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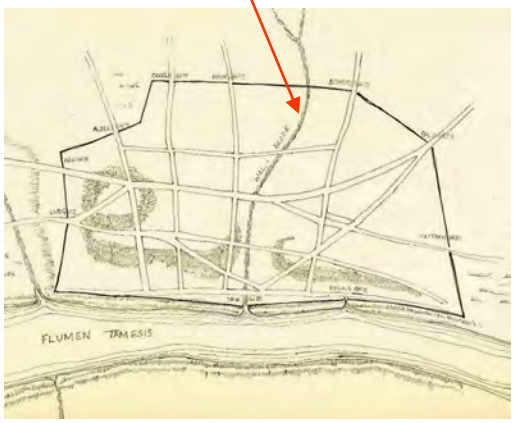
London—

Beginnings in Forced Labour and Murder?

With London hosting the 30th Olympiad in July/August 2012 there is an increased interest in the origins of the city.

The city of London is made up of 25 wards, one of which is called 'the Ward of Walbrook'. Walbrook Street in the Ward of Walbrook follows the course of what was a river on the surface, the River Walbrook, but which is today one of many 'lost' rivers of London, rivers now running entirely underground.



In the 1860s some hundreds of skulls (examples pictured opposite), but almost no other skeletal remains, were found along the course of the River Walbrook. An early theory for the origin of the skulls was that they represented the decapitated remains of defeated military force, rather as the 12th century 'historian' Geoffrey of Monmouth had reported in his *Historia Regnum Britanniae* ('History of the Kings of Britain') the casting into the River Gallobroc of the heads of a defeated legion of Roman soldiers who had been besieged in London by the legendary king of Britain, Julius Asclepiodotus. However, more recent excavation and reflection suggests that the skulls may point to the origins of London in forced labour and wholesale murder.

Hence, the River Walbrook in the Ward of Walbrook is located at the centre of the place where London was founded. The River rising at what is today Finsbury, flowed through the centre of the walled-city of Londinium (in effect bisecting the settlement, see map above) and on into the River Thames at what is now Dowgate.

The traditional theory is that in approximately AD 50, some seven years after the Roman invasion of AD 43, Londinium was established by the Romans as a mercantile centre. There had probably not been a pre-Roman settlement, despite the rich pre-Roman history alleged for the place by Geoffrey of Monmouth. About ten years after its initial foundation Londinium was destroyed by Queen Boudicca's Iceni tribesmen.

The speculation now is that Londinium was founded as a military base, its reconstruction facilitated by slave labour whose reward for service was decapitation, the heads consigned to the River Walbank. The archaeologist Dominic Perring, of University College London, thinks the slave force may have been Queen Boudicca's captured Iceni tribesmen (see this month's *British Archaeology*). Thus, the skulls were defleshed and were mainly of young men, facts suggesting execution. Moreover, the reconstruction evidences the use not of Roman carpentry but of traditional or native woodworking, suggesting the use of native labour.

And the fact that there is no evidence of the construction of temples or civic buildings suggests that the site was not for civic use. It may thus be that London began as a military establishment and was perhaps the command centre for the whole of Roman Britain. Ed.

Carsulae: a Roman Town in Umbria, Italy

Norah Cooper

Anyone who has experienced the pleasures of going round the wonderful ruins of Ostia Antica just near Rome, would also love Carsulae in Umbria, a little gem of a ruined Roman town. It lies just 100 km north of Rome but in the mountains east of the main highway to Florence. The result is that it has few visitors. A great pity as it is like a miniature Ostia Antica and located in a beautiful, scenic area. It gets a mention in Tacitus writing about Vespasian's general Marcus Antonius Primus, who in the civil war of AD 69 camped there on his march to Rome: "*On arriving at Carsulae, the leaders of the Flavian party rested a few days and waited for the eagles and standards of the legions to come up. They also regarded with favour the actual situation of their camp, which had a wide outlook, and secured their supply of stores, because of the prosperous towns behind them…..*" (Historiae, III, 60).

The Carsulae area (circled in map below) had settlements from the mid Bronze Age (15th century BC) to the 5th century BC; these settlements tended to be positioned on high ground. From the 4th century BC there were intrusions by the aggressive and expanding little Roman state further south and in the 1st century BC the region's inhabitants became 'Roman' and registered as citizens in the *Clustumina* tribe. The building of the *Via Flaminia* (see map below) from Rome to Rimini (Arminum) by Gaius Flaminius (during his censorship 220 BC) opened up the region and soon gave rise to a new town – Carsulae, located on the highway and beside natural springs.

