

PART III

**Archaeology and Ancient
Technology**

CHAPTER 16

The Orientation of Towns and Centuriation

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1 Introduction

The establishment of Roman colonies in Italy was a fairly common occurrence from the late fourth century but it was only later, in the second half of the second century, that colonies were founded outside of the Italian Peninsula. Eventually colonies were established in many parts of the Roman world and the foundation of each colony included a decision or decisions about its spatial organization and the orientation of the city. Although there were differing types of colonies, a colony was essentially a city-state that included an urban as well as a rural area. In Italy, Latin colonies (*coloniae Latinae*) were settled by individuals who did not possess Roman citizenship, and Citizen colonies (*coloniae civium Romanorum*) were settled by individuals who did have Roman citizenship. There was a third category, that of *municipium*, which was an annexed foreign community that, following its incorporation into the Roman state, was allowed to keep its own governing structure. Eventually there were also *coloniae militares*, settled originally for the veteran soldiers of Sulla and Julius Caesar (Salmon, 1970).

The decision about when and where to found a colony was approved by the Roman people and during the Republic colonization was preceded by a law (*Lex coloniae*) passed by the Plebeian Assembly (Gargola, 1995). Commissioners, often including ex-consuls, and usually three in number, were appointed to oversee and supervise all aspects of the foundation. They defined the boundaries of the new colony, assigned the allotments, settled any disputes, wrote the charter of foundation and appointed the first magistrates and priests of the colony (Dilke, 1985, 1987a). The formal act of colonization was known as *deductio* and it was this practice that included the laying out of the area of the colony together with the necessary elements of an urban and rural structure, either on new land or on land that had been occupied previously. *Deductio* also included

religious augural rituals of foundation. According to Virgil (*Aen.* 5.755–6) Aeneas founded a second city Troy in Sicily by plowing, and then he distributed the land by a lottery. Tacitus (*Ann.* 12.24) mentions the Forum Boarium as the location of the starting point where the founder of Rome began digging his furrow, “sulcus primigenius”; this was the original furrow and the outer boundary of a newly founded city, made by a plow pulled by a bull and heifer. Appian and Plutarch give a good deal of information about the foundation of Iunonia at Carthage in 123, a colony whose charter was later revoked. Appian (*B Civ.* 1.24–5) says that the triumvirs oversaw the location of the city, the centuriation of the land and the recruitment of the colonists. Plutarch (*C. Gracch.* 11) mentions that formal ceremonies were carried out despite prohibitory signs from the gods, including probably the laying out of boundary markers that were set upon by wolves and carried away.

2 Roman City Planning

Organized and regular city and land planning was not invented by the Romans. There are a number of earlier civilizations that had practiced this kind of interest, including the Etruscans, the Greeks, and civilizations of the Near East (Ward-Perkins, 1974). Varro noted that the origins of centuriation come from the Etruscan world and that *limites* (paths or roads) between plots of land originated with the Etruscans (extract in Frontin. *De limitibus*; see Campbell, 2000). Probably the best excavated example of Etruscan town and landscape planning is at Marzabotto, on the banks of the Reno River, 25km south-west of modern Bologna; the city dates to the late sixth or early fifth century. The plan shows a regular organization of the roads and streets into a grid with divisions approximately 165m long and 40–60 m wide. The orientation of the city is close to true north–south (Ward-Perkins, 1974; Grimal, 1983). At Marzabotto, the *mundus* was discovered; it was a central feature of the organization, a sacrificial pit and a link between the city of the living and the dead. Also found at Marzabotto were *cippi* that marked the intersection of the major roads and, at what presumably would have been the center of the planning organization, was the *cippus* that marked where the *gromatic* survey would have originated.

Colonial Greek examples of regular city and landscape planning in southern Italy and Sicily exist, for instance, at Paestum and Syracuse by the sixth century. There is even evidence of regular city planning in Megara Hyblaea as early as the late eighth century (Ward-Perkins, 1974). Aristotle (*Pol.* 7.1330a), in describing the optimum city, notes how a city is to be divided and laid out. But it was the Romans who took the idea of the organized and well-planned city and landscape and applied it to the cities of the ancient world with common standards and objectives. The underlying reason that the Romans were so keen on urban and rural organization is that it tied in very closely with their system of taxation and the generation of revenue. With an organized system of land in the urban and rural areas of their cities, taxes could be easily calculated based on the area of land owned. It was an early form of what we would call in the present day a GIS (geographic information system), linking the spatial data of the urban *insulae* and rural plots with information about ownership, agricultural production and taxes. The importance of this information cannot be underestimated, since the tax revenue from the produce of the agricultural fields of rural plots of land would be one of the driving forces of the politics of the Late Republic.

