THE AQUA CLAUDIA INTERRUPTION
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ABSTRACT
The eighth of eleven aqueducts, the Aqua Claudia, constructed between 38 and 52, accounted for a fifth of Rome's water supply at the time of its construction, thus making it one of the most important of the Roman aqueducts. Shortly after its construction, the Claudia was out of operation for nine years, and it appears no attempt was made to repair it. A study of the literature suggests poor construction methods and materials may have been the cause of such an unlikely event. A closer examination reveals a more probable reason – fire and imperial whim.

It is generally agreed that the city of ancient Rome had eleven major aqueducts, all built in a five-century period, and possibly a few minor aqueducts, probably between eight and twelve in number (see Appendix for a list of the eleven aqueducts). The first major aqueduct was built in 312 BC and the last around AD 226. Some of the aqueducts outlasted the Empire and remained in use well into the Middle Ages. Some parts of the Roman water system are still in use today.

The estimated total length of the major aqueducts is between 448 and 502 kilometres. Approximately 80% of the total length of the aqueducts ran underground. The rest was carried in channels; only a small percentage used the magnificent bridges and viaducts that are usually associated with the aqueducts. The shortest aqueduct, the Appia, was only 16 kilometres long and the longest, the Marcia, was 91 kilometres long. Hodge (2002:347) gives an estimated total output of 1 127 220 cubic metres of water per day in total. One can deduce then, that when the population may have been well over a million, the distribution system would have been able to provide more than one cubic metre of water per day for each inhabitant of the city of Rome. By comparison, New York City consumes 5,55 million cubic metres of water per day for six million inhabitants (not including commuters who work in, but do not live in the city) (Elert 2004). According to the Rand Water Board (2007:5), they supply 3,55 million cubic metres of water to 11 million people in Gauteng daily. Thus, both New York and Gauteng supply less than 1 cubic metre of water per person per day. The Roman water supply exceeded this quite comfortably.
Much of the water was not intended for use as potable water, but for entertainment. By the end of the 4th century AD Rome had eleven large public baths, 965 smaller bathhouses and 1,352 public fountains (Heiken, Funicelli & De Rita 2005:129). Water usage ranged from hundreds of thousands of litres of water per day for the largest baths, to merely thousands for small fountains. The quality of the water was generally high, as it was well aerated and did not stand, while settling tanks removed particulate matter.

Of all that is unknown about the aqueducts, their construction, paths and purpose, one mystery that stands out is that of the nine year interruption of service of the Aqua Claudia.

Caligula (AD 12-41) initiated the construction of the Claudia in AD 38. Caligula had ordered its construction because the seven existing aqueducts were by now inadequate, due to the demand for water for consumption and the growing popularity of the baths. It was officially completed by Claudius (10 BC-AD 54) in AD 52. The date of completion is given in an inscription at Porta Maggiore (CIL 6:1256), but Tacitus (Ann. 11.13) suggests that the aqueduct was in use by AD 47. This is not implausible; it was fairly common practice to begin using an aqueduct before construction was completed. It is on account of its massive arches that the Claudia is one of Rome’s most visually impressive aqueducts. The Claudia was the most ambitious of the aqueducts (Coarelli 2007:448).

Its source is a number of springs in the Anio Valley, near modern Agosta and close to the sources of the Marcia. Originally there were two springs, the Caeruleus and Curtius. Later these were to be supplemented by the Albudinus spring. From its source the Claudia descended along the right bank of the Anio, mostly underground and slightly uphill from Marcia’s channel. Originally the Claudia crossed to the left bank of the Anio over a bridge below modern Vicovaro. Remains of this bridge still exist, and have been incorporated into a modern road bridge.