The *Via Flaminia* was built to move troops quickly into conquered territory. It's building was crucial to the development of Carsulae, which became a way-station for the transportation not only of armies but of goods and people to and from the sea port at Ariminum on the Adriatic coast and for wheat from the Po Valley to Rome and central Italy. The *Via Flaminia* divides into two branches at Narnia; the oldest eastern branch went to Spoleto (*Spoletium*) and the shorter western branch (Carsulae- Mevania) became the preferred route from the 1st century BC to Late Antiquity. The *Via Flaminia* entered Carsulae from the south and left through San Damiano's Arch, to the north. (See Google image below of Carsulae area).

Carsulae was a *municipium* by the time of Augustus and most of the public buildings which still survive are from the Augustan period, arranged around the forum and along *Via Flaminia,* which formed the *cardo maximus* of the settlement. The town consists of the usual Roman public buildings: a forum with temples and businesses, a basilica, a theatre, an amphitheatre and thermal baths.

Today, you enter Carsulae from the southeast through a small museum. As you walk north along the *Via Flaminia,* on the west are the new excavations of the thermal baths. Continue north and on your right is the 11th century church of San Damiano which was originally built on the foundations of a Roman building in paleo-Christian times. (Photos top next page)

On the west side are the Twin Temples which were faced in pink limestone slabs. They are on a raised podium in the forum and were probably dedicated to the *Dioscuri*, Castor and Pollux, the healing twins, perhaps associated with the mineral springs .
A partially- reconstructed flight of stone stairs lead up to the temples. (Photo below of view of temples with stairs)

Looking southwest from the temples there is a cistern which today is rebuilt as a storage for antiquities with several inscribed monumental stones outside it. (Photo opposite) The wall here shows a good example of *Opus Mixtum* a combination of *Opus Testaceum* (a concrete wall with horizontally faced bricks) and *Opus Reticulatum* (a netlike arrangement of small, diamond-shaped tufa stones, embedded in concrete walls and aligned diagonally –see photo of theatre below). These were common in central Italy in the 1st century BC to 1st century AD.

The forum, which was the centre of the town was originally entered from the east through two arches; only one reconstructed arch is now standing next to the temples, with a lovely view through the arch to the amphitheatre and hills beyond. In the forum you can still see the raised decorative pavement with several buildings including the *curia*, the seat of the senate and municipal government and *tabernae* (market stalls).

Arch entrance to Forum with amphitheatre in background

Forum with *curia*

The *Via Decumanus* which runs east-west across the *Via Flaminia* leads to the 1st century AD (probably Flavian period) theatre (photo directly below) which was built of layers of limestone blocks and bricks in a natural cavity.

Vomitorium from amphitheatre at Carsulae

The photo immediately above left of page shows the *vomitorium* (a passage situated below or behind a tier of seats in an amphitheatre and through which big crowds can rapidly exit) at Carsulae.

The Augustan theatre (photo opposite) which lies immediately behind (and east of) the amphitheatre, has a classical configuration with a *scaena* (building behind the stage), *pulpitum* (part of stage used by actors), and semi-circular *orchestra* (space between audience and stage). The *cavea* (auditorium) is supported by 15 vaulted rooms. Note *Opus Reticulatum* facing

San Damiano's Arch (also known as Arco di Traiano) is 220 m north of the forum (photo above). It was built in the Augustan period and originally consisted of three marble-clad arches. Only the central arch now stands. And just through San Damiano's Arch, in the city necropolis, there is a huge monumental tomb (photo above) consisting of a square base supporting a cylindrical core, possibly belonging to the *Gens Furia* (according to an inscription) dating from 2nd half of the first century AD.

Just further on in the necropolis, a buried travertine sarcophagus was discovered during recent excavations (photo below right of page). It contained a lead coffin (photo below) which is now in the Carsulae museum. The remains of a young girl with a gold necklace and earrings were inside.

The only buildings which have been excavated at Carsulae are the official government ones. The houses of the common people, who enjoyed both the benefits of living in a fertile plain and in a town which enjoyed a great passing trade along the *Via Flaminia,* and also the country villas of wealthy important Romans who came to Carsulae for the healthy waters, are not visible. Carsulae may be the place which Pliny the Elder referred to in an account of the cultivation of vines in the 1st century AD. It is certainly one of the places in which Pompeia Celerina, the rich mother-in-law of Pliny the Younger, had a villa.

