

The Economic Rise and Political Fall of Classical Greece

Book in progress. Very preliminary DRAFT of chapters 2-3. Please do not cite.
Josiah Ober. Stanford University. jobber@stanford.edu. Draft of 140213

Introduction: the project

The following two chapters are adapted from a book in progress that pulls together some work I have been doing on classical Greek political thought and practice over the last 30 years, and sets it within an economic framework defined by “New Institutional Economics.” The book documents and explains the economic development of the Greek world in 800-300 BCE. This was a period of intense and sustained efflorescence, as the term is used by Jack Goldstone (2002): a extended period of intensive (per capita) and extensive (demographic) growth, accompanied by a sharp uptick in cultural achievement. Efflorescence is characterized by more people living at a higher level of welfare and by more culture at a higher level. Some of the evidence that the period 800-300 was an era of exceptional efflorescence, and a hypothetical explanation for that efflorescence was offered in Ober 2010. In a nutshell, the argument is that (1) this era saw unusually high levels (by premodern standards) of both demographic and per capita income growth, (2) Greek economic development was driven by political development. In the book I add (3) political development led to political fall -- i.e. the loss of independence of the Greek city-states to Macedonian and then Roman imperial states. Explaining why and how the Greek ecology of small states got so relatively wealthy and for so long seems particularly important insofar as Hellas is an exceptionally well documented and extensive small state ecology – and thus offers a counterpoint to recent work done on ancient empires (e.g. Alcock 2001, Turchin 2006, Morris 2009, Scheidel 2009).

On the empirical side, the project was made possible by the publication of the great *Inventory of Archaic and Classical Greek Poleis* (2004), compiled by an international team under the direction of the Danish scholar Mogens H. Hansen. The *Inventory* collects detailed information for 1035 Greek states known to have existed in the extended Greek world, across 45 regions, from the 8th through the later 4th century BCE. With the help of some students, I have reduced as much as possible of that evidence to a quantitative data set (soon to be available on a web page, now in beta testing). Part of the goal of the book is to use data from the *Inventory* to provide balance and background to the “great polis” (esp. Athens, Sparta, Syracuse) focus of conventional Greek history.

Chapter 2 uses quantitative evidence, much of it drawn from the *Inventory* to describe the “shape” of the small state ecology of Hellas: the world of the city-states. Chapter 3 is more conceptual: once we have a sense of what Hellas was, we can ask: how did it work? Here I employ the analogy of social insects, which was employed by both Aristotle and (critically) by Hobbes, in an attempt to explain the workings of a small state ecology. In the parts of the ms that are not offered here: Chapter 4 presents the evidence for efflorescence in detail. Chapter 5 develops two hypotheses (competition/emulation and rule egalitarianism) to establish “micro-foundations” in rational human behavior to explain the logic of the Greek institutions and culture that were, so I argue, drivers of economic growth. Chapters 6-10 offer a narrative

account of Greek history from the end of the Dark Age to ca. 300 BCE. The premise is that the explanatory argument developed in chapters 1-5 can be tested by the empirical evidence of Greek history, at least for “goodness of fit.” While narrative cannot definitively prove the hypotheses I offer to explain growth, I suppose that my argument would be falsified (or shown to be irrelevant) if I am unable to retell Greek history in a way that is both plausible (to Greek historians and historical economists) and sheds some new light on well known events and trends.

Ch. 2. Like ants around a pond? The ecology of Greek city-states.

In Plato’s dialogue, *Phaedo*, Socrates describes the corner of the earth that was in his day occupied by his fellow Greeks. He employs what initially appears to be a peculiar analogy: “The earth is very large and we ... live in a small part of it about the sea, *like ants or frogs around a pond*.” Although Plato himself knew little about the lives of ants, new research on ant behavior by evolutionary biologists, discussed in more detail in the next chapter, suggests that his seemingly far-fetched simile was in some ways startlingly apt: Greek society developed, through the historical mechanisms of cultural-institutional innovation, certain features that mimic structures of social behavior developed through evolutionary adaptation by ants. Just as self-conscious biomimicry has, in modernity, inspired notable technological breakthroughs (e.g. Velcro fasteners and drag-reducing “shark skin” swim suits), so too focusing on the unconscious biomimicry by the Greeks of certain behavioral patterns typical of social insects may help us to understand the underpinnings of the classical Greek efflorescence.

In this chapter, we will seek to establish some basic facts about the social ecology of the Greek world -- its extent, topography, and climate; its demography; and the ways in which the city-states of Hellas resembled and differed from one another. This in turn will set up a central question of how some human societies manage to cooperate at scale and over time without resort to centralized systems of authority. As we will see, in chapter 3, Plato’s student, Aristotle, took some important steps towards answering that question by following the interpretive path, briefly hinted at by Plato, of comparing Greeks to social insects. Plato and Aristotle had only limited knowledge of ant behavior. But we can apply what contemporary biological science tells us about the forms of cooperation typical of social insects to Hellas – and ask how forms of non-human cooperation track, and fail to track, the human dispersed-authority ecology of the Greek city-states. Aristotle’s use of the social insects/Greeks comparison, when read along with some insights from contemporary biological and social science, will help us to frame the question of how extensive cooperation in the absence of centralized authority could provide the framework for a sustained period of efflorescence.

Population and distribution

Assuming that the population modeling discussed later in this chapter and chapter 4 is on the right track, the total population of polis-dwelling Greek-speakers at the height of the classical efflorescence was in the region of 8.25 million persons.

In terms of comparison, that would something like 10-15% of the population of the Roman empire in the high imperial first/second century CE. In the late fourth century BCE Greeks may have made up around 3 - 4% of the world's total population – a figure roughly comparable to the percentage of the world's population currently made up by residents of the USA.¹

The total land area occupied by the Greek city-state culture (excluding unclaimed territory/wasteland between poleis and non-Greek populations interspersed among the poleis, as in Sicily, Anatolia, and around the Black Sea,) was about 190,000 km² – about one and a half times the total territory claimed by the modern Greek state. The overall population density of the ancient Greek world was, based on these calculations, about 44 persons per km². That figure is approximately equal to the modern population density of South Africa, Lithuania, or Panama; it is about midway between the population density of the United States (35/km²) and Mexico (60/km²).

The total surface area of the interconnected Mediterranean and Black Seas is about 15 times the land area occupied by ancient Greeks: about 3 million km² (approximately a third of the size of the USA or Europe). The combined length of the coastline of the two seas is about 50,000 km– roughly equivalent to the coastline of Indonesia and 2.5 times that of the USA. On and near the shores of these two very considerable bodies of water, and on the many habitable islands of the Mediterranean, there were, in Plato's and Aristotle's time, something in the order of 1100 Greek poleis.

The Greeks were not evenly distributed along the shores of the Mediterranean and Black Seas; see map 2.1. The great majority of the Greek states – more than nine in ten poleis, and at least seven-eighths of the total Greek population -- were concentrated in just one corner of Plato's pond: the northern and eastern quadrant of the Mediterranean basin: Sicily, southern Italy and the Adriatic islands, mainland Greece, the Aegean islands, western Anatolia. A handful of poleis were located on Mediterranean coasts west of Sicily (Emporion near modern Barcelona in northeastern Spain, Massalia in southern France = modern Marseilles). A few were located south of Crete, notably African Kyrene and Egyptian Naukratis. Most of the rest of the poleis that lay outside the intensely Greek eastern Mediterranean (a total of 92 known communities) were to be found on the shores of the Black Sea, including the Sea of Marmara.²

[Map 2.1 about here]

As we will see in more detail below (this chapter), a polis might have a population of several thousand, to several tens of thousands, to (in a very few cases) several hundred thousand persons. Although Plato could not have known it, the population range for the number of residents in large and small Greek city-states

¹ On the demography of the Greek world, see Hansen 2006, 2008 with discussion

² West of Sicily: 4 poleis in region 1 (total population under 20,000); south of Crete: 6 poleis in region 45 (total population under 100,000); Black Sea (including Marmara): 92 poleis (total population just under one million).

corresponds roughly to the range of populations found in the individual nests of some species of ants. Moreover, by coincidence, the total Greek population, at 8 million plus, is the right order of magnitude for the ecology of ants included in an important ongoing field study of Arizona harvester ants, a study that will be discussed in chapter 3.

Plato's analogy of polis-dwelling Greeks to ants or frogs around a pond points immediately to one of the most striking features of the Greek city-state ecology: Greek poleis were very seldom to be found far from the shores of sea. The majority of the poleis were located within about 25 km in a straight line from the coast, and most of the rest within 50 km from the coast.³ Of course, the overland routes of Greece were rarely straight, and travel to the coast was sometimes arduous due to the rugged terrain. Not every Greek state had easy access to the sea. Nevertheless, the pattern of polis location near the coasts is very striking and Plato's pond analogy is quite apt in this sense, as (we shall see) in others.

The Greek world was (and is) famously mountainous: About 80% of the land area of the modern Greek state is covered by mountains; Sicily, south Italy, and the regions of western Asia in which the Greeks settled in antiquity are similarly mountainous. In a few regions of the Greek world a substantial number of poleis lay far above sea level – high-elevation poleis were especially prevalent in Arcadia, where 28 of 39 poleis with measured elevation lay above 500 m and only 3 below 200 m. Sicily, Caria, and Crete also sported relatively high concentrations of poleis at higher elevations. Throughout most of the Greek world, however, most poleis were located at relatively low elevations: Well over half of the 902 poleis with a measured elevation (507: 56%) were located at elevations under 100 m above sea level, and fewer than a quarter (205: 23%) were located over 300 m. The distribution of poleis by region and by elevation is illustrated in Figure 2.1.

