roman pine trees, which in turn scissor through the arcades of the Acqua Claudia aqueduct.



Sketch collage by author of Roman aqueducts, pine trees and power lines

Now that I am biking under these vast stone arches of the Roman aqueducts as they march across the Roman countryside towards the distant dome of St. Peter's, I am acutely aware of the web of flows that comprise our cities today. Power lines crisscross as they bring electricity to the city, while gas pipes, modern water pipes and the city sewer system are buried below ground. Overhead, low-flying planes dip toward Rome's Ciampino airport. Trains slide by noisily to and from Termini Station.

Whereas back in the city center we are more aware of the boundaries and access points—the Aurelian Wall and its gates are still for the most part intact—out here we feel that cities are more about flows than they are about fixed structures. Again quoting William Mitchell, “the story of recent urban growth has not been one of successive encircling walls, as it mostly would have been for ancient, medieval and Renaissance cities, but of network-induced sprawl at the fringes.” This network-building seems anything but recent as we contemplate the construction

of the Acqua Claudia, begun under Caligula and finished by his successor, Claudius, in 50 CE. By this time, ensuring respect for water no longer demanded its personification in deities like Egeria. The power of Rome's engineering and recognition of the human ingenuity it entailed, was more than enough to command reverence and prevent abuse. In both cases a respect for limited resources was built into their delivery system, whether your water gushed forth from a sacred spring or was carried along towering arches into the glorious public fountains.⁸

As we continue our ride across the fields, I learn that Edoardo's familiarity with this area was partly due to his cinema connections. Son of a great *Dolce Vita* era actor, and involved in the dubbing business himself, he spent time on the sets of the big productions in the film studios of Cinecittà, Rome's Hollywood, a stone's throw from the aqueducts. Cinema and Rome's hinterland have often overlapped. It was amidst these very ruins, in the casually chaotic landscape of Rome's expanding hinterland, that Pier Paolo Pasolini shot the most poignant scenes of *Mamma Roma* and his earlier short film *La Ricotta*. A poet and filmmaker from Italy's northern Friuli region, Pasolini was fascinated by the lives of Rome's underclasses, the residents of the borgata (planned fascist-era towns) but also of the unplanned and illegally-built shanty towns at the margins of the capital. In the early 1960s, he directed his camera lens at the squalid but somehow sublime living conditions of the marginalized sub-proletariat living amongst the ruins of the aqueducts. He was particularly drawn to the Via del Mandrione, sandwiched between the Acqua Claudia and the Acqua Felice, in his time still a squatter settlement inhabited especially by semi-nomadic Rom who made a living as horse-suppliers and extras for the big productions in Cinecittà' nearby. Perhaps like the hydraulic infrastructure, exposed to view instead of hidden discretely in

the walls and floors as it would in conventional architecture, the protagonists of Pasolini's films (only rarely played by professional actors) serve to bring to the surface the inner workings of our society, in the words of Saskia Sassen to "make legible the obscure."⁹

When the source of water is at the edge of town, the architecture of the network is usually quite evident, as in the case of the Acqua Claudia, now squeezed in by building-supply yards, fenced-in spontaneous housing, illegal landfills, and other detritus of contemporary Rome's *periferia*. A resource is transported through a structured channel from the source (exploited to varying degrees) to its end user. Along the way, inefficiencies and waste abound, and profit is extracted.

Also in the Parco degli Aquedotti, for example, I helped others excavate an immense 2nd-century villa that blatantly tapped water from the Acqua Marcia. At least Rome's ancient water system was "transparent." Today we more often consume resources that come from places far from our immediate view. This makes access less of a sure thing, and it is access to clean water "furnished to us gratuitously" as Vitruvius said, that allows our cities to prosper. The amount of water on the planet hasn't changed throughout human history, but the portion available for human use, fresh and non-polluted, is threatened.

Rome's tradition of public access to free water dates to around 25 BCE. As part of a concerted effort by the first Emperor Augustus to secure support through public works, Marcus Agrippa established Rome's first public baths, which were fed by the Acqua Vergine, the city's shortest but also one of its most longevous aqueducts. The Baths of Agrippa were located in the Campus Martius, just behind the Pantheon, which Agrippa also constructed. Like later and larger public baths, Agrippa's com-

plex provided separate chambers for hot, warm and cold water (the *caldarium*, *tepidarium* and *frigidarium* respectively). It quickly became a gathering place for Roman citizens. A generation of American study-abroad students and faculty had the privilege of occupying studio space and classrooms in the remains of the *caldarium*, on Via Arco della Ciambella, the street of the “arch of the donut,” where the donut was the domed, cylindrical bathing hall. From the design studio windows we viewed the circular concrete structure into which are still tucked homes and shops from later centuries.

Apart from the actual bathing in water, baths served important roles in what we would today call “wellness.” Exercise was fundamental to the baths and a workout usually preceded the rubdown, immersion and rinsing phases. Bodily functions were accepted as part of public daily activities, at least if we are to judge by the scatological humor at the “Baths of the Seven Wise Men” at Ostia Antica. But baths also served an important thermal function and will be addressed in the chapter dedicated to energy.