Carsulae is a substantial town, though we don't know the extent of the domestic area; the distance between the Arch of San Damiano to the Thermal Baths is 400 m; and between the western end of the forum and the eastern tip of the theatre is 300 m. The long diameter of the arena area of the amphitheatre is 56 m and the superstructure of the stands is 15 m in depth. For comparison, the arena diameter of the Colosseum is 80 m, but the depth of the three-storied superstructure is 25 m. Carsulae provided a provincial amphitheatre for a much smaller number of spectators than in Rome.

Carsulae was a thriving town until the 4th century AD when the western branch of the *Via Flaminia* fell into disuse. It was abandoned around the mid 6th century perhaps because of an earthquake. There had also been Visigoth incursions under Alaric in 410. The people probably moved to nearby San Gemini (name is equivalent to Dioscuri) where today there are still popular mineral springs.

Excavations at Carsulae began in the 16th century by Italian aristocrats but it seems to have been mainly in pursuit of artefacts which are now in palazzi in Umbria and in the Vatican. Systematic excavations by Umberto Ciotti were carried out from 1951-1972 and these were the basis for Carsulae as it is today.

My thanks to fellow travellers Roger Cooper and Sheila and John Fulton.

The Romans in America

David Kennedy

A generation ago it became fashionable again in the USA to explore the extent to which the Founding Fathers of the young republic had been influenced by a Classical education or at least by being educated within an ambiance in which the Graeco-Roman past was a significant part of the everyday vocabulary and thought of educated people. The latter would be expected to understand allusions to Cicero or Cato or Scipio Aemilianus or the Gracchi. The influential figures of the Roman past tended – inevitably, to be drawn from the Roman Republic or at least the opponents of monarchical tyrants before that such as the two Brutuses. Much of this can be followed in the books listed at the end of this article.

The centuries of the Roman Empire offered models of a different kind – those which could be emulated in concrete terms: the monumental architecture of the emperors or the imperial elites in the provinces. Matters became more confused in the early days of the new American Republic when Republican France passed into the hands of a new Caesar who presided over a new Empire style in art, architecture, furniture, clothing and even in his own public imagery. Napoleon's embrace of the Roman past – which included his initial adoption of the title of Consul and his later anointing of his infant son as King of Rome, dates broadly to the period after 1800.

Already there were powerful hints of the new fashion and Americans in the land of their French ally were captivated by the Roman remains they saw around them and were soon carrying home and turning into public buildings.

Architecture

Thomas Jefferson is renowned as the principal author of the American Declaration of Independence and as Third President of the US. Less well-known is his period as first US Ambassador to France from 1784-9, immediately after the end of the Revolutionary War (1775-83). Jefferson would have brought a mind to the new landscape already well-attuned to the Classical past. He had been brought up on the study of Greek and Latin (as well as becoming proficient in three other languages) and had studied the great 16th century Venetian architect, Andrea Palladio. The latter's revival of interest in the architecture of ancient Rome had already given rise to a Palladian style in western Europe and as early as 1768 Jefferson had begun work on his plantation house in his home state at Monticello in Virginia.

Jefferson's five years as ambassador included travel around France – far from easy then and for a century afterwards. In 1787 he made a tour in the south including to Nîmes – Roman Nemausus (see RAG 6.3), a modest and backward place squatting amongst the ruins of the great monuments of the Roman colony. At the forefront of these was the superbly preserved Roman temple, the La Maison Carrée (pictures below—the second picture is of La Maison Carrée as a church).

But before he reached Nîmes and was brought under the spell of this temple he had stopped at neighbouring Roman sites and written about his journey to his friend Madame de Tessé. The letter is worth quoting in part (The entire letter can be read online):