[Figure 2.1 about here]

Although there are notable examples of large and prominent high-elevation poleis (e.g., Kyrene at 616m m, Mantinea at 629m m, and Megalopolis at 406 m), higher elevation is negatively correlated, weakly overall but quite strongly in some regions (notably Sicily), to both polis size and prominence.⁴ The general preference of ancient Greeks for locating their states at lower elevations within their ruggedly mountainous homelands can be explained in part by the attraction to coastal regions for purposes of trade, and in part because much of the best arable land of Greece was relatively close to sea level. Both the fact that there was considerable

³ The only noteworthy exception is region 30: Inland Thrace – where a half-dozen towns were sufficiently Hellenic by the later fourth century BCE to qualify as poleis.

⁴ Overall correlation of elevation/size = Pearson -0.19; elevation/prominence: Pearson -0.13 In Sicily the correlations of both elevation to size and prominence = Pearson -0.48. Note that polis location, where precision is possible is measured at the center of the central city; large poleis, like Athens, included in their regions considerable high elevation territory, and some villages lay at elevations considerably higher than the main city.

intra- as well as inter-regional variation in polis elevation, and the fact that most poleis were *not* situated in inaccessible mountaintop locations are relevant to the development of the Greek economy. Both of these features of polis distribution also had a very significant bearing on the Greek way of war.

The distribution of poleis is noteworthy in respect to climate. With the exception of about 50 poleis around the Black Sea proper (north and east of the Sea of Marmara), the Greek city-states were located almost entirely within a particular and rare (in global terms) climactic zone characterized by a temperate, hot and dry summer, “Mediterranean” climate.⁵ Moreover, if we look more closely at the distribution and climate maps, we will see that (again the Black Sea poleis excepted) almost all Greek poleis were located in only one band of the Mediterranean climate zone: Greeks lived almost uniquely in places in which winter lows now average between -1C to 4C (30-40F) and 7-15C (45-60F). They never lived in the relatively “frigid” parts of the Mediterranean near-coastal zones, where winter lows are on the average below -1C (30F). In terms of rainfall, Greeks strictly avoided desert regions, that is areas with average rainfall in the range of 15-25 cm per year or less.

More surprisingly, perhaps, Greeks very seldom settled in regions that, today, see *any* substantial rainfall in the summer months. Although a fair part of the Mediterranean climate zone receives between 2.3 – 5.0 cm of rain per month in the summer (e.g. most of the west coast of Italy from Naples north, and the south coast of France), almost all Mediterranean Greek poleis – and thus the great majority of all poleis, were located in regions that currently receive less than 2.3 cm of rain in each of two consecutive summer months. This region was, in antiquity, unsuited to irrigation – there are very few major rivers in Greece. Those that there are did not lend themselves, and did the Nile and Tigris/Euphrates systems, to large-scale irrigation systems in antiquity. Without irrigation, and with very low summer rainfall, most plants are dormant in the mid-summer months. Most crops were therefore planted during the wet months and harvested before the driest part of the summer.⁶

⁵ Designated “Csa” (temperate/dry summer/hot summer) in the standard Köppen-Geiger climate classification system: Peel, Finlayson and McMahon 2007). Per below, “dry summer” includes a rainfall averages up to about 5 cm per month. Total average precipitation across the Greek world most of the Greek world ranges from ca. 20-50 cm (Attica, Cycladic islands, parts of Sicily and Cyprus), to 50-75 cm (Argolid, Lakonia, Korinthia, Boiotia, Thessaly, Thrace, Sporades and Dodecanese islands, Macedonia, E Crete), and up to to 75-125 cm (W Peloponnese, Epirus, Acharnania, Adriatic islands, Rhodes, W Crete, Caria). Source:

<http://www.bestcountryreports.com>. Precipitation maps for Greece, Italy, Turkey. Accessed November 7, 2013.

⁶ Source (accessed 2013.09.23):

<http://www.pacificbulbsociety.org/pbswiki/index.php/DrySummerClimates> = Pacific Bulb Society Map of Mediterranean summer rainfall:

http://www.pacificbulbsociety.org/pbswiki/files/00_others/Europe_climate.gif. On this map the range of Mediterranean climates is subdivided from A (“extreme desert”: 5-15 cm total annual rainfall) to G (“wetter”: rainfall of more than 2.3

By the classical era the Greeks had occupied virtually *all* of the territory in Eurasia (all of it near the Mediterranean) that falls in the specific moderate temperature and “dry but not too dry” rainfall bands described above – except, that is, for those regions that were claimed and successfully defended by another highly developed society. The Phoenicians and their kinsmen, the Carthaginians, occupied the relevant parts of the coastal Levant, the Mediterranean coast of Africa from the Tunis peninsula west, the big islands of Sardinia and Corsica, the smaller western Mediterranean islands, parts of western Sicily, and the Hispanic Mediterranean coast south of Barcelona/Emporion.

Evidently the Greeks – not unlike like particular species of ants – tended to occupy a very particular ecological niche. Their niche was characterized both by its proximity to seacoasts and by a specific climate of above-frigid winter temperatures and very (but not excessively) dry summers. By the classical period Greeks had occupied all the territory in that niche that was available to them. In thinking about the potential significance of the geographic distribution of Greek poleis, we will need to answer several related questions: First, since virtually all of the relevant (temperate/dry but not too dry) climate zone is to be found near the Mediterranean coasts, was the striking coastal, “around the pond,” distribution of poleis simply an epiphenomenon of a climate preference? Next, why were the Greeks so attached to (or alternatively so limited to) the particular coastal/climate niche? And finally did the narrow ecological niche in which Greeks mostly lived serve to promote or to inhibit the growth of the Greek world?

We have, in a sense, already answered the first question: the Black Sea and outlier Greek settlements show that climate is not strictly determinative. Evidently a good location on a coast could sometimes, if not often, trump a less-than-ideal climate. The second question, why the Greeks lived where they did, is harder and may benefit from Plato’s ant analogy. Suppose that an ant nest is established by accident (say the queen was blown a long way from her home nest) in a new region with abundant resources that the particular ant species is well adapted to exploiting. Suppose further that this new region lacks rival nests (or other species) to exploit the same resources, and that it is relatively free from ant-predators. We may expect the nest to flourish and eventually to spawn other nests. The descendants of the original nest will eventually occupy the entirety of the region with the desirable features of resources, absence of rivals, and low predation. The basic settlement history of the Greek world fits that scenario tolerably well. Starting out from their homeland in mainland Greece, in the course of the later Bronze Age, through the Early Iron Age, and especially in the archaic and classical periods, Greek speakers occupied all places available to them with the right natural features that

cm/month in 2 summer months, but less than 5.1 cm in the driest month), and from 1 (“frigid”: winter lows average below -1C) to 4 (“temperate”: lows average 7-15C). Greeks outside the Black Sea region inhabit almost uniquely zones C3, C4, D3, D4, E2, E3, E4, F2, F3, F4. Notable exceptions to the “very dry summer” rule are Neapolis and Massalia, both in zone G2.

lacked effective competition from rival cultures and offered security from predatory cultures.⁷

The “right natural features” were, in the first instance, the climactic conditions that made it possible to grow grain (especially wheat and barley) which was the staple of the Greek diet, grapes for wine, and olives whose oil was used for lighting and cleaning as well as for food. These three basic crops make up the so-called “Mediterranean triad” (see below): the basis of the Greek diet. Of the three crops, the olive is by far the most demanding in terms of where it can be cultivated. Nutritious grains can be grown under a wide variety of climactic conditions. Grapes (of the sort suited to wine production) are pickier, requiring average annual temperatures in the range of 10-20C. Olives grow only in under the conditions specific to the generic “Mediterranean” climate, as described above.

We have yet to specify *why* Greeks were so culturally wedded to the grain/olive/grape triad – obviously humans (unlike a given species of ant) can live on a wide variety of diets. But accepting for the moment that Greeks *were* attached to the triad, we have an explanation for their territorial distribution. As the Black Sea settlements show, under the right conditions, i.e. favorable conditions for lucrative trade with other cultures, olive cultivation could be foregone. But through the classical era Greeks never established communities outside the zone of ready cultivation of grain and grapes.

In regions with the right resources, and lacking militarily effective competitors, the Greeks were able to push aside, assimilate, or exterminate local populations – the history of Greek colonization (as with other colonial histories) conjoined accommodation, assimilation, and organized violence. Effective competition for regions with the right resources came, as we have seen, in the form of the Phoenicians and Carthaginians, who tended to occupy exactly the temperate “dry but not too dry” subset of the Mediterranean zone particularly favored by the Greeks. Given that grain, olives, and grapes can be grown throughout the Mediterranean climate zone, it seems possible that Greeks might have settled more of the somewhat wetter parts of the Mediterranean zone (as they did, for example, in Neapolis), had those areas not been occupied by other competitor cultures: for example by Latins and Etruscans on the central and northern parts of the western coast of Italy. Possibly, in the absence of competitors, Greeks would have extended their range into very low rainfall regions in which agriculture was made possible through large-scale irrigation and drainage systems – places like Egypt and Mesopotamia. But these areas were settled by highly organized cultures and for the most part unavailable for Greek settlement. Naukratis, a trading port in the Egyptian Delta, was a notable exception.