Yet even by the beginning of the Republican period, Roman colonies and cities in Italy, and eventually all over the Empire, were characterized as having regular and predictable organization for both their urban and rural aspects (Salmon, 1970). There were streets and roads in the urban center of the city that were parallel and that met perpendicular cross roads at regular intervals, making the orthogonal “Roman grid.” Of course the cities were not necessarily oriented to exact north, or exact east, and in reality there were many different orientations for Roman colonies and cities. The layout of the roadways was critical to the successful life of a city. The *cardo maximus* (the main east–west street) and the *decumanus maximus* (the main north–south street) would have been the first roadways to be surveyed and laid out. Pseudo-Hyginus (*De limitibus constituendis*) mentions that Augustus had specific recommendations for the widths of these two major roadways: 40-foot width for the *decumanus maximus* and 20-foot width for the *cardo maximus*, with 12 feet and 8 feet for the lesser roadways (Campbell, 2000). It is known that centuriation was introduced to the Latin colonies after 338 and spread throughout the Roman Empire. Regularly planned Roman cities have been discovered all over the ancient world and it is the archaeological evidence, together with the literary and historical texts, that give us many of the details of the planning and organization of the urban and rural aspects of Roman cities.

Within the city, space for the forum was set out from the planning stage and it would have a specific shape and area (Rykwert, 1988). Typically, the forum would be close to the middle of the colony or city and it could be the place where the *cardo maximus* and the *decumanus maximus* intersected. Vitruvius (I.6.1) tells us that the proportions of the forum should be at a relationship of three times for the length and two times for the width, and he ties the size and shape of the forum directly to the fact that in Italy the spectacles were held in the forum.

Insulae were often of a uniform size; buildings and structures would be built within them. The amphitheater and circus could be set out within the new plan in fairly predictable places and the same would be true, generally speaking, for the markets, the baths, the basilicas, the temples and the areas of public assembly, including the theater and *odeion*. Areas of the city would be designated for houses and the domestic region; walls would commonly enclose the city, with gates opening to major streets (Rykwert, 1988). The agricultural fields that surrounded the Roman city or colony would have been divided up into regular units. These fields would characteristically be divided into squares or rectangles (*centuriae*) and they would be divided by paths and roads (*limites*) at regular intervals. Centuriation was typically applied to public land (*ager publicus*), land acquired by the state as a result of conquest, which was usually cultivated by individual landowners. Boundary stones were set out throughout the centuriated land to indicate where the *territorium* of the colony began and ended, and more detailed boundary markers were set into place to mark the specific locations of the agricultural fields with respect to the overall plan of the colony. Centuries were identified as being to the left (*sinistra*) or right (*dextra*) of the *decumanus maximus* and either beyond (*ultra*) the *cardo maximus* or on the near side of it (*citra*). The implication of this kind of organization meant that the surveyor was facing east for these descriptions to be true. The viewer would be able to learn from a single boundary marker in the landscape how far he was away from the *cardo maximus* or the *decumanus maximus* and how far from the origin of the system.

The map of the colony (*forma*), engraved in bronze, was set up in the forum of the colony to show the centuriated land. Although no *forma* in bronze has survived, there are multiple examples of *formae* in marble and on papyrus that show aspects of the city and land planning of a colony. The best examples of surviving ancient tax maps are the stone cadastral maps from Aurasio (Orange) in France (Piganiol, 1962; Salviat, 1977). These are remarkable documents that illustrate the location of fields around the Roman city and give the details of ownership and taxes. The maps also show areas of the landscape that are reserved for sanctuaries, or areas that are unable to be divided due to the presence of swamps or rivers. Some of the most interesting aspects of these marble maps are that they represent several different time periods and that there were land divisions that occurred one after the other in the same area; the latter represent surveys of land that were at times superimposed on one another. By the Imperial period, there appear to be seven or eight different orientations of land division in the areas that surrounded the city. These different orientations appear to be the result of differing phases of colonial settlement, from the original Gallic tribe occupying the area, the Tricastini, to the Roman colony for legionary veterans *Colonia Iulia Firma Secundanorum*, which was founded on their territory around 35. Another phase of centuriation likely developed in the Flavian period, when the town name was changed to *Colonia Flavia Tricastinorum*; the result was a change in land distribution that included allotments for the Tricastini tribe.

The stone maps depict fields divided by lines with no great width, probably indicating narrow paths, but the major roads have a width in the landscape. This reflected the practice of reserving land in the landscape for the most important of the roadways: an example of “*iter populo non debetur*” (see below). In their original location, these ancient maps were located near the theater of the city, to be used as a reference for magistrates, tax officials and other inhabitants of the city.