Hadrian built an alternate loop that crossed the Anio upstream at the gorge of modern S. Costamato, near the base of the hydroelectric dam. On the left bank of the Anio the Claudia followed approximately the same route as that of the Marcia and Anio Vetus, even crossing their paths occasionally on its way around Tivoli towards the Alban Hills. The Claudia emerged above ground near Capannelle, like the Marcia, and crossed the land near Romavvecchia on a long series of attractive high arches. After about ten kilometres on these arches, the Claudia entered Rome at Spes Vetus, modern Porta Maggiore, and crossed the Via Praenestina and Labicana. Its castellum, or terminal reservoir, was on the Esquiline Hill, near the 4th-century temple of Minerva Medica. After Nero (AD 37-68) built the Arcus Neroniani, one of the Claudia’s branch lines, the aqueduct supplied water to all fourteen
districts because of its height. Domitian (AD 51-96) also added a branch to supply water to the imperial palaces on the Palatine Hill. It was one of the more difficult aqueducts to maintain, possibly because of its overall length and technical innovations. The Claudia was 69 km long and delivered 185,000 cubic metres of water per day.

We can judge the importance of the Claudia by its impressive castellum. Nothing remains of it; it was destroyed by fire in 1880 when it was being used as a hay barn (Aicher 1995:55). Giovanni Piranesi’s (1720-1778) etching is useful when imagining what the 21.5 by 14.2 metres and several storeys-high castellum looked like. The Porta Maggiore can be seen in the background of this etching.

Inscriptions on the Porta Praenestina indicate that Vespasian (AD 9-79) and Titus (AD 39-81) repaired the aqueduct shortly after its completion, in AD 71, after a nine-year period of inoperation. Furthermore, Hadrian (AD 76-138) and the Severan dynasty carried out later restorations.

The three inscriptions at Porta Maggiore state:

1. TI. CLAUDIVS. DRVS| . F. CAISAR . AVGSTVS . GERMANICVS . PONTIF. MAXIM
2. TRIBVNICIA . POTESTATE . XII . COS . V . IMPERATOR . XXVII . PATER . PATRÆ
3. AQUIAS . CLAUDIVAM . EX . FONTIBVS . QVI . VOCABANTVR . CAERVLEVS . ET . CVRTIVS . A MILLIARIO . XXXV
4. ITEM . ANIEMEM . NOVAM . A MILLIARIO . LXII . SVA . IMPENSA . IN VRBEM . PERDVCVDNDAS . CVRANT
(CIL 6:1256).1

1. IMP . CAESAR . VESPASIANVS . AVGSTVS . PONTIF . MAX . TRIB . POT . II
2. IMP . VI . COS . III . DESIG . III . P . P
4. PER ANNOS . NOVEM . SVA . IMPENSA . VRBI . RESTITVIT
(CIL 6:1257).2

1 Tiberius Claudius Caesar Augustus Germanicus, the son of Drusus, pontifex maximus, in his twelfth year of tribunician power, consul for the fifth time, imperator 27 times, father of his country, saw to it that, at his own expense, the aqua Claudia be brought from the 45th milestone, from the springs which are called Caeruleus and Curtius, and too the Anio Novus be brought from the 62nd milestone into the city of Rome.

2 The Emperor Caesar Vespasian Augustus, pontifex maximus, in his second year of the tribunician power, imperator six times, consul designate for the fourth time, father of his country, at his own expense restored for the city of Rome the Curtian
1. IMP. T. CAESAR. DIVI. F. VESPASIANVS. AVGVSTVS. PONTIFEX.
MAXIMVS. TRIBVNIC.
2. POTESTATE. X. IMPERATOR. XVII. PATER. PATRIAE. CENSOR. COS.
VIII.
3. AOVAS. CVRTIAM. ET. CAERVLEAM. PERDVCTAS. A DIVO.
CLAVDIO. ET. POSTEA.
4. A DIVO. VESPASIANO. PATRE. SVO. VRBI. RESTITVTAS. CVM. A
CAPITE. AQUARVM. A SOLO. VETVSTATE. DILAPSAE. ESSENT. NOVA.
FORMA. REDEVCDNAS. SVA. IMPENSA. CVRavit (CIL. 6:1258).

Brick stamps from AD 123 provide the evidence for Hadrian’s restoration, which had an elegance about it which was unusual in this type of undertaking. Restorations during the later, less prosperous period were more utilitarian in nature.