Nismes [sic], *March 20, 1787*

Here I am, Madam, gazing whole hours at the Maison quarrée (sic)*, like a lover at his mistress. The stocking weavers and silk spinners around it, consider me as a hypochondriac Englishman, about to write with a pistol, the last chapter of his history. This is the second time I have been in love since left Paris. ... From Lyons to Nismes I have been nourished with the remains of Roman grandeur. They have always brought you to my mind, because I know your affection for whatever is Roman and noble. At Vienne [Roman Vienna] I thought of you. But I am glad you were not there; for you would have seen me more angry than, I hope, you will ever see me. The Praetorian palace, as it is called, comparable, for its fine proportions, to the Maison quarrée, defaced by the barbarians who have converted it to its present purpose, its beautiful fluted Corinthian columns cut out, in part, to make space for Gothic windows, and hewed down, in the residue, to the plane of the building, was enough, you must admit, to disturb my composure. At Orange [Roman Arausio] too, I thought of you. I was sure you had seen with pleasure, the sublime triumphal arch of Marius at the entrance of the city. I went then to the Arenae [= theatre]. Would you*

believe, Madam, that in this eighteenth century, in France, under the reign of Louis XVI. they are at this moment pulling down the circular wall of this superb remain, to pave a road? And that too from a hill which is itself an entire mass of stone, just as fit, and more accessible? A former intendant, a M. de Basville has rendered his memory dear to the traveller and amateur, by the pains he took to preserve and restore these monuments of antiquity. The present one (I do not know who he is) is demolishing the object, to make a good road to it. I thought of you again, and I was then in great good humor, at the Pont du Gard, a sublime antiquity, and well preserved. But most of all here, where Roman taste, genius and magnificence, excite ideas analogous to yours at every step. could no longer oppose the inclination to avail myself of your permission to write to you, ...

I have the honor to be, Madam, your most obedient and most humble servant,

Thomas Jefferson

Jefferson's visit/tour soon produced a result across the Atlantic. The following year work began at Richmond on the Virginia State Capitol. It was designed by Jefferson and modelled on La Maison Carrée at Nîmes.

The resulting Roman 'temple' in the heart of the Old South has witnessed two great moments in history. Between 1861-5 it had become the Senate House of the Confederacy, under its President, the aptly named Jefferson Davis. Briefer but more dramatic were the events of 4 April 1865. Richmond had fallen to Union forces the previous day and Abraham Lincoln swiftly arrived to lay symbolic claim to the centres of power – the Senate and the White House of the Confederacy (another neoclassical building dating from 1809). A contemporary view (of precisely 1865) preserved in an early photograph (below), shows the building as Lincoln would have seen it – minus the surrounding wreckage of recent battle. One wonders if Honest Abe, self-educated backwoodsman from Illinois, standing in the empty chamber with his 12 year old son, Tad, appreciated Jefferson's architectural inspiration.

Completed just after Jefferson's death and burial at Monticello (colour photo below) in 1826 was new University of Virginia at which the centre-piece was the Rotunda (old photo below) he had designed. It was modelled as a conscious evocation of the great temple built by Hadrian in Rome, the Pantheon.

Jefferson himself was commemorated in monuments widely, not least beside the Potomac River in Washington. The Jefferson Memorial was built between 1939-1943 but by then, neoclassical architecture was (almost) out of fashion and one critic condemned it as constituting a "tired architectural lie." The 6 m tall bronze statue of Jefferson inside is also 20th century but is curiously Roman in its huge scale – an uncommon feature of even royal statues in Europe but found elsewhere in the USA, not least that of Lincoln nearby.

Postscript 1:

La Maison Carrée also inspired La Madeleine in Paris – after various false starts it was commissioned by Napoleon as a 'Temple de la Gloire de la Grande Armée', finally dedicated as a church in 1842.

Postscript 2:

Nîmes made a further contribution to American culture. Blue 'Jeans' derive their name from the French name for Genoa (Gênes) from which a cotton textile originated. Later it was replaced by a heavier weave originating from Nîmes, 'de Nîmes' (= denim).

Reinhold, M. (1984) *Classica Americana: The Greek and Roman Heritage in the United State,* Detriot (Wayne State UP)

Reinhold, M. and Haase, W. (eds) (1994) *The Classical Tradition and the Americas,* Berlin-New York

Rome, Mining and Western Anatolia

Graham Sylvester

Graham Sylvester is a retired geologist who is now writing a Master's thesis at UWA on THE 'DISCOVERY' OF ANCIENT MINES – A METHODOLOGY BASED UPON INVESTIGATIONS OF THE DERININ TEPE GOLD MINE, WESTERN ANATOLIA. *He has recently returned from his first season of fieldwork in western Turkey.*

The power of Rome was founded upon the wealth produced from mining. The fabulously rich gold and silver deposits in Spain, Gaul, Dacia, northern Italy and other areas produced the wealth to both sustain the society and support the military in its dual roles of expanding and defending the empire. When the reserves of these deposits – not least in Spain then the loss of Dacia, began to be depleted the empire found it increasingly difficult to sustain the huge outpouring of precious metal coinage.