Dangerous human predators came in the form of relatively highly developed expansionist imperial states (notably, in the classical period, Persia and Carthage), and in the form of the steppe cultures of central and western Eurasia – the people the Greeks called Thracians and Scythians. Predations by peoples from the steppes

⁷ The question of when Greek-speakers first arrived in mainland Greece (i.e. when mainland Greece became “the Greek homeland”) need not concern us here: the arrival was in any event before the Late Bronze Age.

was an endemic problem for even the largest and best-organized premodern imperial states – including Rome and China. While the Greek communities in western Anatolia and especially around the Black Sea were exposed to steppe-culture predation, the European Greeks, those located west and south of the Bosphorus, were effectively insulated from the steppes by the nature of the terrain. Most of the territory occupied by Greeks lay outside the dry and frigid grassland zone in which the horse-centered culture of the steppe nomads especially flourished. In much of the Greek world great herds of horses could not graze and so cavalry could not readily operate at the grand scale required by the steppe cultures.⁸

The third question posed above -- did the restriction to a narrow climactic/coastal zone limit or promote Greek growth? -- will be considered in much more detail in later chapters. I will suggest that, far from inhibiting Greek growth, the conditions typical of the particular zone in which Greeks lived provided a firm foundation for the development of the institutions and cultural features that, so I will argue, drove the classical efflorescence. Among other things, subtle variations within the distinctive Greek climate zone created opportunities for sub-regions to specialize in one or another of the “triad” crops. The very dry summers created a natural break in the agricultural year, a window that was therefore available for long-distance travel -- and for war. Moreover, as we have seen, the poleis of the northeastern Mediterranean quadrant, where resources were tight and competitors absent, were tightly packed together. Arable land was at a premium within that quadrant, and rival poleis were typically within a short march or a shorter sea voyage of one another. These conditions created ample opportunity for conflict, but also rewarded intensification and specialization. As we will see, inter-polis competition and specialization were especially important drivers of the classical efflorescence.

Similarity

The Greek states around the shores of the Mediterranean and Black Seas manifested notable regional differences, some of which we will consider below (for the 45 regions of the Greek world, see the Appendix). But the many poleis of Hellas shared some important cultural similarities, including language; religion and death-ritual; ways of war-making and peace-making; styles of architecture and city-planning; modes of dress, games, and food ways.

By definition all Greeks spoke the same language (albeit with many dialectical variations). The standard Greek definition of “barbarian” was one who did not speak Greek. To be Greek was, at a minimum, to be a speaker of the Greek language and a sharer in some key aspects of a common culture typical of the Greek city-states. The Greek world expanded so dramatically in the period 800-300 BCE in part because so many of the Greeks’ neighbors learned the Greek language and adopted other aspects Greek culture. In some cases this process of Hellenization was thorough enough by the latter part of the fourth century BCE for formerly “barbarian” cities to be categorized, by the Greeks themselves and by the editors of

⁸ Morris 2014 on steppe nomads. XX

the *Inventory*, as Greek poleis. Their shared language and culture enabled Greeks from across the extended Mediterranean-Black Sea world to communicate easily with one another – even as marked regional/ethnic dialects and local cultural peculiarities made it readily apparent where in the Greek world a traveler originally hailed from.

Although they varied greatly in size and splendor (below this chapter) Greek poleis resembled one another in some salient ways. Greek sacred and civil architecture took roughly the same form across the Greek world: Temples, stoas, theaters, gymnasia, council-houses, and fortifications would readily be identified by any experienced Greek traveler to a distant polis. Post and lintel construction (famously, colonnaded public buildings and temples) was standard. Stone (especially limestone and conglomerate, but sometimes marble) along with plastered brick, were the primary building materials; wood was generally reserved for roofs and superstructure. Moreover, Greek cities tended to be laid out in a similar way, typically featuring a central public square (the agora) in which no private building was allowed, public wells for water; public sanctuaries for the gods. Beginning in the seventh century BCE, a number of Greek towns were laid out in a strict grid pattern (see below). The primary conurbation was typically surrounded by a substantial city-wall. Greek houses were, by the fourth century, relatively large (chapter 4) and tended to be built on a fairly standard pattern, around a courtyard. A special room was often reserved for entertaining male guests at drinking parties (symposia). Women and men tended to center their activity in different parts of the house, but there was no archaeologically visible separation into strictly gendered private spaces.⁹

The standard Greek diet was based on the “Mediterranean triad” of grain (especially wheat but also barley), olives (mostly for oil used for cleaning and light as well as for food), and grapes (for wine) discussed above. This basic fare would be complimented by seasonal vegetables, and occasionally by fish. Meat was commonly consumed at public occasions, after animal sacrifices. In elite households, provided with adequate leisure and with hounds, meat might also be provided by a successful hunt – rabbits were the most common quarry.¹⁰

Religion was an important shared culture feature: A common poetic tradition (beginning with the Homeric epics in the 8th century BCE, and continuing with lyric, and then tragic poetry), helped to forge a rich shared mythology. Gods, goddesses, and heroes had the same names across the Greek world, and some of the same stories were told of them, although heroes and deities took on very different roles in the rituals and narratives of different regions and towns. The growing popularity of several great Panhellenic religious sanctuaries – at Delphi, Olympia, the Isthmus, Nemea, and elsewhere – became important nodes in extended inter-polis social networks and encouraged the emergence and continuity of a repertoire of shared

⁹ 84 (of a total 1035) poleis are known to have employed a street grid (*Inventory* Index 22), but since the street plan of many urban centers remains archaeologically undetermined, this certainly underestimates the total number of grid-planned Greek cities. See further Cahill 2000, 2002. Greek houses: Nevett 1992, 1999, 2005.

¹⁰ Food ways: Foxhall and Forbes 1982; Dalby 1997; Davidson 1997; Garnsey 1999

cultic practices. The rituals defining local expressions of religious life were diverse; but animal sacrifice (followed by distribution of meat), processions, initiation into sacred mysteries, consultation of oracles, and formalized kin-group-centered death-rituals were standard features. An attentive Greek traveler, like the historian Herodotus in the fifth century BCE, or the polymath travel-writer Pausanias seven hundred years later, would be repeatedly struck by the unity in diversity of the religious practices in the Greek Mediterranean/Black Sea culture zone.¹¹

Warfare was, from the perspective of understanding efflorescence and its end, a particularly salient shared cultural feature. Throughout much of the Greek world and over most of our half-millennium period, the dominant mode of Greek land warfare centered on combat between phalanxes of hundreds or even thousands of heavy-armed infantrymen (hoplites), often supported by lighter-armed foot-soldiers and, in sometimes by light cavalry. Meanwhile, the standard Greek warship was the trireme: a triple-banked oared ship with a crew of about 200. Like an individual hoplite, an individual warship was quite vulnerable, but deployed in ranks, both hoplites and triremes were formidable.

Wars were traditionally fought in the mid-summer months, which, due to plant dormancy (above) was a slack time in the agricultural calendar and the least dangerous time for warships (as well as trading vessels) to ply the seas. The Greek way of war demanded the mobilization of many men. Bigger forces were, in general better because a large formation of men or ships could outflank, and thereby overwhelm a smaller one. Greek warfare therefore favored larger poleis, or coalitions of poleis, over smaller or isolated states – and thus helped to place a premium on political innovations that allowed poleis and coalitions to get and stay big.

A major Greek state might be able to launch a few thousand hoplites and a few dozen triremes; the very greatest of the poleis numbered their infantrymen in the tens of thousands and their warships in the hundreds. On land and sea alike, Greek warfare was centered on large numbers of men, similarly equipped, wielding spears or oars, all operating together in very close formations. The key differentiator, in addition to size, was training that forged groups of individual soldiers and rowers into reliably similar and skillful fighting units. Marching or rowing in tight formation and meeting the shock of an enemy formation without losing unit coherence took a great deal of practice. Training in the use of spear and shield or oar was a common experience for Greek men. In the fifth century BCE, Sparta and Athens stood out as premier land and sea powers, respectively, not only because they were especially big and coherent states and thereby able to mobilize big forces, but also because they were innovators in techniques of standardized military training.¹²

Just as Greek states typically shared many characteristics in common, so too many of the inhabitants of a given polis (especially the adult male citizens) would have appeared to an outsider to be quite similar to one another. In contrast to, for example, medieval European society in which kings, nobles, merchants, and

¹¹ Greek religion: Parker 1996; Cole 2004

¹² Greek warfare: Strauss 1996; van Wees 2000a, 2000b; Pritchard 2010.

peasants were readily distinguished by dress and manner, as well as by occupation, Greek citizens tended to dress and behave (at least in public) more or less alike. In aristocratic Sparta, the similarity in dress and lifestyle was taken to an extreme among citizens, but there were clearly marked distinctions in dress and behavior between citizens and non-citizens. In democratic poleis, like Athens, however, it could be difficult to distinguish a free citizen from a slave or foreign visitor (Ps-Xenophon 1.xx). Moreover, in most poleis each of the apparently similar citizens took on a variety of quite different social roles.