The nine-year hiatus in operation is a puzzling aspect, especially when it is realised that the Claudia accounted for nearly 20% of Rome’s water supply at that time. It is exceedingly strange that the aqueduct should break only 15 years after entering operation, and only 8 years after its official opening, unless it was poorly constructed, the ambitions of its builders exceeded their abilities, or it suffered a series of unfortunate disasters, or all three. The frequent repairs, while not unusual for an aqueduct, are initially more frequent than for the other aqueducts, which suggest inferior construction. Titus’s inscription certainly suggests poor construction, if by AD 81 the aqueduct needed repairs ‘down to its foundations’. However, while low-quality material and construction might explain why the Claudia collapsed, it does not explain why it took so long to repair it.

The interruption has been doubted by a number of authors (Richardson 1992:16). One of the reasons given is that Vespasian claimed to have repaired the Claudia for propaganda reasons. While emperors may not have been above inflating their accomplishments, the repair of an aqueduct was

and Caerulean waters that had been brought forth by the divine Claudius and subsequently had fallen into disrepair and had been interrupted for nine years.

1 The Emperor Titus Caesar Vespasian Augustus, son of the divine Vespasian, pontifex maximus, in his tenth year of the tribunician power, imperator for the seventeenth time, father of his country, censor, consul for the eighth time, saw to it that, at his own expense, the Curtian and Caerulean waters that had been brought forth by the divine Claudius and afterwards had been restored for the city of Rome by the divine Vespasian, his father, since they had fallen into disrepair at the source of the waters from the very foundation because of age, he brought back again but in a new channel.
not uncommon nor particularly prestigious enough to inflate imperial honour to any significant degree.

Some major events of the 60s serve to provide additional clues for the hiatus. Firstly, there was a major earthquake in southern Italy on 5 February AD 62, which caused extensive damage to a number of towns, including Pompeii. Though there is little to no evidence suggesting that the earthquake affected Rome, the date coincides with the breakdown of the Claudia. In the same year a storm wrecked 200 ships in the newly-constructed, but still-incomplete, Claudian harbour at Ostia, and 100 more by accidental fire further upstream (Tac. Ann. 15.18). There has been some speculation that the storm may have been a tsunami, caused by the same earthquake that damaged Pompeii. If this is the case, it points to a powerful earthquake that might have caused some damage to Rome; the collapse of some badly-made bridges or viaducts might perhaps go some way to explaining the Claudian interruption.

One result of the storm was the loss of huge quantities of corn at the harbour, in warehouses and on the ships. The destruction of so much corn, when Nero had just thrown away vast quantities of old spoilt corn, must have led to shortages. These particular events may not have damaged the aqueduct itself, but may have further drained the imperial coffers (Nero was well known for his financial irresponsibility; Cary & Scullard 1975:361), resulting in delayed repairs. However, there is some evidence for expenditure on other construction projects during this period.

Another possible explanation may be that, during the construction of the Arcus Neroniani, the Claudia was purposely shut off. This is unlikely, as it would not have been necessary to cut off the supply for more time than it would take to connect the branch, a few weeks at most.

Nero toured Greece from 67-68. His imperious showmanship not only caused him to neglect urgent public business, but involved him in riotous expenditure which threw the state finances into grave embarrassment (Cary & Scullard 1975:359). This may have reduced the state’s capacity to repair the Claudia.

There are some other possibilities to consider. While the measurements for the water volume at their intakes are close for the Claudia and Marcia, Frontinus describes the Claudia as overly abundant. He also states that the channel could not receive all the water available at the intake (2.72). One can speculate that the intake was badly placed, and the abundance of water led to the occurrence of structural damage. This would necessitate rebuilding it at a more suitable location.
Flooding along the line of the aqueduct may be the culprit. Pliny the Younger (Ep. 8.17.3) writes of the Anio flooding and causing extensive damage. In Pliny's words:

The Anio ... has broken off and carried away most of the glades with which it is shaded. It has undermined the hillside, and in several places it is blocked by massive landslides. In its search for its lost course, it has battered buildings and forced its way, extricating itself over the fallen masonry ... [e]ven areas not reached by the rising river have not escaped the calamity. Instead of river-floods they have had incessant rain, tornadoes hurling down from the clouds ... (transl. Walsh 2006)

Though it is a stretch, earlier floods may have had a detrimental effect on the Claudia (and other aqueducts). Unfortunately, no evidence has been found yet for a flood at the time of the interruption.