3 Roman Agrimensores

When a new Roman colony was built, the plan for the city would be provided and the measurement of the city would be carried out by the *agrimensores*, the land surveyors. We know a good deal about this professional group, which was a part of the Roman army, from a compilation of ancient texts that is known as the *Corpus agrimensorum Romanorum* (Dilke, 1971). The *Corpus* was originally compiled in the fourth or fifth century CE but includes texts as early as the first century CE. These texts give us information about the training of the *agrimensores* and their day-to-day activities, as well as some of the practical issues that they faced in the field. A number of hand-drawn illustrations, likely based on earlier Roman drawings, accompany the text and relate to the topics covered there.

The *agrimensores* used as their principal surveying instrument the *groma* (Grimal, 1983). This was a very simple instrument that consisted of a vertical staff with two horizontal cross bars connected by a bracket. Each of the ends of the crossbars supported a cord that was held vertical by a plumb bob. The *agrimensor* was able to use the *groma* to sight straight lines and right angles with great accuracy and was able to use this instrument in conjunction with *decempeda* or sighting rods. There would have been multiple assistants holding *decempeda*, working together with a surveyor and a single *groma*.

At the measuring out of a Roman colony, the groma would have been set up first in a location where much of the planned urban and rural areas of the colony or city could have been seen. The major *cardo* or *decumanus* would have been first sighted, the other major roadway would have been created at a right angle, and then the subsidiary roads would have been added. The *agrimensores* had a sophisticated method of checking the accuracy of the orientation of roads whereby they were able to make a visual check every fifth road (*quintarius*) and if an error was discovered it could be identified and swiftly corrected. The *quintarius* was usually a wider road in the Roman city.

Frontinus (*De limitibus* 37–43) gives us specific information about the question of orientation of colonies (Campbell, 2000). Frontinus says that colonies may take as their orientation the rising and setting of the sun, although he indicates that other solutions are possible as well. For instance, he cites the case where a reversal of orientation is possible when two colonies are close to one another, to prevent the same orientation for both of the colonies. Pliny (*HN* 18.76) has a passage on orientation in general in which he describes the method for an individual to determine east from sunrise and west from sunset and thereby locate south and north. Pseudo-Hyginus (*De limitibus constituendis*) indicates that a correct south bearing for the sun is necessary for centuriation of a colony. The correct south bearing that could be ascertained with the assistance of a gnomon would be the first step in being able to determine true east or true west, which were the cardinal directions for surveyors.

In preparation for a colonial foundation, the *agrimensores* would typically have worked under the supervision of the commissioners who were in charge of the foundation of the colony. The commissioners would have had several responsibilities: to delimit the boundaries of the territory of the colony (the *pertica*); to measure the *limites* of the city; to survey and to subdivide into sections the urban areas; and to do the same for the *territorium* of the colony. The survey of the urban as well as of the rural area of the city would be accomplished before the arrival of the colonists, since the division of urban and rural land would have been necessary before the allotment of plots of land could be carried out. Only after this had been accomplished could the actual allotments of land, both urban and rural, be measured out and assigned to the individual colonists.

The basic linear measure that was used by the *agrimensores* was the Roman foot (0.295+ m) and multiples of the Roman foot were calculated in terms of an *actus*, 120 linear feet. A square *actus* was 14,400 square feet and 2 square *actus* were known as one *iugerum* (thus Varro, as quoted in Frontin. *De limitibus*). Allotments of land for urban as well as for rural subdivision were calculated in *iugera* and in *heredia*, or 2 *iugera*. As an example in the Caesarian colony of Corinth the urban *insulae* were measured 1 *actus* wide and 2 or 4 *actus* in length, producing *insulae* of 1 or 2 *iugera*. *Cardines*, which could vary in width from 8 to 24 feet, divided the *insulae*. The major roadways were typically the widest, 25 feet or wider, and there were a variety of smaller roadway widths.

The roadways in the urban center could be planned and built so as to fully respect the entire calculated area of the *insula* according to a legal formula “*iter populo non debetur*,” meaning that the widths of the roads were added outside of the regular *iugera* measure of the *insulae* (Gargola, 1995). This would result in an urban area where there would be a multitude of roadways, *cardines* and *decumani*, but the areas of the *insulae*, since they were calculated in regular numbers of *iugera*, would be preserved. In the rural landscape there was a different solution, “*iter populo debetur*,”

which meant that roadways could be added over land that was divided into iugera for farming purposes. This would mean that portions of the assigned rural land would in fact be utilized as paths or cart roads through the agricultural fields. The reason for this was related to the fact that the rural roadways between large tracts of agricultural land were not always major thoroughfares and often could be narrow tracks. However, there were exceptions to this scenario, primarily for the widths of the *cardo maximus* and *decumanus maximus* in the *territorium*. These were in fact planned in the manner of the urban roadways as “*iter populo non debetur*,” meaning that the land for these major roadways in the rural *territorium* would be reserved, since they were important thoroughfares.