It was not just mining *per se* that led to the accumulation of wealth. It was the Roman inventiveness and the ability to innovate that was the key to their success.

The Greek philosophers and natural scientists of the 3rd and 4th century BC were aware of mechanics and natural laws that governed hydraulics but were ascetics and had no interest in putting their observations to practical use (they deplored the idea). They viewed technology as a base art. According to the anecdote related by Plutarch (Plutarch: *Marcellus* 17.3-4) about Archimedes, he considered any practical application of his research demeaning. The Romans on the other hand were very practical and were quite prepared to harness such findings and by use of engineering innovation put them to practical and productive use. Probably the most important use of the scientific findings lay in the capture of water and the use of hydraulic power. The initial use of water power lay in the field of agriculture: the ability to transport water over long distances using aqueducts; the ability to raise water through various mechanical devices and the capability of using water power to drive water wheels to run grain grinding and crushing facilities. This occurred during the 3rd century BC. Roman engineers soon applied these technologies to other activities, one of the most important being mining and ore processing in which by the first century AD water power was being used to drive trip hammers to crush ore. The other innovation of crucial importance to the development of mining and ore processing was the ability to transform rotary motion into reciprocating linear motion. The application of this technological innovation to the crushing of ore allowed the development of mining on an impressive scale by the 2nd and 3rd centuries AD.

Before the application of hydraulic power, mining had largely been confined to the extraction of minerals from surficial elluvial or alluvial deposits and to a lesser extent by gouging of valuable minerals from outcrops. Whilst the Greeks at the Laurion silver mines and subsequently, the Romans, used running water to concentrate ore minerals on washing tables, the Romans went further and mechanised practically the whole process of exploration, mining and ore processing. The Roman precious metal mines of the Iberian Peninsula utilised the most advanced and large-scaled applications of technology witnessed by the world until the advent of the European industrial revolution over one and a half millennia later.

Figure 1. Collapsed old workings at Derinin Tepe

The Romans developed the hydraulic techniques of hushing and ground sluicing. Hushing is the method of breaking up and removing overburden by periodic, rapid release of a large volume of water from a reservoir to expose the underlying ore. It commonly involved the driving of adits into the overburden then collapsing them to destabilise the ground to make the hushing more effective. Ground sluicing involves the direction of a steady stream of water over an alluvial or elluvial deposit to free the ore minerals and the collection of those minerals by water washing in a sluice box. It was commonly applied in series with hushing. Pliny in the 1st C. AD

Figure 2. Old test opening at Derinin Tepe

described the effectiveness of these techniques in the Spanish mines. Application of these techniques would not have been possible without the use of the Roman aqueduct technology—to develop this they invested huge amounts of human resources.

The need for location of more mineral deposits for exploitation took the Romans far afield and into the mountains. The difficulties and hence costs of exploiting primary deposits, especially in mountainous regions, were much greater than for working secondary deposits. These deposits had to be mined by opencast or underground mining, both of which were expensive and limited by the water table level. Mining could only be undertaken below the natural water table depth if the water level could be reduced (and maintained) by use of drainage machines. Extensive usage was made of water lifting devices such as the treadwheel and Archimedes screw. Pliny describes the drainage operation in a Spanish silver mine with a gallery a mile and a half long where men stood continuously pumping out water by lamplight to create a river. It was also difficult to use machinery in the underground galleries, adits and shafts because they were very limited in size. Pliny does however, refer to a *fractura machina* which incorporated 100kg weights to attack mining faces in adits whilst evidence exists for the use of a primitive underground railway for transport of ore in the Galeria dos Alargamentos in Spain.

Ore processing and smelting were crucial steps in the liberation of wealth from the mined ores. Considerable evidence exists of the Roman use of mechanised crushing and grinding of ores. The Romans were also well aware of and utilized the various techniques of smelting developed in Anatolia two millennia earlier.

Whilst there is considerable documented historical evidence of the extent of Roman mine production perhaps the most striking comes from the Greenland ice core measurements of atmospheric pollution. Isotope studies demonstrate that considerable atmospheric pollution with lead isotopic ratios characteristic of the Roman lead-silver mines in Spain was so widespread between the 3rd century BC through until the 3rd century CE that it is graphically recorded in the Greenland ice many thousands of km distant from Spain. The lead pollution level in the cores rises to a peak in the 79 BC sample with the levels maintaining a slightly declining plateau through until the early 3rd century AD. Similarly, evidence of copper pollution resulting from the Roman smelting of copper ores is preserved in the ice cores. The levels of atmospheric copper pollution were high from the first century BC through into the 2nd century CE and at levels not to be exceeded until the Industrial Revolution. Hong *et al.* (1996) estimated that copper emissions to the atmosphere must have been between 2100-2200 tonnes per year with actual metal production being many times more than that amount.

