

In previous issues of Labyrinth, an overview was given of the methods by which the Romans brought a great abundance of water not only to their urban centres, but also to their far-flung frontiers and desert outposts. Now we will investigate some of the private and public uses to which they put their ingenious hydraulic technology.

As reported by the Roman Water Commissioner of A.D. 97, Sextus Julius Frontinus, the eight major aqueducts which terminated in the city of Rome

itself supplied more than 200,000,000 gallons of water a day to the reservoirs and cisterns of the city (De Aquaeductibus, 65-73). Whether the water arrived at urban centres in Italy or desert camps in Jordan, this precious commodity usually found its way first to settling tanks where mud and stones were allowed to settle to the bottom. From there, it either flowed to large storage reservoirs and cisterns, or was led to storage towers at or below the aqueduct level.

From the reservoirs, the water was first piped off at ground level to supply the public fountains and basins, then the middle reservoirs fed the public baths and, finally, the uppermost supplied the private houses with the cleanest water available. It is this latter use by the wealthy which Frontinus complains most bitterly about. It seems that, for the most part, those who could afford to buy the lead pipes which connected the water supply to their houses and could subsequently afford the annual water payments and taxes did so honestly and legally. There were, however, all too many who took to bribing the city water employees to tap into the system illegally. Frontinus noted that, as a result of illegal tapping into the public conduits, which would have greatly reduced the overall hydraulic pressure, "the public supply is brought to a standstill by private citizens, just to water their gardens" (De Aquis Urbis Romae, II.75). In the same report, Frontinus states that "I have found irrigated fields, shops, garrets, and every house of ill repute in Rome with fixtures to ensure constant running water." It is obvious that the elaborate terraced gardens, fountains and pools of the wealthy had devastating consequences on the already unsatisfactory water pressure in the state-run system. Illegal tapping only compounded the problem, making it virtually impossible for any but the ground floor tenants of a building to be supplied with the seemingly limitless water flowing into Rome. Some houses, such as the Villa of the Papyri at Herculaneum, even had elaborate private subterranean aqueduct systems built to supply the villas, fountains and pools with an endless amount of fresh water. Whether legally or illegally, this extravagant private use of the public hydraulic system meant that most of the citizens of the urban centres had to carry their water for everyday use from the public fountains back to their small cenacula or rooms in the upper floors of the insulae. It seems that a steady and constant residential supply of water was the privilege of the few despite the need of the many.

The great and elaborate fountains at Ostia, Pompeii and Rome - where there were more than 1300 public fountains by the end of the third century A.D. - were, therefore, the main supply of water for the inhabitants of these cities. It is at Rome, where "veritable rivers flow through the city and the sewers, and almost every house has cisterns and service pipes and copious fountains" (Strabo, Geography, V.iii.8), that we also find one of the most elaborate

systems to handle the overflow from these reservoirs and fountains. This overflow from the constantly running conduits was put to good use flushing latrines and sewers on its way to the Tiber River. Some of this secondary overflow water was even used to power mills along the way.

The drainage system and sewers themselves were a marvel to behold, flushed out by diverted overflow and large enough, as Pliny tells us, to allow a boat to travel their entire length (Natural History, XXXVI.104-8). Strabo describes "the sewers, vaulted with close-fitting stones" as having "in some places left room enough for wagons loaded with hay to pass through them" (Geography, V.iii.8). The main feature of this remarkable drainage system, in many ways as complex and ingenious as the actual aqueduct and conduit system supplying the city of Rome, was the Cloaca Maxima drain, the opening of which emptied into the Tiber and can still be seen today.

It is quite clear that the marvelous hydraulic systems which supplied both the urban centres and the frontier settlements with fresh water - "the chief requisite for life, for happiness, and for everyday use" (Vitruvius, De Architectura, Book VIII.4) - and the drainage systems were both highly efficient and remarkably ingenious. These systems were supplied and paid for by the State, thereby precluding any individual profit or monopoly, and although not on a par with our own modern system of supply on demand, were, nonetheless, an incredible feat of ancient engineering skill.

Next, we will look at some of the devices, such as water clocks, water wheels and mills, which made use of the water supply provided by this early hydraulic engineering.