The objective of urban planning was to provide space for all of the many civic functions of a city. It would have been essential to start with a drawing that would have been the basis of the survey to be undertaken by the *agrimensores*. If the colony were to be created *de novo*, this drawing would have located every major building and structure in the city, including the forum, theater, temples, sanctuaries, baths, markets, basilica(s), tabularium, and possibly an amphitheater and circus. As the size of a colony or city would grow over time, there would be the need for increased numbers of buildings and structures, but it is likely that there would have been a reservation of land for the major buildings of a city from the beginning of the planning process. There would also have been a decision made as to the number of colonists and the necessary amount of domestic space in the urban area of the colony. Clearly the population could enlarge over time and the area for domestic buildings and services could have increased.

4 Rural Planning as Centuriation

The rural organization of a city or colony followed the survey by the *agrimensores* of the *territorium* (see also Chapter 13). The process of surveying and subdividing the land was known as *limitatio*. Once the surveyors had set out the borders of the colony, then the rural land could be subdivided. Originally the land was divided into *centuriae* that were equal to 100 units of land. The most common measurement of a *centuria* in the Augustan period was 20 by 20 *actus*, producing an area measuring about 200 iugera (Dilke, 1987b). Much of the area of the Po Valley was divided in this way. *Limites* were the essential framework of the centuriation system. Surveyed straight lines of no width were called *rigors* and surveyed lines with widths were called *limites*; the width of the *limites* could have varying dimensions. It was important for some of the rural *limites* to have a width to allow for passing vehicles. The *centuriae* were not always squares of 20 by 20 *actus*; they could also be 12 by 12 *actus* rectangles at Forum Iulii (Fréjus), or 21 by 20 at Cremona, or 25 by 16 at Beneventum (Benevento), or other measurements, as indicated by the ancient authors. The allocation of land varied from colony to colony and it is known from literary and historical sources that allotments of land came in various sizes depending on a variety of factors. Allotments for individual settlers ranged from 2 to 50 iugera. The smallest division of land was 2 iugera, also known as a *heredium*, a heritable plot of land. Typical allotments were in the range of 5, 8, 10 or 12 iugera, but there were also larger allotments of 20 iugera or more; in exceptional cases, as many as 100, 140 or 200 iugera were allotted to a colonist.

In the rural landscape there would be areas that were not attractive for agricultural purposes; for instance, swamps or gullies or lakes would likely be excluded from the measurement of centuriation, as at Aurasio. In addition, there could be rivers and streams that could overflow their banks at times and could diminish the amount of land within a particular surveyed area. There could also be previously existing sanctuaries or cemeteries or roadways that would not be surveyed. Land that was not surveyed by the *agrimensores* for any reason was called *subseciva*. The distribution of land to settlers utilized the method of a lottery that is clearly stipulated by Pseudo-Hyginus (*De limitibus constituendis*) and it is probably very likely that over time a single allocation of land may have been divided and subdivided based on inheritance over many generations.

It is fairly typical that the orientation of the centuriated land that is associated with a colony or city was in keeping with the orientation of the urban colony so that either the *cardo maximus* or the *decumanus maximus* or both would be represented in the territory as extensions of the urban roadways and at the same orientation. This is clearly documented in many of the illustrations that accompany the *Corpus agrimensorum Romanorum* as well as by scientific study of the Roman cities in the modern day. It is also true that there are systems of centuriation in the landscape surrounding a Roman city, the orientations of which do not necessarily correspond with the planning of the Roman city or colony. Certainly the orientation of some systems that are associated with a Roman colony are organized with respect to an existing roadway or to a physical feature of the environment: a coastline, a mountain range, or a river valley. Such is the case with Tarracina (Terracina), on the west coast of Italy midway between Rome and Naples, which was founded as a colony in 329 (Gasparri, 2000). Here the Via Appia, a major regional roadway extending south-east from Rome, serves as the *decumanus maximus* for the colony, as is explained by Pseudo-Hyginus (*De limitibus constituendis*). The roadway runs north-west-south-east and most of the centuriated land was to the north-east of the roadway towards the mountains. The centuriation appears to be laid out with respect to the *decumanus maximus* which intersects the coastline near the urban colony. A hand-drawn illustration from the *Corpus agrimensorum Romanorum* illustrates the layout of Tarracina with the Via Appia running through it. From Livy (VIII.21.11) we know that after defeating the Volscians Rome sent 300 settlers to the new colony, each receiving 2 iugera of land. This was a fairly small colonial settlement, lasting only three centuries, although additional settlers may have been added at a later time.