According to Frontinus, the Claudia was especially susceptible to damage by water thieves, whose typical practice was to puncture aqueduct channels and drain them continuously. This could cause serious damage, and many would create their illicit channels in close proximity, seriously weakening a small section of the aqueduct and leading to leakage and partial collapse. Frontinus states (2.72):

Claudia, flowing more abundantly than the others, is especially exposed to depredation. In the records it is credited with only 2,855 quinariae, although I found at the intake 4,607 quinariae, 1,752 more than are recorded. Our gauging, however, is confirmed by the fact that at the seventh milestone from the City, at the settling reservoir, where the gauging is without question, we find 3,312 quinariae, 457 more than are recorded ... after many depredations ... only 1,750 quinariae are delivered, less than the computation shown in the records, and less than is shown in the gauging. (transl. Bennett 1925)

Taken in isolation these events suggest little, but in concert may have resulted in delayed repairs for the Claudia and would provide a partial explanation for the interruption. However, there is another possibility.

The fire that swept through Rome for more than a week in 64 devastated the city. Tacitus gives a dramatic account, stating that the fire left only four districts intact, destroying three totally and reducing the other seven to smoking ruins. In his own words (Ann. 15.38):

It began in the circus, where it adjoins the Palatine and Caelian Hills ... the conflagration instantly grew and swept the whole length of the circus ... the fire swept over the level spaces and then climbed the hills, but
returned to ravage the lower ground again ... When [the residents of Rome] escaped to neighbouring quarters, the fire followed even into districts believed too remote to be involved ... the flames overwhelmed the whole of the Palatine ... [the fire] was finally stamped out at the foot of the Esquiline Hill. (transl. Grant 1956)

However, flames broke out again and many temples and ‘pleasure arcades’ were destroyed. Tacitus also mentions that many buildings were demolished in an attempt to break the fire. It is likely that the Claudia was damaged by the fire, as it would have passed through some of the worst-affected regions. However, as the Claudia and Anio Novus met in Rome, and there is no mention of the Anio Novus being damaged, the reason for the shutdown of the Claudia is unlikely to be the damage of the fire itself. Instead, the fire may have reduced the combined Claudia/Anio Novus line to the extent that it would be unwarranted to repair the Claudia until the damage within Rome had been repaired. This is indeed quite plausible, as there would have been other priorities in the succeeding few months.

The fire may have had another effect. Subsequent to the fire, massive rebuilding took place in the area where the Flavian Amphitheatre, later known as the Coliseum, would be built. Nero began to build his Domus Aurea, or Golden Palace, which consisted of a forty-metre statue of Nero, parks, colonnades and, most significantly, a large lake. Suetonious (Nero c. 31) tells us:

An enormous pool, like a sea, was surrounded by buildings made to resemble cities, and by a landscape garden consisting of ploughed fields, vineyards, pastures and woodlands – where every variety of domestic and wild animal roamed about – sea water, or sulphur water, was always available on tap in the baths. (transl. Graves 1978)

The Domus Aurea ran from the Palatine and Velia to the edge of the Oppian, then east along the Servian Wall to the Caelian. From here it returned to the Palatine (Coarelli 2007:284).

The most convenient aqueduct to use to fill and maintain the lakes and water, the gardens and animals, would have been the Claudia. It is possible that Nero drained the Claudia for this purpose. Sometime between AD 70 and 72 Vespasian began the construction of the Flavian Amphitheatre. It would have been necessary to drain Nero’s lakes to build the amphitheatre, at which time the water from the Claudia would no longer be needed to maintain it. Indeed, such a vast quantity of water would have been dangerous and unhealthy; the obvious solution was to cut the Claudia. The timing of these two events is suggestive of a link.