In his great dialogue, the *Republic*, Plato argued that all real-world city-states fell short of his ideal highly-regulated community in regard to the organization of work. In Plato's ideal society each individual was perfectly specialized, in that he or she did only one task: farmers did the farming, guardian-auxiliaries did the fighting, philosopher-kings did the ruling. No guardian ever took up a hoe, and nor did a farmer wield a spear. In contrast, in every real Greek city-state, each individual citizen took on different tasks at different times. Whereas in a few poleis, notably Sparta (chapter 6), specialization was taken quite far, in Athens, as in many other Greek poleis, the same citizen might, for example labor in his fields as a farmer in the spring, fight as a heavy-armed warrior in the summer, officiate over religious ritual as a priest, and conduct public business as a civic magistrate at almost any time of the year. In this crucial respect, as in others, the ants/Greeks analogy will get some purchase, as it would not if we were comparing ants to societies in which social and occupational roles were much less fluid.

Difference

The notable similarities between Greek states can be juxtaposed to equally striking differences. Most obviously, Greek states varied greatly in size – albeit, the variation in scale does not equal that found among the nation-states of the contemporary world.¹³ While all Greek poleis were tiny in comparison to most modern nation-states, within the world of the poleis, it is reasonable to speak of small, middling, and large states. In terms of territorial extent, Greek states range across two to three orders of magnitude, from tiny Koresia on Kea with a territory of about 15 km² to Syracuse, which may at one point have controlled as much as 12,000 km². Although some very small poleis had large populations (notably Aegina/i358), across the entire sample, territorial size can be taken as a rough proxy for population. The population estimates adopted here, and summed up in Table 2.1 are based primarily on the data in the *Inventory* and on the estimation methods developed by Mogens Hansen (2006 and 2008).

Of the 672 poleis whose territorial area is known or can be plausibly estimated, 148 were relatively tiny, with territories estimated at 25 km² or less and estimated populations of 1000 or less; at the other end of the distribution only three classical-era poleis – Athens, Sparta, and Syracuse -- had territories over 2000 km²,

¹³ Aside from Vatican City, the smallest independent modern nation-states, Nauru and Tuvalu, have populations around 10,000; some 10 other countries have populations under 100,000. China's population is in excess of 1.3 billion.

with estimated populations ranging up to a quarter million persons or more. Polis size also varied by regions: In Phokis, the region around Delphi, the average polis territory is about 65 km², whereas in Arcadia, in the central Peloponnese, it is ca. 120 km²; on the north Aegean island of Lesbos in the fourth century it was about 320 km².

We will return to the implications of demographic distribution in chapter 3. The key point for now is that although most (about 8 in 10) poleis were small (under 200 km², most Greeks (about 2 in 3) lived in middling (200-500 km²) to large (over 500 km²) poleis. Table 2.1 models the distribution of an assumed total of 1100 classical poleis by territory size and estimated population size. Figure 2.2 graphically illustrates the distribution of polis territory sizes. The inverted U on the left side of the chart and the long “tail” on the right shows the extent to which the distribution of polis territory sizes was sharply skewed toward the small end of the scale.¹⁴

[Table 2.1 and Figure 2.2 about here. Size of poleis]

Poleis also varied greatly in their relative prominence. The impact of state prominence on individual and collective lives was keenly appreciated by the Greeks. The Roman-era biographer Plutarch (*Life of Themistocles* 18.2) records an exchange between an anonymous citizen of the Aegean island polis of Seriphos (i517) and the renowned Athenian general and politician of the early fifth century BCE, Themistocles: “When [Themistocles] was told by the Seriphian that it was not due to himself that he had got his reputation, but to his polis, ‘True,’ said he, ‘but neither should I, had I been a Seriphian, have been famous, nor would you, had you been an Athenian.’”

Lacking an ancient Greek’s fingertip feel for the relative prominence of Greek states, I use the amount of space (measured in columns of text) allotted to each polis in the *Inventory* as a proxy for individual polis prominence. This “fame” proxy is obviously rough: it indicates what is *now* known about a given polis, and thus is sensitive to the loss of knowledge since classical antiquity. On the other hand, the *Inventory* includes all that is now known about obscure poleis, whereas many volumes have been written about the most prominent states (e.g. Athens, Sparta, Syracuse). Over all, given the intensity of scholarly investigation to which the Greek world has been subjected, it seems plausible to assume that most poleis that are famous or obscure today were also relatively famous or obscure in antiquity.¹⁵

¹⁴ Regional variation in size: *Inventory*, 70-73 with Index 9. Hansen 2008 adds 32 poleis to the “plausibly estimated size” group; four others were added by Emily Mackil (per litt.). Distribution of population into small, medium and large poleis: Chapter 3 table 2.

¹⁵ Although a diverse array of scholars wrote the individual *Inventory* entries, editorial oversight ensured a good level of consistency in treatment. Comparison of the space allotted to a sample of poleis in the *Inventory* and two other recent and distinguished encyclopedic works on Greek antiquity shows high correlation: Ober 2008: appendix.

Table 2.2 and Figure 2.3 show that we know, individually and in the aggregate, very little about more than half of all known poleis (fame categories 1 and 2: 567/1035 poleis = 55%). Yet for several hundred “middling” poleis (fame categories 3 and 4, 442/1035 = 43%) we do have a fair amount of historically relevant information, and many of these poleis would have been quite widely known in antiquity. Seriphos (fame rank 3, size rank 2), the polis whose relative obscurity would have doomed the ambitions of Themistocles, falls at the low end of this middling group. We may guess that many of the 158 poleis whose constitutional histories were collected by Aristotle, and which provided some of the data for his *Politics* (chapter 3) fell in the upper end of the middling-fame range.

The hypothesis that a low fame score likely reflects (albeit imperfectly) the limited prominence of a state in antiquity, and is not simply an artifact of lost knowledge, can be tested by the evidence of coinage. Literary evidence and archaeological evidence are subject to the vagaries of preservation and exploration. Yet, because silver coins minted by a given state usually circulated outside the territory of the polis of origin, and because they remain valuable and are recovered through a variety of methods (including amateurs with metal detectors), if an ancient state *did* mint silver coins in any quantity, we are likely to know it. Of the middling-fame group of poleis, 60% (264/442) are known to have minted silver coins, compared to only 9% (51/567) of the low-fame group. In another test of the evidence: 15% of the poleis in the middling group (68/442), are known to have had at least one victor in one or more of the great Panhellenic games, as opposed to only 1% (6/567) in the low-fame group.¹⁶

We know, relatively speaking, a great deal about a couple of dozen Greek poleis (26/1035: fame categories 5 and 6). All of these high-fame poleis, except (notoriously) Sparta coined silver, and 20 of the 26 recorded victors in the games. These high-fame poleis would certainly have been almost universally well known in classical antiquity, and likewise very influential. Although there will have been significant exceptions, their institutions were more likely to be imitated by other poleis, and they were more likely to take dominant roles in regional systems of hegemony and dependency.

Table 2.2 documents the distribution of fame scores, and their relationship to the aggregate of our knowledge of the world of the poleis, as it is measured by the *Inventory*. Figure 2.3 illustrates the distribution graphically; the “long right tail” of relatively high-fame poleis is where most of the attention of historians of ancient Greece has traditionally tended to focus. Our goal will be to keep in view the relatively greater historical impact of the most prominent poleis, *and* the reality that there were a great many poleis that were prominent enough to be significant players on the stage of Greek history, *and* that there were even more small and obscure poleis that were an essential part of the ecology, even if they were individually less likely to be major players on the stage of Greek history. Grasping

¹⁶ Coin data: see below, note xx. The evidence of coins as a category of archaeological evidence: Callataÿ 2011; van Alfen 2012. Victories: *Inventory* Index 16.

the dynamics of the dispersed authority ecology of classical Hellas requires attention to the interplay between the most prominent poleis and all the rest.¹⁷

[Table 2.2 and Figure 2.3 about here. Fame scores]

Prominence is obviously related to polis size: Figures 2.1 and 2.2, which graphically illustrate the distribution of poleis by size and fame respectively, trace similar inverted-U curves, with similarly sharp peaks on the left side of the chart (many small size, low fame) and similar long right tails (few large size, high fame). The three outstandingly famous polies – Athens, Syracuse, and Sparta -- were also the largest poleis. The average high-fame (category 5-6) polis was substantially larger (average size category about 4+ = ca. 500+ km²) than was the average middling-fame polis (fame category 3-4, average size category 2+ = ca. 100+ km²) and much larger than the average low-fame polis (fame category 1-2, average size category 1+ = ca. 25+ km²). Yet a number of very small poleis were very well known: Delphi/i1777 (fame 5, size 2) and Delos/i478 (fame 4, size 2) were associated with major sanctuaries, but Neapolis (fame 4, size 1) and Aegina/i358 (fame 4, size 2) were famous for quite different reasons. At the other end of the scale, Kereneia/i1015, Byblis/i92, and Tyrodiza/i687 register low fame scores of 2, but boasted large, category 5, territories. The overall correlation between size and fame for the 672 poleis whose size can be estimated ($r^2 = 0.34$) is somewhat weaker than one might expect, and certainly does not support the assumption that the prominence of a given Greek polis was a simple function of its size.