5 Roman Corinth

From Roman Achaëa, we know a good deal about the planning of the successive Roman colonies founded at Corinth, the first under Julius Caesar in 44 as the *Colonia Laus Iulia Corinthiensis*, and the second during the Flavian period as the *Colonia Iulia Flavia Augusta Corinthiensis* (see Chapters 35 and 37). Archaeological excavation and research, including computerized topographical survey with the methods of digital cartography, GIS and remote sensing, have provided a great deal of information about the successive Roman cities (Romano, 2003, 2005, 2010).

Following the sack of Corinth in 146 by the consul Lucius Mummius, who opposed the Corinthian leadership in the Achaean League against the coming of Rome, the Greek

city was deprived of its civic and political identity. The men were killed while the women, children, freedmen and freedwomen were sold into slavery. From the archaeological record it is clear that there was a partial and selective destruction of Greek structures and the city walls. Following the defeat of Corinth, the Roman Senate sent ten commissioners to assist Lucius Mummius in the settlement of Greece. This work included the sale of property confiscated from those who had been prominent in the fight against Rome (Livy *Per.* 51; Paus. 7.16.7–9).

During the 102 years from the capture of Corinth to the colonization by Julius Caesar, the land that had been under its control became largely *ager publicus*, although several ancient authors mention that Sikyon had taken over the care of a part of the Corinthian land. Evidence for the work of the Roman *agrimensores* at Corinth can be divided into three phases of activity: (i) an interim period lasting from the sack of Corinth in 146 until the foundation of the Caesarian colony in 44; (ii) the foundation of the Caesarian colony *Colonia Laus Iulia Corinthiensis* in 44; and (iii) the foundation of the Flavian colony of *Colonia Iulia Flavia Augusta Corinthiensis*.

The *Lex agraria* of 111 includes information that some parts of the Corinthia were measured out for sale or rent and boundary stones were erected. This epigraphical evidence matches evidence of a Roman roadway, in use between 146 and 44, which was found to have broken through the old wall of the Greek city of Corinth, near the Asklepieion. Both the epigraphy and the topography suggest that the activity mentioned in the *Lex agraria* was the same as the division of land to the north of the city and between the long walls of Corinth. A series of roadways extending from the coastline of the Corinthian Gulf to the city of Corinth have been identified as 8 *actus* apart from each other; one of these roads is the same width as the road that breaks through the Greek wall at the Asklepieion. There also exists a reservation of one *actus* in the landscape to the north of the city, interrupting the 8 *actus* units, that corresponds with the location of the *cardo maximus* within the Roman city. If these preparations had been made in the area to the north of the city between 146 and 44, it seems very likely that preparations for the colony were in progress long before the colonists were on their way. The process of centuriation, preceding the actual colonization, was one way in which the ground-work was laid for the eventual colonization process.

The orientation of these north–south roadways that extend from the Corinthian Gulf to the Greek walls of the city are uniformly 3 degrees west of north and they agree in their orientation with the later evidence of the roadways and *insulae* of Roman Corinth, taken from the curbstones of the principal roadways of the city. There are also several interim period roadways from the 146–44 phase that have been discovered within the limits of the former city, indicating that a new system of roads was extended throughout the former Greek city. This orientation was utilized by those who founded the colony of Julius Caesar in 44, as the urban organization of the colony is largely based on this direction. Three degrees west of north was close to true north or close to true east and was possibly related to the measurement of sunrise from the east. More importantly, it provided for the division of land north of the city and south of the Corinthian Gulf, land divisions that were consistently parallel to the coastline.

There is some evidence to suggest that the general orientation of the earlier Greek city of Corinth was more north-westerly, in the vicinity of 13 degrees to the west of north. This suggestion is based on the presumed orientation of the Greek Lechaion Road within

the Greek city and several other Greek roadways, as well as Greek buildings and structures within the walls of Corinth. It is also likely that the Greek port at Corinth was not in the same location as the Roman port but was located several kilometers to the west. When the Roman surveyors came in during the second century to lay out the centuriation to the north of the former Greek city of Corinth, their general north–south orientation of 3 degrees west of north was not the same as the earlier Greek orientation.