One of Rome's typical Roman *nasoni* fountains

Fountains

Ask a visitor to Rome in August what stood out most and the answer will often be the presence of fountains. The list of fountains is long, especially when we include the simple but beautiful *nasoni* drinking fountains, cast-iron cylinders with beak-like, continuously-flowing outlets from which every Roman and most discerning travelers have learned the trick to drink comfortably.

Three of Rome's most spectacular fountains share connections to Gian Lorenzo Bernini. The *Barcaccia* at the foot of the Spanish Steps was designed by Pietro Bernini, father of the more famous Baroque architect and sculptor. In order to preserve the water pressure of its aqueduct for fountains elsewhere, Bernini devised a narrative solution which justified a fountain sunken below street level: a sinking boat (or *barcaccia*) that has taken on water and is overflowing at its sides. On a hot day, descending onto the marble stepping stone at the port or prow end of the boat, you are rewarded simultaneously with a cool mist, a musical sound which drowns out the street noise above, and a drink of delicious cold water.

From this point, the conduits were diverted in the 16th century under what is appropriately called Via Condotti (street of the conduits) and would later supply Gian Lorenzo Bernini's greatest fountain, the Fountain of the Four Rivers a half-mile away in Piazza Navona.

Bernini also had a hand in Rome's most famous fountain, the Trevi, which is also fed by the Acqua Vergine. When he was appointed architect of the aqueduct in 1629, Bernini was asked to design a replacement for a basin that provided water to a neighborhood on the Quirinal Hill just below the papal summer palace. His plan for it was not quite feasible, but a century later it had an enormous influence on Nicolo Salvi, the architect who *did* design Trevi Fountain in 1732. No other fountain in the world celebrates water with such theatricality, nor blurs the lines so expertly between nature and artifice. John Pinto points out that "rather than seeming shaped by the hand of man, the *scogli* appear to have been deeply eroded by the action of the water, which courses through and over them, to create an extraordinarily expressive form of abstract sculpture¹⁰. Salvi popu-

lates his faux natural landscape with stone flora and fauna, from prickly pairs to a snail crawling on a marsh marigold. Here, like experiments in biomimicry coming out of cutting-edge architecture schools, art is made to imitate nature, but unlike contemporary reliance on computers and para-metrics, in the 17th century the critical eye and hand of the artist was required. Salvi “often climbed out onto the *scogli* (rocks) with charcoal stick in hand to sketch particular details on the surface of the travertine.” And the work only succeeds because of the dialogue it sparks with the spectator.

The Acqua Vergine has its source ten kilometers outside the city, a spring discovered, according to the legend, by a young woman after whom the pure “virgin” water was named. After Caligula demolished much of it because it blocked the amphitheatre he was constructing, Claudius rebuilt it and it is Claudius’ name we see carved in the monumental arch at Via Nazzareno where the aqueduct spanned a road. Unlike most aqueducts, it has never ceased to carry water for the simple reason that outside the center it is underground and resistant to destruction. In 1937 the Vergine Nuova was built along the same route but in a separate channel to augment its flow.

The Vergine is really more of a drain than an aqueduct, with feeder pipes entering it. Not far from the here it morphs into a sewer, carrying its bounty of water out towards the Tiber while collecting ever more water from street level drains. The drain under the oculus of the Pantheon, for example, feeds into this extension of the Vergine according to the thick blue line on Rodolfo Lanciani’s map, the Forma Urbis. In the Middle Ages, the Frangipani family controlled the ancient aqueduct with a fortress, determining who had access to the water at what price.

To understand more fully water’s role in this part of Rome,

turn your back to the Trevi fountain, duck around the first street after the church, and descend into the archaeological excavation almost ten meters below modern street level. In the early 2000s, food-services mega-company Gruppo Cremonini restored the building, creating a bookstore, restaurant, underground (literally) cinema and a publicly-accessible archaeological site. The site goes by several names, Cinema Trevi, or Vicus Caprarius (goat alley, after a place of animal sacrifice that may once have stood on the ancient street) or Città dell'Acqua (city of water). The site contains several structures, including a tenement house from the 2nd century CE (that was transformed into an upscale mansion in the 5th century) and a cistern which in the Middle Ages, after most aqueducts had been cut, stored 150,000 liters of this valuable liquid commodity in two cement lined rooms. Water is still present at the lowest level, close to the city's water table, dripping through the walls and sitting transparently in shallow pools over ancient paving tiles.