The substantial differences in polis size and prominence, along with the important roles that manpower, training, and wealth played in military operations, were factors in the emergence of various voluntary and hegemonic forms of interstate cooperation among the Greek states. In the fifth century BCE, most of the poleis of the Peloponnese (continental Greece south of the Isthmus of Corinth), along with a number of poleis in central Greece, were members of the Peloponnesian League, a defensive-offensive military alliance dominated by Sparta. In the mid-fifth century, Athens had transformed a defensive league of poleis into an eastern Mediterranean empire that, at its greatest extent, extracted tribute from between a quarter and third of the states of Hellas. In the age of Plato, most of the 200+ Greek states on the west coast of Anatolia were under at least the nominal control of Persia. Meanwhile, by Aristotle's day, about four in ten of the poleis of central Greece were members of one of several federal leagues (*koina*). These leagues were increasingly influential voluntary associations of states. Federation enabled smaller poleis to compete more effectively in an environment potentially dominated by aggressive and successful big states. We will be looking at each of these systems in more detail in later chapters. Table 2.3. estimates the total numbers of poleis and estimated Greek populations that were involved in each of these state-autonomy-limiting systems of inter-polis dependency.

¹⁷ On the challenges of finding a balance between the most prominent poleis and the rest, see Gehke 1986; Brock and Hodkinson 2000.

[Table 2.3 about here. Limitations to independence]

Dependency relations, voluntary and coerced, create some blurriness at the margins when we ask the question: Is a given Greek settlement actually a city-state – in the sense of being an urban center connected organically to a specific rural hinterland, and in the sense of being an political unit that is sufficiently autonomous, as a system of territorially-defined authority, to qualify as a state? The editors of the *Inventory* recognized and addressed the issue. While standing behind the claim that each of the 1035 settlements listed in the *Inventory* as poleis does in fact deserve to be called a city-state in a territorial and political sense, the editors also assign each polis a score from A to C meant to measure the strength of the claim that a community was actually a polis – with A indicating those communities (about half the total) unambiguously attested in ancient sources as poleis. Category C is reserved for 217 settlements for which the evidence for polis status is weakest and the status of the settlement as a polis can only be regarded as likely or possible. The upshot is that for about two in ten of the communities considered to be poleis in the *Inventory* there is reason for hesitation in considering the settlement to be a city-state in the most robust sense of the term. Table 2.4 sums up the distribution of *Inventory*-listed sites according to this “polis-certainty” measure.¹⁸

[Table 2.4 about here: polisty and hellenicity.]

Despite the variety of limitations to full autonomy, each Greek city-state sought to be a politically distinct, at least locally independent, and an entity unto itself. Each had its own code of law (written or unwritten), its own ritual calendar, its own peculiar social customs. Although weights and measures were becoming increasingly standardized across the Greek world, by the time of Plato most of the larger and more prominent poleis minted their own silver and (usually later) bronze coins. These coins typically proclaimed the name of the state (often abbreviated) along with some suitable image: Athena’s owl for Athens, a sea-turtle for maritime-trading Aegina, an ear of wheat for grain-rich Metapontum, and so on. Almost 100 Greek states were already minting their own distinctive silver coinage by the end of the sixth century BCE and, by 323 BCE, a third of all known poleis were minting their own silver coins.¹⁹

Just as each city-state cherished its own laws and customs, so too each remembered and recounted its own local history. Among the distinctive shared features of Greek culture was a concern with historical narrative. By the time Aristotle began collecting polis constitutional histories, local polis identity was

¹⁸ Discussion of certainty of polis attribution and “hellenicity,” and definitions for each category: *Inventory* xx.

¹⁹ Silver coinage: 340 poleis (of 1035) are known to have minted silver coins, 94 of these by the end of the sixth century; 285 poleis also issued bronze coins. Coinage figures: *Inventory*, Index 26, with corrections of Peter van Alfen (American Numismatic Society), per litt. Coinage and autonomous state identity: T. Martin 1986.

manifest in a flourishing literary genre of local and regional historiography.²⁰ The many diverse but at least partially overlapping local Greek histories were the raw materials that enabled Herodotus, Thucydides, and other classical Greek historians to write histories, not just of individual poleis, but of Hellas. These master narratives concerned interaction among individuals within Greek states, conflict and cooperation among the Greek states -- but they also took in the relations, by turns friendly and hostile, of the Greeks with their non-Greek neighbors.

Among the issues prominently addressed by historians, local and “panhellenic” alike, was the emergence, endurance, and change of political regimes. Although most Greek political regimes are startlingly decentralized and citizen-centered by comparison with other premodern states, the diversity of regimes among the poleis was a constant theme of Greek historical and philosophical literature. No doubt, every state’s local regime had its own peculiarities, but by the early fifth century BCE, the Greeks had settled on a canonical list of three regime types: The rule of one man was tyranny (or in a benign form, monarchy); the rule of a restricted part of the adult native male population in a state was oligarchy (or, when spoken of approvingly, aristocracy). The rule of all, or almost all, the free, adult, native males was democracy.

Herodotus and Thucydides, along with many other Greek writers, regarded the question of the emergence and collapse of regimes in specific poleis to be among the most important events in a state’s history, and they considered the regime to be a primary determinant of state behavior. The question of how specific social conditions and institutions preserved or undermined regimes was a major concern of Greek theoretical writing on the subject of politics: both Plato (*Republic* and *Statesman*) and Aristotle (*Politics* and the Pseudo-Aristotelian *Constitution of the Athenians*) treated the question of regime persistence and change as a primary issue for political philosophy.

At any given point in the sixth through fourth centuries, a political map of the Greek world would have resembled a mosaic of regime types, but the mosaic would have looked substantially different depending on the moment chosen. Overall, tyranny would have appeared less prevalent over time compared to its two citizen-centered rivals, oligarchy and democracy. Moreover, by the later fourth century, democracy had gained a good deal of ground over oligarchy. Yet regional differences persisted. For example, tyranny remained a major factor in Sicily long after it had largely disappeared from central and southern mainland Greece. Both the general Greek drift away from tyranny and toward democracy, and the persistence of regional specificity of regime distribution played a role in the classical efflorescence, and we will return to these topics in later chapters.

The history of a given polis was often traced (whether historically or mythologically) back to a founder-hero. Some founders were thought to have magically sprung from the earth (as in the case of Athens); other founders were more plausibly remembered as having been natives of another city-state, who led expeditions from their homeland in the hope of creating a new and independent

²⁰ Most local Greek historiography has failed to survive intact; the very substantial fragments are collected in by Jacoby et al. 1957 (and following).

state in some other land. It was through the process of colonization that the Greek world grew outwards from the Greek peninsula, first to Anatolia, then Sicily, Italy, southern France, northern Africa, and the shores of the Black Sea.

Some 81 Greek states (8% of all known poleis) are known to have served as “mother-cities” in that they colonized, or participated in the colonization, of one or more of hundreds of other “colonial” poleis – some of which themselves became major colonizers. Several especially prominent states (Athens, Miletos, Syracuse, Corinth, Samos, Thasos) were involved in 10 or more colonizing expeditions; 25 other poleis were involved in establishing 3 or more colonies. Greek colonial settlements typically developed into independent poleis; a few (like Syracuse, a colony of Corinth) became preeminent poleis. Yet relations between colony and mother city sometimes remained strong, and some mother-cities took a proprietary interest in the doings of their former colonies. The question of how much deference a colony ought to show to its mother city helped spark the conflicts leading to the outbreak of the Peloponnesian War in 431 BCE (see chapter 8), whereas aid sent by a mother city to a former colony sparked the economic resurgence of Sicily after its decline in the mid fourth century (chapter 9).²¹

Colonization was one important route by which Greeks came to live among non-Greek peoples, in ways that make obvious the error of imagining that the “Greek world” was ever purely Greek in ethnicity, culture, language, or history. Some 10-20% of known “Greek” poleis – mostly located in Sicily, Thrace, and Anatolia -- are best understood as hybrids, manifesting strong non-Greek cultural features. Of these 44 (4% of all known poleis) were primarily non-Greek in their culture and only became substantially hellenized after the end of the classical era. The degree of Hellenization of the 1035 known poleis is summed up in Table 2.4.

Moreover, and obviously, the Greeks of the city-states shared their extended Mediterranean/Black Sea world with a variety non-Greek peoples: Some of these (for example, Assyrians, Lydians, Persians, Egyptians, Phoenicians) lived in highly developed, state-based societies. Others (for example, some Thracians and most Scythians) were semi-nomadic tribe- or clan-based societies, and at least part-time pastoralists. Yet others (native Sicilians, Anatolians, north Africans) lived in towns and villages interspersed amongst Greek poleis. Greeks learned many things from their neighbors -- borrowing their alphabet, for example, from the Phoenicians and the idea of coined money from the Lydians. Non-Greeks, for their part, borrowed some of the cultural features of the poleis. The Greeks engaged intensively in trade relations with non-Greek peoples. Yet competition for resources periodically led to conflicts between Greek states and their non-Greek neighbors.

Finally, circling back to the physical conditions of the Greek world, different poleis, and even different subregions within the territories of large city-states, had quite different resource endowments. In addition to the uneven distribution of valuable minerals (iron, silver, gold), regional differences in elevation (Figure 2.1) and in rainfall (above, note 5xx) produced areas better suited to one or the other of the triad of basic crops (grain, olives, grapes), or to specific grains (wheat or barley),

²¹ Greek colonization: Graham 1964; Malkin 1987, 1994, 2011. Data: *Inventory Index* 27.

or to some specialty crop (e.g. silphium, at Kyrene, a now-extinct plant used both as a seasoning and as a medicine). While much of the Greek world had abundant building stone, fine marbles, suited for sculpture, were located only in particular regions (most famously on the island of Paros). Moreover, the core Greek world lacked certain essential metals, most notably copper and tin, the components of bronze – these essential raw materials had to be imported into the Greek core from Cyprus, Anatolia, and western Europe. Resource diversity and scarcity provided a further impetus to specialization and exchange, and to competition and to conflict – both within Hellas and with neighboring cultures. And, as we will see, those conditions in turn helped to drive the classical efflorescence.