5.1 *Colonia Laus Iulia Corinthiensis*

There is considerable literary, historical, epigraphical and numismatic evidence concerning the foundation of Corinth by Julius Caesar. Although we do not know from the historical record how many colonists arrived to settle the colony, we do know from Strabo (8.6, 23) that most were freedmen, and Plutarch (*Caes.* 57. 5) implies that many were veterans. The Roman agrimensores' plan for Roman Corinth included a measured design for the overall urban limits as well as the location and dimensions for other specialized areas of the city. From archaeological evidence and the study of topographical maps, air photographs and satellite images, we know that the “drawing board” plan of the urban center included 4 centuries each of 32 by 15 actus or 240 iugera. Each of the four centuries of the urban colony was characterized as having the capacity for 29 cardines and 29 one-actus-wide insulae at the orientation of 3 degrees west of north, although the implementation of the colonial design may not have been completed in all areas of the city. The width of the excavated roadways varies from 8 to 24 feet. Each century was also designed to have the capacity for six decumani. The urban centuries of the colony were organized according to the formula “iter populo non debitur” meaning that the road widths were added outside of the regular insula measure. The overall size of the planned urban colony was 240 hectares or 593 acres and it fit largely within the Greek city walls. The *cardo maximus* of the urban colony was the Lechaion Road that extended the north–south length of the colony to the Corinthian Gulf, some 3,150 m from the rostra of the forum.

The evidence for centuriation of the *territorium* of Corinth outside of the urban center dating to the Caesarian colony indicates a division of land into large units of 16 by 24 actus, at the same orientation as the orthogonal grid of the city, 3 degrees west of north, or 3 degrees north of east (Figure 16.1). The large units were subdivided into smaller sections. The overall area of centuriation in the Corinthia associated with the colony of Julius Caesar at Corinth is *c.* 100 km.²

Within the area of the urban colony of Julius Caesar the forum area as a whole occupied 24 actus² or 12 iugera in its topographical center, measuring 6 actus east–west and 4 actus north–south (Figure 16.2). This large area included important aspects of the former Greek city including several large buildings, notably the South Stoa that was 164 m long. Many of the most important civic, political and religious buildings of the Roman colony would eventually be constructed within this space. Interestingly, the most important Augustan buildings that were built within the area of the forum were at an orientation other than the principal orientation of the colony. These buildings included the Julian Basilica and the South-east Building at the east end of the forum, Temple F (likely dedicated to Venus Genetrix) and the Fountain of Poseidon. Along the northern border of the area was built what is known as the North-west Stoa and towards the



Figure 16.1 Centuriation of the territorium of Corinth, dating to the time of the Caesarian colony. Source: David Gilman Romano, Corinth Computer Project.

middle of the forum area was constructed the Rostra and a large altar. In the Late Augustan period or slightly later, Temple E, Temple C and the West Shops were built in what appears to have been a western appendage to the forum, 2 by 4 actus in area (Figure 16.2).

It is perfectly clear to anyone looking at a plan of the Roman forum at Corinth that the Roman surveyors picked an orientation for many of these Augustan and later Roman buildings and structures that was not in keeping with the urban insulae grid of the new Roman colony of 3 degrees west of north. Although the overall space reserved for the forum was rectilinear, and designed with respect to the city plan, most of the new Roman buildings and structures added inside this space were not oriented with respect to the urban grid. The orientation of many of the Augustan buildings within the area of the forum was based on an earlier Greek orientation that was known from a Greek race-course in the area as well as the Greek North Building to the north of the forum that was slightly different from the orientation of two other major Greek buildings of the area, the Temple of Apollo on Temple Hill and the South Stoa. It is not completely clear why the Roman agrimensores chose this orientation for the most important buildings of the Roman colony, but they did.



Figure 16.2 Centuriation of the urban center of Corinth, dating to the time of the Caesarian colony. Source: David Gilman Romano, Corinth. Computer Project.

Table 16.1 The north–south orientation and unit size for parcels around Corinth in the Flavian era

<i>Unit</i>	<i>Geographical region</i>	<i>Orientation</i>	<i>Area (km²)</i>
A00	Sikyon north-west	N20°20'22"E	10
A0	Sikyon north	N34°22'32"E	12
A1	Sikyon	N62°26'52"E	40
A2	Sikyon coastal region	N48°24'42"E	58
A3	Nemea River area	N34°22'32"E	108
A4	Longopotamos River area	N20°20'22"E	27
A5	Corinth, Lechaion to Kenchreai	N6°18'12"E	142
A6	Corinth to Kenchreai, south corridor	N20°20'22"E	12
A7	Xerias River area	N7°43'58"W	30
A8*	West of Isthmus	N34°22'32"E	11
A9	West of Isthmus	N21°46'8"W	15
A10	East of Isthmus	N35°48'18"W	16
A11*	Area of canal (parallel to canal)	N48°20'02"W	17