Back on the surface, looking at the Trevi Fountain gushing water in all its splendor, it is common to hear snide remarks about Rome's modern plumbing. Everyone who has spent time in Rome has hydraulic anecdotes to tell, usually involving lack of water pressure or cold showers. The days of imperial aqueducts and public thermal baths are long over, but water is still very present in Roman life. The apartment we moved to after getting married, near Termini station, had three water faucets in the kitchen. I learned that the extra one was for *acqua diretta*, though not as abundant, it was fresh and pure as opposed to the normal hot and cold which carried *acqua di cassoni* through a rooftop cistern and thus could get contaminated. We would use the *acqua diretta* for drinking and other uses for which purity was essential, but had no qualms about washing and flushing toilets with *acqua di cassoni*. To many this separate system was an

embarrassing holdover from the wartime year's of deprivation and couldn't wait for the cisterns to be phased out. But I actually saw it as a smart choice, a means of calibrating our domestic habits to optimize performance. Like pulling the shutters closed to keep out the sun, having choices makes us more free. Watering our plants, filling our pools and flushing away our waste in clean drinking water is not a sign of progress.

Today Rome's water supply, though only half what it was in antiquity per capita, is still one of the most abundant in the world, making Rome the only European capital whose water resources are recharged faster than the city can drain them. Amidst all this abundance, it pains us to remember that 780 million people live without clean drinking water¹¹.

So aren't Rome's constantly flowing fountains somehow contributing to planetary water shortage? To understand why the answer is no, we have to go to the source of the water. Typical of most of the aqueducts, although the longest and most capacious, is the Aqua Marcia which begins its 90 kilometer journey to Rome in the upper Anio river basin at a place called Agosta. Here numerous springs fed into catchment channels which, in turn, fed the main channel of the aqueduct which was completed by Roman praeto Q. Marcius Rex in 140 BCE. This water streams constantly from the ground, especially plentiful in the springtime when the snow on the Apennines melts, but adequate year round to feed Rome's fountains. Even if never funneled into artificial pipes, it would still travel more or less the same route on its way to the sea; the Romans simply (!) detoured it through their baths, fountains, latrines and drains and if these were all shut off at once the pressure at the source would have caused other channels to form. Rather than simply conserving water in a city blessed with its abundance, the challenge is to devise ways

of sending this water to places that suffer from drought, such as Puglia and Calabria. Or perhaps better, finding ways in which more people can benefit from this supply of fresh water without taxing other limited resources such as land and energy. As clean water re-emerges as it was in antiquity as the limiting planetary resource of the 21st century (the “new oil” according to some), Rome may discover ways to leverage its water supplies as generators for growth.

In 2011 Rome held a referendum to decide whether its water supply should remain public or become privatized. The question was not as simple as the posters showing coin-operated water fountains would have you think; all services have to some extent come under private management in recent years in an attempt to improve efficiency and reduce the bloated public sector. But what was at play was the very life-blood of humanity here and for it to become a corporate commodity was worth questioning. It was not surprising that people voted overwhelmingly to keep water public since access to water has always been at the base of political support. At the time of Frontinus, water was a public resource, distributed for free in public baths and fountains but also for a fee through concessions to private entrepreneurs whose baths were more exclusive and provided other perks. Water itself was a *bene comune*, a public asset, like the food distribution and the entertainment at the Colosseum (the proverbial “bread and circuses”). Free, clean water was one of the rewards for being Roman. In the event of a shortage of water due to a faulty aqueduct or damaged cistern, the private concessionaires would be the first to forfeit their supply, and the public drinking water the last to be shut off.

Today one hears about “smart city” solutions, soft technologies that work with natural forces rather than against them. In an age

of impending climate crisis, cities with longstanding experience in limiting and adapting to floods (Amsterdam and Venice to name a few) are well positioned to lead the battle to survive rising sea levels. In the same way Rome, with its millennia-long hydraulic know-how, might spearhead the global drive for smart water management. And that's something to drink to.

Notes

1. John Hopkins, "The Cloaca Maxima and the Monumental Manipulation of Water in Archaic Rome," in *Waters of Rome, Number 4, March 2007*, posted on <http://www3.iath.virginia.edu/waters/Journal4Hopkins.pdf>, 8.
2. Lewis Mumford, *The City in History*, (New York: Harcourt, Brace and World. 1961).
3. Paul Bennett, "Rome's Ruins" in *National Geographic*, July 2006
4. William Mitchell, *Me++ The Cyborg Self and the Networked City*. (Cambridge, MA: MIT Press, 2004)
5. This previously forgotten aspect of architecture was the subject of Reyner Banham's 1969 book *Architecture of the Well-Tempered Environment*.
6. "Garibaldi and the Improvement of the Capital." *The New York Times* 7 Mar. 1875
7. For more on this see Heiken, Grant, et. al. *The Seven Hills of Rome: a Geological Tour of the Eternal City*. (Princeton: Princeton University Press. 2005)
8. Later I will bring travel personality Rick Steves to this site; the documentary we end up making will put this place on the map for

international tourists, helping them once again to become a destination for the new Grand Tour.

9. Saskia Sassen, "Seeing Like a City" in Burdett, Ricky, ed. *The Endless City*. (London: Phaidon. 2007).
10. John A Pinto, *The Trevi Fountain*. (New Haven and London: Yale University Press, 1986), 150.
11. <https://www.foodandwaterwatch.org/water/interesting-water-facts/>