It can be seen that the Roman mining technology enabled the extraction of metals on an unprecedented scale. Polybius in the mid 2nd century BC stated that the silver mines in the Cartagena region of Spain produced 35 tonnes of silver per year, whilst Pliny observed that the gold mines of Asturia, Callaecia and Lusitania collectively produced in excess of 9 tonnes of gold each year.

Thus did mining continue at maximal rates through until the mine reserves began to be depleted during the 2nd and 3rd centuries AD. Diminishing production, as evidenced by the fall in pollution values recorded in the Greenland ice cores, combined with increased civil unrest requiring improved payment to the legionaries to maintain loyalty and natural attrition (wear and coin loss which is estimated to have been about 2 %) resulted in successive debasements of the silver coinage from the denarius containing 97% silver at the end of the 1st century AD to 40% by 250 AD and merely 4% by 270 AD. In addition to depletion of reserves, the Spanish mines were increasingly threatened by Moorish incursion and a sharp drop in output occurred about 190 AD. To this was added the loss of the Dacian silver mines in 258 -259 CE. These factors contributed significantly to the currency debasement and a worsening of the economy. A consequence of the deteriorating economic climate was increased pressure to find new deposits, especially in regions of the empire that were relatively secure, such as Western Anatolia.

Figure 3. Old workings at the Kizil Prospect near Sindirgi.

Roman involvement in Asia began in 133 BC when she acquired the kingdom of Pergamum, and created the Roman Province of Asia.. After the civil wars that brought Octavian to power as the Emperor Augustus (traditionally 30 BC), there was a period of c.300 years during which the province was entirely free of war. This was a time of great prosperity and saw the development of wealthy cities, some with combined populations of as many as 250,000 people. The standards of living and health were high. The cities were largely occupied by Greek speakers whereas the rural areas were mainly populated by native Anatolians. The

Figure 4. Backfilled workings at the Toscu Prospect near Sindirgi.

cities remained essentially free of excessive Roman interference but under the official control of a Roman governor, who was changed each year. By the middle of the first century AD the whole of Asia Minor had been incorporated into the Roman Empire in the form of provinces.

Mining had always been a feature of life in Anatolia. Copper had been extracted as long ago as 6000 BC and Anatolia became the cradle of metallurgical development during the Chalcolithic and Bronze Age periods. Gold and silver had been traded across Anatolia from Syria to the Aegean for over a thousand years up to the end of 3rd millennia BC. Throughout much of the 2nd millennium BC copper, silver and to a much lesser extent tin, were extracted from small operations widespread throughout Anatolia. After the fall of the Hittite civilisation towards the end of the 2nd millennium the strong kingdoms of Phrygia and Lydia were established in inland western Anatolia. These powerful kingdoms coexisted (although often in conflict) with the Greek coastal communities of Ionia and Aeolia which had begun to be established about 1000 BC. Phrygia was the more powerful kingdom during the 8th century. Its wealth was based upon gold and the legend of King Midas and his golden touch is evidence of that prosperity. By the end of the 8th century BC Lydia under King Gyges had become the more powerful of the two and after the destruction of the Phrygian kingdom by the barbarian Cimmerians in the 7th century BC Lydia became the dominant force in inland western Anatolia. Once again the strength and wealth of this kingdom was derived from gold. Much of this gold was gained from the rich alluvial deposits found on the Pactolus River in the southern part of the kingdom near its capitol Sardis. As with Midas the wealth of the Lydian kings became legendary, Croesus in the 6th century being the most famous.

The development of the first gold coinage is believed to have occurred in Lydia about 640 BC. The coins, developed to standardise trade, were composed 78% gold and 22% silver - a mixture referred to as electrum. During the course of much of the first millennium BC trade was strong between the wealthy coastal communities of the Aegean east through the Meander Valley across Lydia and east to Syria, Persia and the eastern kingdoms. These trade routes appear to have been little affected either by the subsequent Persian occupation of Anatolia or the events following the overthrow of the Persians by Alexander in 331 BC. So at the time of the occupation by the Romans in 133 BC western Anatolia was an area of political stability, rich in mineral resources and having well established trade routes with links to both Europe via the Aegean and to the east and Western Asia. In this stable environment mining was of course embarked upon to supply the taxes and tribute demanded by Rome.