5.2 *Colonia Iulia Flavia Augusta Corinthiensis*

The refoundation and renaming of Roman Corinth by the Flavians is known from epigraphical and numismatic evidence. The physical vestiges within both the city and the surrounding rural area attest to a second Roman land division that may be equated historically with the establishment of the *Colonia Iulia Flavia Augusta Corinthiensis* by Vespasian, although we do not know the exact date of the refoundation. The Flavian system of centuriation is characterized by a fan-shaped grid that is divided into ten differently oriented units in the plain immediately to the south of the Gulf of Corinth. Each of the units corresponds to a specific area of the coastal plain and all of the units, except one, are linked to each other by the simple ratio of the arctangent of 1:4, equal to the angle of 14° 2' 10". Each of the ten rectilinear units is roughly parallel to the coastline and to the river of the area. The length of the entire stretch of Flavian centuriation along the south coast of the Corinthian Gulf is *c.* 30 km. This kind of linking of centuriated units of land is known from other regions of the Roman Empire and is specifically a technique of Roman land division. Of course, the Roman agrimensores did not use degrees, minutes and seconds to determine the linking of these individual units of land. They used the simple ratio of 1:4 in a right triangle that produced this exact angle (see Table 16.1).

The reason for the linked orientation of these units of land along the southern coast of the Corinthian Gulf must be related to several geographical factors. First, the rivers drain towards the Gulf and many of the units seem to follow the general course of the rivers. Second, each of the units seems to be perpendicular to the coastline, creating rectilinear plots of land. Some of the units were surveyed on top of earlier surveyed areas of the Corinthia that are associated with the colony of Julius Caesar but there are several areas in the Corinthia that had not been centuriated previously. Along the coast these areas are in and around the city of Sikyon. The total amount of newly centuriated land

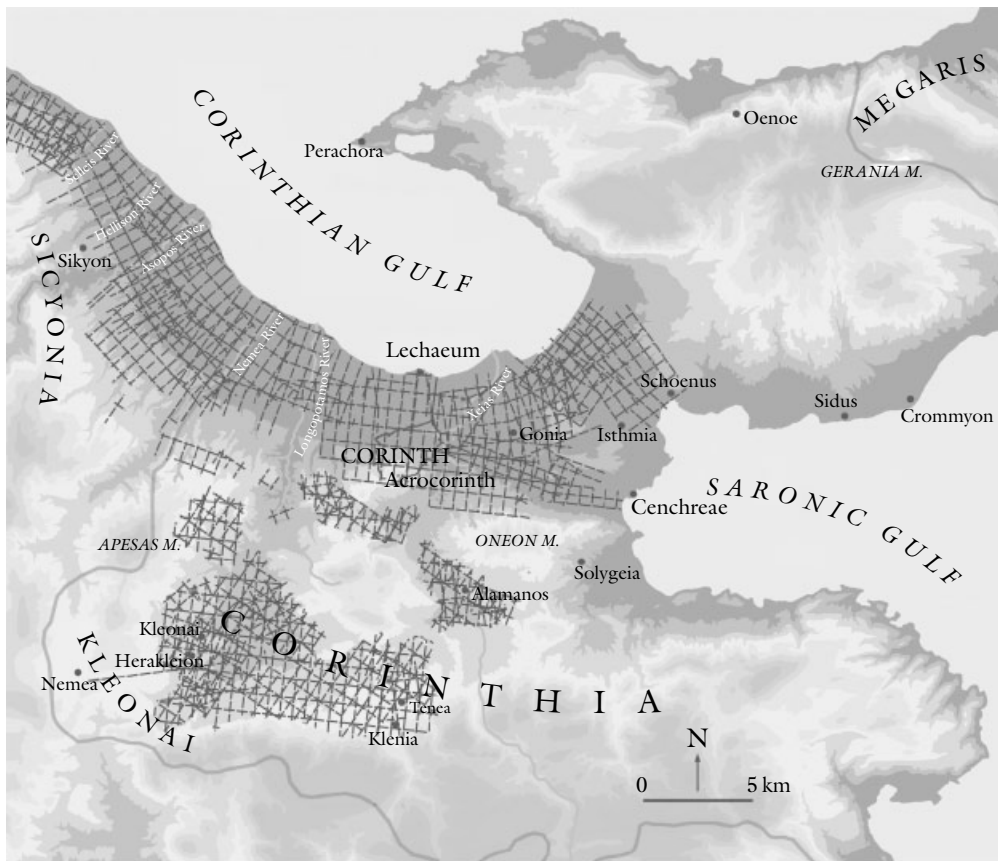


Figure 16.3 Centuriation of the territorium of Corinth, dating to the time of the Flavian colony. Source: David Gilman Romano, Corinth Computer Project.

in the Corinthia associated with the Flavian colony, including a large area of the central and southern Corinthia, is approximately 300 km² or roughly three times the area of the land centuriated in the Caesarian colony (Figure 16.3).