Ch. 3. Political Animals: The puzzle of decentralized cooperation

Cooperation is among the most important and pervasive features of life. It plays a major role in the activity of, for example, bacteria, ants, birds, and humans -- and it defines a major research area for the social sciences and biological sciences alike. Yet many aspects of cooperation have long resisted explanation. Why do organisms cooperate? And how does local cooperation among individuals produce higher order, system-level effects? In biology, explaining emergent phenomena associated with decentralized cooperation, exemplified by the complex and rapidly changing formations of large flocks of birds in flight or schools of swimming fish, remains a research frontier.²² The behavior of flocks and schools is minutely coordinated, but the decision process producing that coordination is radically decentralized. No bird in the flock, nor fish in the school, issues commands to others, Yet huge flocks and schools move as one – resembling at times a single, gigantic, shape-shifting super-organism.

Biologists have recently shown that relatively simple algorithms can go a long way towards explaining how large groups of birds and fish coordinate their movements (Couzins et al. 2005). Explaining decentralized cooperation in ants is harder, because their collective activities are more complex, but major advances have recently been made, as we will see in this chapter. Explaining decentralized cooperation in humans is hardest of all, yet it is imperative if we are to understand the classical efflorescence of Hellas.

For social scientists, the research agenda for the problem of “human cooperation at scale” was set a half century ago by Mancur Olson (1965), who posited that cooperation without coercion (i.e. a centralized system of authority, backed by a credible threat of force) was only possible in small groups of not more than a few hundred persons. This is because, in small groups, individuals can readily monitor one another’s behavior, and can act quickly to sanction aberrant behavior by those who deviate from a cooperative regime. As Olson famously argued, once a human group exceeds a certain size, it becomes impossible for group members effectively to monitor free-riding – i.e. strategically defecting from the cooperative regime by refusing to pay the costs of cooperation, yet continuing to share in the

²² On the science of emergent phenomena, see for example Jensen 1998; S. Mitchell 2009; M. Mitchell 2009.

collective benefits accruing through others' cooperation. As a result of the failure of monitoring, and because of the costs associated with punishing defectors, sanctioning of defection will be foregone. Given that, under these conditions, everyone has the same incentive to defect by free-riding, we can expect that a cascade of rational defection will doom the cooperative regime: In Olson's words, "unless the number of individuals is quite small, or unless there is coercion or some other special device to make individuals act in their common interest, *rational, self-interested individuals will not act to achieve their common or group interests*." (Olson 1965: 2, original emphasis).

Olson's argument was backed by an impressively strong theory of human behavior (often called rational choice or rational actor theory) that posited the pursuit of self-interest, expressed as expected utility maximization, as the primary motivator of human social action. Yet rational choice theory, in its original strong form, notoriously fails to account for some evident facts about the world – including the success of large and democratic Greek poleis, and the efflorescence of Greek polis ecology as a whole. The question of how certain human communities of well over several hundred persons have managed to solve the problem of cooperation at scale, without the creation of a centralized authority system, is obviously important. There is now a large and rapidly growing scholarly literature that seeks to conjoin natural and social science to explain the motivation for human cooperation at scale and the mechanisms that would allow well-motivated cooperation to be effective in producing valued goods. This literature is based on hypotheses about human sociability that weaken the strong assumptions of rational behavior on which Olson predicated his theory.²³

Plato's star student, Aristotle, may reasonably be considered as having anticipated, or even as having founded, the "natural and social science" approach to the problem of human cooperation. Aristotle took up Plato's apparently light-hearted "Greeks and social insects" analogy, and transformed it into a theory of politics as collective social action. Following Aristotle, we may seek the answer to the puzzle of decentralized cooperation by asking why self-consciously rational and highly communicative humans would be motivated to cooperate, and how, once motivated, they could produce goods that would be comparable, on an expansive human scale of value, to those produced by nests of ants.

Despite some flaws in his arguments, Aristotle's core theory of human collective activity seems to me to offer much of what we need to explain the cooperative behavior that underpinned the classical Greek efflorescence. It also has the virtue, for our purposes, of being a theory that was devised by a Greek at the height of the classical efflorescence, and that was tested with reference to a mass of (now sadly lost) empirical data on the observed behavior of city-states and their residents. Like the editors of the *Inventory*, Aristotle was convinced that gathering a great deal of information about a great many poleis would further the endeavor of making sense of the development of the Greek world. Of the 158 constitutional histories that were gathered in Aristotle's school, we now have only one – known to classical scholars as "Pseudo-Aristotle's *Constitution of Athens*" because it is

²³ See for example Bowles and Gintis 2011; Boehm 2012.

generally thought to have been written by one of his students, rather than by Aristotle himself. But happily we do have the major work of political theory and institutional design that was, at least in part, based on the empirical data of many other constitutional histories: Aristotle's *Politics*.

Aristotle's political animals

Aristotle was at once a naturalist (the author of many works on animals and their behavior), a moral philosopher, and a political theorist. Moreover, he was very interested in conjoining aprioristic theorizing about social order, of the sort perfected by Plato, with empirical observations of natural and social phenomena. For our purposes, the most notable example of his conjunction of natural science with the science of morals, and social theory with empirical observation of human behavior, is his political philosophy. In the *Politics* Aristotle employed his knowledge of the behavior of non-human social animals, and especially social insects, to help explain the distinctive forms of cooperation that he observed among his fellow Greeks. Moving beyond Plato-style simile ("like ants around a pond") to behavioral taxonomy, Aristotle noted that the kingdom of animals, ranging from insects to mammals, could be organized according to social behavior, rather than mere physical appearance. This allowed him to see why humans and ants belong, behaviorally, in the same category of animal, and how their behavior is affected by their natural capacities. Thinking with Aristotle about the social insects/classical Greeks comparison that was introduced in the previous chapter will help us to grasp some of the distinctive institutional and cultural features that were characteristic of the dispersed authority ecology of city-states.²⁴

In one primary category of animals Aristotle placed those species whose members lived essentially solitary lives, without need for complex forms of intra-species cooperation – we may think, for example, of orangutans, many species of wild feline, bumble-bees, or spiders. In a second category were those species whose members always lived in groups – for example flocks of birds, schools of fish, herds of herbivores, and bands of primates. Within the broad category of the social, group-dwelling, animals, he observed that the individuals of some species gained an essentially passive benefit from their sociability. Herbivores, for example (think of antelope, bison or zebra), benefit from the multiplication of individual senses. If a single antelope in the herd sees, hears, or smells the approach of a predator, and therefore takes flight, all the rest in the herd may take her flight as a signal and themselves flee to safety. But antelope do not create or share goods in common.

Aristotle's second subcategory of group-dwelling animals was made up of species whose members live more actively social lives, in that they cooperate in the production of some tangible good that is publicly shared by all members of the community. The behavior of these public-good-producing creatures was designated by Aristotle as "political." Social insects provided Aristotle with his prime examples of non-human political behavior. He singled out honey-bees, although he might just

²⁴ Aristotle's work in the *Politics* makes better sense when read in light of certain of his works on biology; see Depew 1995.

as well have referred to ants: Like honey bees, harvester ants process and store food that is shared by all individuals in the nest. All creatures that lived in clearly defined communities, producing and sharing public goods, were, in Aristotle's behavioral taxonomy, "political animals."²⁵

Humans, according to Aristotle, fell into this public-good producing sub-category of social creatures, which is the basis of his famous claim that "the human being is a political animal" (*Politics* 1253a). Indeed, for Aristotle, humans were the *most* political of animals – that is, we are, in behavioral terms like social insects, only more so. Although, as we will see, Aristotle was well aware of the human propensity to engage in strategic behavior, the hypertrophy of human political nature was not, according to his behavioral theory, due to humans' capacity to act strategically in pursuit of their own selfish interests. Rather, humans are, for Aristotle, the most political of animals because of our uniquely human capacity to employ reason in pursuit of common ends and to communicate complex pro-social plans through the use of language.

The unique provision of reason and complex language enables humans to produce public goods that are greater, in abundance, variety, and (as Aristotle confidently believed) moral worth, than those produced by any other species. Our hyper-political nature is, for Aristotle, the relative advantage that humans enjoy in comparison to other animals – some of which are obviously stronger, faster, and have more acute senses of sight, smell, and so on than any human. Our political nature is the reason, we might then add, that the human race is so prevalent on the face of the earth – why humans as a single species have recently (in evolutionary time) become, as ants as a taxonomic family have long been, a very large part of the total biomass of land animals.

[Figure 3.1: Aristotle behavioral taxonomy about here]

Aristotle's discussion of humans as political animals was intended not only descriptively, as a naturalistic explanation of why humans behave as we do, but also normatively, as a moral argument for how we *ought* to behave. Unlike the philosopher David Hume, who famously claimed that it was a fundamental error to seek to derive an *ought* from an *is*, Aristotle supposed that certain moral duties arise directly from the specifics of human nature. In the *Politics* Aristotle sought to explain to his readers, first, that the well-springs of human behavior *do* lie in our ontological status as a certain sort of social creature. And next, he sought to show that, as a consequence of having an inherently social – indeed political – nature, humans *ought* (that is, have a moral duty) to behave in specific pro-social (public goods creating and preserving) ways. In a properly ordered Aristotelian society, then, cooperation would rightly (as a matter of justice, not merely of expediency) be praised and rewarded, while defection from cooperation would rightly be blamed and punished. He supposed that this felicitous condition could be achieved only in a polis, and moreover, only in a polis that was provided with the right resources.