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The remains of the Claudia show repeated efforts at repair, from its construction and throughout the 2nd and 3rd centuries (Richardson 1992: 16). It is entirely possible that the Claudia was badly built and suffered from poor workmanship; despite Vitruvius’s hope to the contrary, not all Roman buildings exhibited the property *firmitas*. Disasters due to poor workmanship were not unknown. Suetonius (*Aug. c. 43*) tells us of the panic in the Theatre of Marcellus shortly after its completion under Augustus, brought on by the crowd’s fear of the structural integrity of the building. Though the incident was brought on by the collapse of Augustus’s chair, the fact that the crowd panicked so easily suggests that such a disaster was not such a rare event. In Suetonius’s words (*Aug. c. 43*):

A panic started in the Theatre during a public performance in honour of Gaius and Lucius; the audience feared that the walls might collapse. Augustus, finding that he could do nothing else to pacify or reassure them, left his own box and sat in what seemed to be the most threatened part of the auditorium. (transl. Graves 1978)

At the collapse of the amphitheatre at Fidenae, which killed perhaps as many as twenty thousand people, which was justifiably considered a grievous calamity, Tiberius returned from his island retreat of Capri (Taylor 2002:5), an unusual act.

Poor workmanship, the storm, the construction of Arcus Neroniani and Nero’s fiscal irresponsibility are likely to have had some toll on the Claudia, perhaps reducing its capacity, perhaps causing periods of interruption. Of all the possible reasons for the collapse, it is probable that poor construction, fire and the *Domus Aurea* were the main reasons for the interruption. After Vespasian had drained Nero’s lake and repaired the Claudia, it managed to survive less than a decade before requiring additional repairs, perhaps due to general neglect during the interruption. After the Goths disrupted the Claudia in their siege of 537, Belisarius repaired it (see Procopius, *Bell. Goth. Books 1 & 2*). Surprisingly, it survived long enough and in reasonable enough condition for Pope Hadrian I, in 776, to restore it to use again, suggesting that ultimately the construction was not all that poor (Aicher 1995: 63). This suggests that use of the water for the *Domus Aurea* is the more likely explanation, though of course Titus’s repairs may be the cause of the longevity of the aqueduct.
Appendix

The Aqueducts of Rome

<table>
<thead>
<tr>
<th>Location</th>
<th>Length (km)</th>
<th>Date built</th>
<th>Constructed by</th>
<th>Discharge (cubic m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appia</td>
<td>16</td>
<td>312 BCE</td>
<td>Appius Claudius Caecus</td>
<td>73,000</td>
</tr>
<tr>
<td>Anio Vetus</td>
<td>64</td>
<td>273 BCE</td>
<td>Mantius Curtius Dentatus and Lucius</td>
<td>175,920</td>
</tr>
<tr>
<td>Marcia</td>
<td>91</td>
<td>144 BCE</td>
<td>Quintus Marcus Rex</td>
<td>187,600</td>
</tr>
<tr>
<td>Tepula</td>
<td>18</td>
<td>125 BCE</td>
<td>G. Servilius Caepio and L. Cassius Longinus</td>
<td>17,800</td>
</tr>
<tr>
<td>Julia</td>
<td>22</td>
<td>33 BCE</td>
<td>Agrippa</td>
<td>68,240</td>
</tr>
<tr>
<td>Virgo</td>
<td>21</td>
<td>19 BCE</td>
<td>Agrippa</td>
<td>100,160</td>
</tr>
<tr>
<td>Alsietina</td>
<td>33</td>
<td>2 BCE</td>
<td>Augustus</td>
<td>15,680</td>
</tr>
<tr>
<td>Claudia</td>
<td>69</td>
<td>38-52 CE</td>
<td>Caligula and Claudius</td>
<td>184,220</td>
</tr>
<tr>
<td>Anio Novus</td>
<td>92</td>
<td>38-52 CE</td>
<td>Caligula and Claudius</td>
<td>189,520</td>
</tr>
<tr>
<td>Traiana</td>
<td>35-60</td>
<td>103 CE</td>
<td>Trajan</td>
<td>113,920</td>
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<td>Alexandria</td>
<td>22</td>
<td>c. 200 CE</td>
<td>Alexander Severus</td>
<td>21,160</td>
</tr>
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</table>

Bibliography


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