What do we know about the Roman mining activities in western Anatolia? The answer is unfortunately very little. It is known that elsewhere in the empire at this time, that whilst the majority of mines were owned and operated by the State (commonly using slave and condemned criminal labour), some operations were run under what would now be called public-private partnerships: the mines were commonly operated by *publicani* who rented the rights to mine. For large mines substantial infrastructure and operating equipment would have been required. The provision of all of that was the responsibility of the *publicani*, wealthy individuals or mining companies (*societates*). That the size of some operations could have been very large and that many of these *publicani* became very rich is highlighted by Pliny's statement that the *publicani* who operated the gold mines at Victimulae in northern Italy were prohibited from employing more than 5000 men. Evidence from Vipasca in Spain shows that laws governing the rights of concessionaires to exploit the state owned silver and copper mines declare that concessionaires had to commence mining within 25 days of being granted the rights to mine and that they must not leave the mine inactive for more than 10 days. Failure to comply would mean forfeiture. Extracts from statute documents issued by Emperor Valentinian in 365 AD give details of the royalty payment to be made to the state for an individual's right to mine. That figure amounted to an annual fee currently equivalent to around $A700.

Figure 5. The Toscu Prospect near Sindirgi.

Whilst there are many old mines known in western Anatolia, few if any can be conclusively established as of being Roman in origin. The writer visited a number of these sites during a recent trip to Turkey. The locations are shown on the Map on page 6 above. Observations on four of these follow.

Derinin Tepe (meaning ‘deep cave hill’ in Turkish) is a gold prospect consisting of a series of old workings on massive quartz veins and located in the Balikesir Province of western Turkey, 28 km east of the town of Bigadiç (site of the largest boron deposit in the world) at an elevation of over 1200 m above sea level. The old workings are assumed (by the mining company that currently holds the mineral title and the local people) to be of Roman age and are located within 10 km of the Roman hot spring centre of Hisakoy. The surface workings cover a strike extent of about 2 km. The quartz veins vary in width up to a maximum of

Figure 6. Gold bearing scree from the ancient gold workings at the Kepez Prospect near Hisakoy

about 8 m. Figure 1 shows a typical example of these old workings. Exploration drilling has shown that the workings extend to a depth of about 50 m and cover a strike extent of about 200 m. It is believed that the deposit was accessed by driving an adit into the steep hillside to reach the vein system. The deposit was then mined by the process known as stoping where ore is removed from the roof to form a gallery. The ore would have been removed for processing and the waste returned to the gallery as a floor upon which continued upward stoping proceeded. Drill holes have penetrated a number of these backfilled areas in the old mine. It appears that at Derinin Tepe the stopes were continued to the surface as there is no evidence of waste rock on the site and the old workings are collapsed. A number of small openings are found along the vein system which are interpreted as old test openings (Figure 2) where gold values were too low to warrant further work. This view is substantiated by current sampling which has verified low gold grades in the veins at these points. It is believed that the miners were seeking high grade ore (most likely displaying visible gold) as there is no evidence on the site of any ore processing. It is likely that the ore was removed from this remote and rugged site for processing elsewhere. Field examination revealed no trace of surficial mining and no tools have ever been found. None of the old underground workings are accessible so little is really known about the history of this mine. The local inhabitants have no cultural knowledge of the origins of the old mine which is not surprising as the village has only been in existence for about 500 years.

The Kizil (red in Turkish) prospect is located on flat land a few km east of Sindirgi. It covers a series of gold mineralised quartz veins up to 5 m wide which have a strike extent of greater than 1.5 km. These have been tested in the past (possibly Roman). A number of old test pits are visible but none of the workings appear to be extensive. Drilling by the current mining title holder has indicated that the gold mineralisation extends to a depth of at least 200 m.

Nearby is the Toscu (rabbit) prospect which has extensive old underground workings on the high grade area of the gold bearing quartz vein where current sampling has returned gold values of 40-50 gm/tonne These underground working have been exposed by current trenching (Figures 4 and 5). They are narrow (about 1 m wide) and are backfilled with waste. There is no evidence of gouging and no tools have been recovered. There is a small amount of rubble on the site which may possibly indicate local ore processing.