²⁵ On the surprisingly complex forms of cooperation achieved by honey-bees, notably in the vital project of finding a new nest site, see Seeley 2010.

Aristotle's moral "ought" served, and was clearly meant to serve, to distinguish polis-dwelling Greeks from their non-Greek neighbors – and very much to the favor of the former. Aristotle's attempts to show that the Greek polis was the most natural, and thus the best, system of social organization for humans was put to blatantly ethnocentric purposes. It led him into what we must now regard as a reprehensible attempt to justify slavery as both natural and moral. But despite these failings, it is worth our while to pursue Aristotle's naturalistic argument, because it can help us to see what actually is historically distinctive about the social order developed in the classical Greek world, and how that social order contributed to the remarkable efflorescence of the classical era.²⁶

Aristotle's thought was strongly teleological. Human beings, Aristotle supposed, are like all other beings in that we have a proper end (in Greek, a *telos*). Achieving its end, in fullness, is what, in Aristotle's teleological naturalism, is best for each sort of being. Ends differ according to species: Each distinctive kind of being's end is specific to the kind of thing it is. Thus antelopes, ants, and humans all have their proper ends, but not the same ends. Our proper end as humans – and therefore what is best for us as humans -- is, in Aristotle's account, hard-wired into the hyper-political sort of social beings that we are by nature. Aristotle supposed that it is only by attaining the highest and fullest form of its own proper end that a being (or a collectivity of social beings) could truly be said to flourish. Human flourishing -- construed as true well-being, genuine happiness, in Greek: *eudaimonia* -- required the production of and access to a wide range of public goods. Human flourishing thus required behavior on the part of each individual human that was appropriately hyper-political in the sense of orientation to provision of the requisite public goods through cooperative social activity.

Aristotle knew, of course, that many individual beings and communities exist, and have long existed, in a state that could not appropriately be described as flourishing. There are, for example, individual ants and ant-nests that are alive but in a self-evidently poor physical state, and likewise individual humans and human communities. Aristotle posited that certain species-appropriate material conditions are necessary for any creature or community of social animals to flourish. As a contingent matter of luck, these material conditions might, or might not, be adequately abundant in a given local environment. Obviously enough, every animal needs, at a minimum, enough oxygen, water, and food of the proper sort. For many species, appropriate shelter will also be necessary. For all political animals, the necessary conditions include access to raw materials from which the right sort of public goods (honey for the bees, grain for the harvester ants) can be produced. If by bad luck resources are inadequate, the political community will fail to flourish.

Assuming that the right resources *are* available, the flourishing of individual political animals requires that the right public goods be produced from those raw materials and that each member of the community has access to public goods once they are produced. That in, turn, meant that individual flourishing required living in the right sort of community – not only one with the right resources, but also with

²⁶ On the potential value of Aristotelian naturalism for contemporary political theory, see, further Ober 2013 (Political Animals).

the right systems of production and distribution. For honey-bees or ants, then, the conditions necessary for flourishing included living in a well-located and well-functioning hive or nest.

For humans, the conditions necessary for flourishing, according to Aristotle, prominently included living in a well-located and well-functioning city-state. The city-state was, he argued, a natural communal environment for humans just as was the hive was for bees, or the nest for ants. This is a startling claim, and on the face of it an implausible one, when we consider how relatively rare extensive and long-lived city-state ecologies are in human history. But Aristotle's argument was about ultimate flourishing, not about historical prevalence. His argument hinged on the unique advantages that were offered to humans, as hyper-political animals, by life in a community large enough to be self-supporting, but small enough to enable effective communication among its members.

According to Aristotle, in every community of political animals, the individuals (bees, ants, humans) constituting the group should be thought of as *parts* of a community *whole* (hive, nest, or polis). In each case the right activity for each individual part (that is, what the bee, ant, or person ought to do) was to act for the common good of the community as a whole. Choosing to act cooperatively in ways that promoted the common good through the production of public goods was thus, for Aristotle, one way to define the ethical value of justice. Aristotle's second definition of justice was fairness in respect to the distribution of the public goods produced through social cooperation. These two aspects of justice link his moralized conception of human flourishing to collective material flourishing – and potentially, at least, to the high level of sustained collective flourishing that we are calling efflorescence. A well-ordered Aristotelian community produced enough public goods so that all of its members, through sharing fairly (each receiving goods according to his or her desert: a combination of need and virtue), could achieve their highest ends. The requirement that all members of the community have the chance to flourish up to their highest potential, thus meant that the community as whole must be highly productive and must divide the fruits of that productivity fairly.²⁷

Ants, like humans, make mistakes, but ants are incapable of injustice in the Aristotelian senses of ignoring the common good or engaging in unfair distribution of public goods. In the case of social insects there is no meaningful gap between the natural *is* and the moral *ought*: The nest is the only environment in which individuals of the relevant species of ants can survive. Cooperation in the production of essential public goods, and fair distribution of those goods among the members of the nest is hard-wired. Individual ants have little, if any, capacity (much less desire) to behave strategically in order to pursue private advantage at the expense of their productive roles in the community, and so ants act justly by nature.

²⁷ Fair Aristotelian fair distribution is predicated not only on need, but also on the differential levels of virtue possessed by different individuals, and by different categories of persons. His theory is not egalitarian in an “equal shares to each” sense. It notoriously allows for very unequal distributions of certain goods to slaves and women, based on Aristotle's peculiar (by our lights) beliefs about moral psychology. See further Ober 2013.

But the vistas opened by reason and language give humans many more options -- both in terms of the kinds of communities (city-states, empires, nomadic societies, nation-states) in which they may potentially live, and in terms of how individuals contribute to and benefit from those communities.

Aristotle knew that many peoples in the world lived in societies that were not organized as independent city-states. And, assuming that he consulted the 158 constitutional histories of mostly Greek city states that were collected for him by his students, he certainly had at hand a great deal of evidence that showed that some residents of city-states failed to produce their fair share of public goods for the community. Much of Aristotle's *Politics* is devoted to squaring his naturalistic moral theory with readily observable facts about human history and sociology. He needed to explain to his readers how and why the *actual* behavior of humans, unlike that of social insects, deviated so often from what was *naturally and normatively* the right course for them as political animals -- that is, the course that would lead to the collective achievement of the highest human ends by the members of a polis community, and thus to flourishing of individuals and community alike.

His answer, in brief, was that human sociability was not enough to produce consistently cooperative behavior, in light of the human capacity and tendency to use our capacities for reason and communication to identify and exploit gaps between the good of the whole community and the interests of the individual or subgroup. If human political nature produced naturally just individuals, there would be no need for laws and education -- which feature prominently in the description of the best possible city-state, "the polis we should pray for" that is the subject of books 7 and 8 of Aristotle's *Politics*. The purpose of human political institutions, in a well-ordered state, was, in Aristotle's view, to close that gap -- to align individual and factional interests with the collective good of the state as a whole. Much of the *Politics* is devoted to showing how specific mechanism designs could help achieve that salutary purpose -- not only in the best possible state, but also in the imperfect poleis of the real Greek world.

Unlike Aristotle in the *Politics*, my concern in this book is *not* to show that organizing human society into Greek-style city-states is the *only*, or even the most obvious, or even (in modernity) a feasible way to move forward toward collective human flourishing. We need not pursue Aristotle's sometimes tortuous explanations for why it is that so many human societies deviated from the one path that he supposed could promote true flourishing. Nor need we concern ourselves with his diagnosis of the origins of social-psychological pathologies that led polis-dwellers to ignore the common good.²⁸

Our goal is to explain why and how, despite the various obstacles to large-scale efficient cooperation that are seemingly intrinsic to life in the Greek city-states, the communities and individuals that constituted the ancient Greek world did in fact flourish, materially and culturally. Much in Aristotle's moralized naturalism is clearly (in light of evolutionary science) mistaken and at any event unlikely to help in achieving our goal. But Aristotle's basic insight about the potentially beneficial role of political institutions in sustaining high levels of social cooperation in a

²⁸ On these questions see Murray 1993, with Ober 2005 (Aristotle's natural).

community of citizens – that is, that good institutions could and should align the motivations of citizens with the collective good of the community, and that it was well within the abilities of real-world states to make institutional changes that would go some ways to achieving that alignment – does help to explain the classical efflorescence. My proposed solution to the puzzle of decentralized cooperation in the ancient Greek world will be based on Aristotle’s basic insight and on several related Aristotelian ideas.

I propose that Aristotle was right about the following things: Humans are like other political animals in our production and distribution of public goods. We are distinctive among social animals in our natural capacities to employ reason and our ability to communicate complex ideas through language. Well-ordered human communities produce and distribute public goods through the development and pro-social use of human capacities of reason and communication. Societies that offer individuals especially rich opportunities to use those distinctive capacities are (all other things being equal) especially conducive to both individual and collective flourishing. Citizen-centered communities are (once again, all other things being held constant) more likely to allow relatively more individuals to employ reason and communication in the pursuit of public goods than are highly hierarchical societies.