The proof that the large system of centuriation along the southern coast of the Gulf of Corinth is datable to the Flavian colonial refoundation at Corinth is found in the area of the Sanctuary of Demeter on the lower slopes of Akrocorinth. Three parallel Ionic prostyle Roman temples were built on the Upper Terrace of the Demeter Sanctuary, all with similar orientation. The temples are identified with Demeter (west), Kore (central) and possibly the Morai (east) and are datable to the period following the earthquake of the 1970s. A setting line on the top surface of the eastern wall of the central temple was measured to be only 3.5' of 1 degree from the orientation of the Flavian centuriation in this area, determined by independent means. It would appear that the temples were constructed with the specific orientation of the centuriated land. Their orientation is very different from the other temples that were built within the forum of Corinth and they were also different from that of the insular grid of the colony. Another building in the heart of the Roman city should be mentioned with respect to the Flavian surveyors

and the Flavian system of centuriation. In the Forum South-west, immediately to the west of the South Stoa, is a long narrow structure that is identified as the "Long Rectangular Building." This structure has been dated by ceramic evidence to the period of Nero. The orientation of the building and the adjacent monumental arch are less than 2 degrees, measured at foundation levels, different than the Flavian centuriation orientation, suggesting a possible connection.

The implications of the new system of centuriation in and around Corinth were that the areas of centuriated land were greatly enlarged during the Flavian period and there was, in great likelihood, an increased number of colonists. I have made the suggestion that this increase in population may have been related to an account in Josephus (*BJ* 3.540) that in 67 CE, Vespasian called for 6,000 strong male Jewish slaves, who were assembled in the stadium at Tiberias, to be sent to the Isthmus at Corinth, presumably in connection with the construction of the canal that had been initiated by Nero. Although the canal was not finished by Nero or by Vespasian, it is possible that the importation of these Jewish slaves to the Corinthia may have been related to the refoundation of Corinth as a Flavian colony. It is possible that the slaves may have been given their freedom together with plots of land in the Corinthia, or possibly the slaves may have become tenant farmers of the refounded colony. There may also have been the relocation of citizens of Sikyon or of other cities nearby.

With respect to the question of the size of the allotments that were given to the Corinthian colonists, based on the area of centuriation, I have estimated that between 12 and 24 iugera was the original allocation, to between 1,500 and 3,000 colonists for the Caesarian colony. For the Flavian colony the newly centuriated area is approximately three times the size and, if the allotments were the same, this would suggest an increase of between 4,500 and 9,000 colonists.

6 Conclusions

The study of urban and rural city planning bears on many different aspects of ancient history and archaeology. By means of modern techniques of computerized survey, digital cartography, GIS and remote sensing, together with the traditional literary, historical and archaeological evidence, aspects of the ancient city and landscape can be documented and interpreted in new ways. With respect specifically to the studies of the orientation of towns and centuriation, precise mapping on both the small and the large scale can provide unexpected and important discoveries.

FURTHER READING

Archaeological excavation and research in the area in and around Corinth was conducted under the auspices of the Corinth Excavations of the American School of Classical Studies at Athens; it was combined with a study of the planning of the Roman colony in the Corinth Computer Project from the University of Pennsylvania Museum of Archaeology and Anthropology. The results can be found at the Corinth Computer Project (<http://corinthcomputerproject.org>).

For an excellent study of historical, literary and practical aspects of Roman colonization see Salmon (1970). Rykwert (1988) brings together many subjects, civic as well as religious, which

relate to early examples of city and town planning. Dilke has written several important books and articles on the work of the agrimensores (including Dilke, 1971, 1985, 1987a, 1987b). An excellent translation of the *Corpus agrimensorum Romanorum* has been made by Campbell (2000). The study of Roman centuriation across Europe has been undertaken by the COST G2 Commission of the European Community, and a series of publications have appeared edited by Clavel-Lévêque and Orejas (1998, 2002), with a catalogue of case studies of documented systems of centuriation, often with discussion of the methods used to determine the results. Ward-Perkins (1974) provides an excellent introduction to the salient aspects of Greek and Roman city and landscape planning. Specific studies of ancient cities have produced many articles and monographs that deal with city and landscape planning. For Corinth, see Williams and Bookidis (2003) for a recent summary of current research at the site including the study of Roman centuriation and land planning.