At the Kepez Prospect, located high in the hills above the Hisakoy hot springs site about 20 km east of Sindirgi, there is considerable evidence of old mining activities. Massive quartz veins up to 20 m wide were mined primarily from adits driven into the side of the steep hills. These adits are collapsed and are no longer accessible. There is also ample evidence of surface working and there is a large accumulation of discarded hand cobbed quartz vein material which forms an extensive scree slope on the hillside. Sampling of this scree by the current titleholder has indicated that some of the material contains gold at concentrations of 40-50 gm/tonne.

The above mentioned sites are just a few of very many such sites in western Turkey. Whilst the ones visited are old gold workings there are also examples of ancient copper and other metal workings. Few, if any, of these sites have been studied in any detail in a geoarchaeological context and this represents a potentially very fruitful area of research for those interested in the history of mining in western Anatolia and how those mining activities fitted into the society of the time.

Figure 7. Massive quartz veining on the hilltop at Kepez where extensive ancient mining has taken place.

Roman Archaeology at UWA

Roman Archaeology and 'the Arab Spring' —Update

In RAG 6.3 we reported on the effects of the upheavals in the Arab world including Syria. The media this week has reported the halting of the excavations at Zalebiyeh on the Euphrates. The Euphrates has been the scene of a string of major dams from Turkey down to Iraq. Each has inundated extensive areas of the rich alluvial soils along the valley and flooded numerous sites; most famously the major Roman cities of Samosata and Zeugma in Turkey. A new dam in Syria has been under construction on the central Euphrates and had been the scene of several excavations to salvage evidence before sites disappeared.

The Society of Antiquaries this month has reported that excavations by an international team, including Manchester University, had had to be discontinued because of the insecurity in the region, not least in Deir es-Zor where the archaeologists were living. This great fortress, along with Halebiyeh on the opposite bank of the Euphrates, was one of a pair of Late Roman sites controlling the river route between the Roman and Sassanian empires, and there seems no likelihood matters will allow the archaeologists to return soon.

Jarash Hinterland Survey

Work is in progress on the mass of data collected in the course of three seasons. The objective is a book and Andrew Card has agreed to work a day a week on helping co-ordinate efforts and drive the enterprise to completion.

Don Boyer – who financed almost all of the second and third seasons, is working on a Master's thesis studying the water supply of the Jarash region. He will be in Jordan in May to pursue fieldwork for the research.

Aerial Archaeology in Jordan (AAJ) 2012

The next season will be a short one. Two flights are planned for May this year to allow us to explore the lavafield of the Harret al-Shaam in the wet season. Hopefully, with areas of standing water and vegetation still green, we will get insights to help explain the location and nature of sites.

Mat Dalton

Mat joined the AAJ project several months ago and played a key role in the last flying season (Sept-Nov. 2011). He has been working for some years with projects in Cyprus and Sudan and has taken two months leave to return with the British Museum team to Sudan.

Rebecca Banks

Rebecca was the winner of the first Don Boyer Roman Archaeology Travel Scholarship and joined the AAJ project last year. She started on 1.5 days a week but has proven a considerable asset and now works 4-5 days a week. She, too, joined the flying season last October.

Mycenaean Civilization

Linear B (commonly referred to as 'Mycenaean Greek') is almost certainly a precursor to classical Greek and the socio-political values expressed in Homeric epic poetry and Hesiodic didactic poetry are thought to reflect to a degree Mycenaean society, although written centuries later.

It at least seems certain that Mycenaean civilization left a significant legacy to the ancient Greek societies that followed it, and thus it left a legacy to Rome: Homer was for Virgil a model, and ancient Greek language and literature in general had a profound effect on Rome. Mycenaean archaeological sites in Greece, for example Mycenae itself in the Argolid, are deeply interesting and in a number of places in Greece a full or near full profile of historical periods from Neolithic to Ottoman can be inspected at the one site.

Foreshadowing the Greek archaeological tour in November 2012 referred to in RAG 6.3, there will be five illustrated lectures on Linear B and Mycenaean Civilization at the University Extension Summer School beginning March 6, 2012. Details can be found on the University extension website.

Decline and Fall of the Roman Empire

The first pair of lectures will be in SSLT on Saturday 21 January. Two further pairs will follow on 25th February and 24th March.

Further enquiries to Norah Cooper (coopsathome@optusner.com.au); booking for afternoon tea to Maire Gomes (maire@westmount.com.au).

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