The efflorescence of the city-states of Hellas was, as I will argue in chapter 5, promoted by high levels of specialization, innovation, and human capital. Those were in turn made possible through the reliable production and fair distribution of bountiful and varied public goods. All of this was accomplished through self-governance, by citizens: individuals who were not under the command of a centralized, third-party governmental authority. The social structure of the Greek polis, was well adapted -- by the use of reason, history, and learning rather than by nature alone -- to the development and application of new knowledge and the exchange of information among the community’s members. Institutions and culture promoting communication of useful knowledge among citizens (and sometimes non-citizens) sustained a complex set of activities and thereby allowed for high levels of collective and individual flourishing.

Dispersed v centralized cooperation

If the Aristotelian claims sketched in the previous section are right, and if, counterfactually, Greeks had been more like ants, in terms of having an unproblematically hard-wired propensity to cooperate in the effective production of public goods for their local communities, the answer to why Hellas flourished in the classical era would be quite obvious. But the Greeks were certainly no more *inherently* cooperative than are the people of any other society. Indeed the sometimes ferocious Greek attachment to competition – between individuals as well as between communities – is often, and reasonably enough, taken as a central hallmark of ancient Greek culture. Greek society, with its agonistic values, its multiplicity of small states, its lack of centralized authority, its emphasis on the value of independence for states and of freedom of choice for the individual, seems on the face of it poorly positioned for an efflorescence based on cooperation. Why, given the salient differences between Greeks and most other great civilizations in

terms of the locus of authority, did the little corner of the earth that was the Mediterranean/ Black Sea Greek world do so well for so long?²⁹

For all the obvious disanalogies, what makes the ants around a pond analogy useful as a starting point for an investigation of Greek flourishing – indeed much more useful than Plato or Aristotle could have known, given their limited knowledge of the actual behavior of social insects -- is precisely the absence of central authority. In this crucial respect, the Greeks of Hellas appear rather like ants, and rather unlike most of the other highly civilized peoples of the ancient world. It would not make much sense, for example, to analogize the Egyptians of the Old, Middle, or New Kingdoms with “ants along the banks of the Nile.” Aristotle was right that the Greeks were, in this highly salient way, unlike their civilized neighbors.

Unlike social insects, and unlike Plato’s and Aristotle’s contemporary Greeks, Egyptian society in era of the Pharaonic, Old, Middle, and New Kingdoms, and periodically thereafter, was oriented around a unitary and legitimate central authority: a King (Pharaoh). The Egyptians expected the King to manifest in his person, and to maintain through his rule, the order of their world. Most Egyptians indeed lived in many villages scattered along the banks of the Nile. But the king of Egypt decided, for example, when the unified Kingdom of Egypt went to war, and with whom: it was not left up to a process of distributed or collective decision-making in the villages. The King’s will (at least in principle) was law and determined many aspects of the activity of each individual Egyptian. Egyptian literature celebrated the authority of the King, and registered the deepest dismay at times in which the centralization of authority was temporarily disturbed. While there were practical limits to the extent of centralization, the political and social organization of ancient Egypt is inexplicable without reference to centralized royal authority.³⁰

So it was, *mutatis mutandis*, for most of the great civilizations of western Asia with whom the Greeks shared their extended world: for example ancient Assyria, Persia, and Lydia. Others of the Greeks’ neighbors, notably the Phoenicians, lived in nominally independent city-states, but from what little we know of Phoenician political organization, it appears that the typical Phoenician city-state was considerably more hierarchical than the typical Greek polis. Moreover, for much of their history, the original Phoenician city-states were incorporated into one or another of the great empires of western Asia. The highly successful Phoenician north African colony of Carthage was ruled by a wealthy oligarchy rather than by a king -- and was included in Aristotle’s catalogue of poleis whose constitutional history was to be collected by his students. Yet, like the great monarchical civilizations of Asia, the government of Carthage served as a centralized authority for an extensive empire.³¹

By contrast, in the period with which we are concerned (ca 800-300 BCE), Hellas as a whole was never brought together as an empire with a unified center – although it was not for want of effort: Syracuse acted as an imperial sovereign in Sicily for parts of the fifth and fourth centuries, and Athens built a regional Aegean

²⁹ Agonistic competition as definitive of Greek society: Burkhardt; van Wees, xx.

³⁰ Egyptian royal authority: XX.

³¹ Politics of Carthage and Phoenician cities: Krings 1998; xx.

empire, incorporating hundreds of Greek states for much of the fifth century BCE (chapter 8). Nor, *a fortiori*, there was ever a king or emperor of Hellas – although at the very end of our period, Philip II of Macedon, and his son Alexander the Great came close to achieving that position (chapter 10). Moreover, very few of the most important city-states were dominated for more than two generations by anything resembling an absolutist ruler (chapters 6-7, 9). Despite these various attempts to “normalize” the polis world through centralized authority, Hellas remained, in classical antiquity, distinctively and peculiarly “ant-like” in the dispersed and decentralized nature of political authority – both at the level of the Greek world as a whole and at the level of the individual poleis.

The highly complex activities carried on by most middling or large city-states, and *a fortiori*, by democracies, were the products of communication and choice-making on the part of many individual citizens who did not know one another as individuals. Given that most Greeks lived in middling or large poleis (Table 2.1 and chapter 4), we cannot resort to Mancur Olson’s small-group exception to explain decentralized Greek cooperation. Choices were strongly influenced by rules (formal and informal), but the rules of the community were not given or enforced from above, by an all-powerful supreme ruler or by divine dispensation. The rules governing each polis, laws and customs alike, were self-consciously devised and often revised, by the citizens themselves. The citizens of each polis acted as a collectivity -- as a more or less coherent group agent.

Likewise, the higher-level inter-polis coordination between Greek states that was sometimes achieved in the recognition of common regional interests, or in the face of common threats (Chapter 9) was a matter of inter-state communication and cooperation. With a few notable exceptions (most notably the relatively short-lived Syracusan and Athenian empires: Chapter 8) there was no central authority structuring when or how a number of city-states would choose to collaborate on common projects, or whether and how they would oppose common enemies.

In sum, it is the combination of an extensive and relatively cohesive Greek cultural zone, around the shores of the two great seas, and the lack of anything like cohesive central authority, either for the culture zone or for in the individual communities that comprised it, that makes Hellas appear in some ways so strikingly like Plato’s ants around the pond, and that renders Hellas so historically unusual in premodern history. In light of Olson’s theory of collective action, which posits that large scale non-coercive cooperation is simply not possible, the distinctive Greek form of geo-political organization poses a puzzle: How did the residents of city-states manage to act cohesively, as an effective group agent, in the absence of anything resembling centralized authority? It is all fine and well for Aristotle to claim that people *ought* to act cooperatively, but why would they be motivated to do so, and how did they actually manage to do so in ways that were highly productive?

Hobbes vs Aristotle

Group agency and collective action are relatively easier to explain in political systems featuring strong individual leadership and centralized authority – which is why the relative success of ancient Egypt, Assyria, Lydia, or Persia, after central

authority had been established, is less of a puzzle: A unitary will determined (at least in principle) the choices of the community. A centralized-authority community, although in fact made up of many individuals, possessing unique sets of preferences and diverse interests, is in practice an extension of a single, unified intelligence.

If the King's preferences are coherently ordered; if his choices, expressed as commands, reflect his preferences; and if the individuals making up the community act on the basis of his choices via a hierarchical system by which orders are passed down in a chain of command to the base of the social pyramid, then the community may be regarded as functioning like a rational individual.³² If we further suppose that the King has a good sense of what needs to be done (e.g. in the way of public works necessary for basic state security), then we can readily grasp why the state that he rules does adequately well. The same may be said to be true of a society ruled by a cohesive junta of like-minded rulers. The result (chapter 1) is the "natural state." As we have seen, a natural state will not be optimally productive, but it does solve the problem of the motivation and mechanism of cooperation. The necessity of a unified ruler (or ruling junta) to provide coherent direction for an extended community of individuals with diverse preferences and interests is the core assumption of many influential accounts of political authority. Among these, in the Anglophone European tradition, Thomas Hobbes' *Leviathan* holds pride of place.

Hobbes, who was fluent in ancient Greek, was well versed in Aristotle's political philosophy and he engaged directly with Aristotle's vision of humans as political animals, taking the comparison to social insects head on: "It is true that certain living creatures, as bees and ants, live sociably one with another (which are therefore by Aristotle numbered amongst political creatures), and yet have no other direction than their particular judgments and appetites; nor speech, whereby one of them can signify to another what he thinks expedient for the common benefit." Hobbes acknowledged that "therefore some man may perhaps desire to know why mankind cannot do the same" (*Leviathan* 17.7).

Hobbes' answer was, he supposed, decisive: 1. Humans, unlike social insects, were "continually in competition for honour and dignity," 2. For social insects common and private goods were identical, "But man, whose joy consisteth in comparing himself with other men, can relish nothing but what is eminent." 3. Social insects, lacking reason, do not find fault with one another, whereas men habitually do. 4. Lacking language, social insects cannot misrepresent reality to one another, as men do. 5. Social insects make no distinction between injury and damage, as men do. And, 6. "Lastly, the agreement of these creatures is natural" whereas humans can have agreement only by "artificial" covenants between them, and thus they require a third party coercive enforcer of agreements: an absolute ruler, standing above and outside the law. (*Leviathan* 17.8-12). In short, the production and fair distribution of public goods was simply impossible absent a central authority. Moreover, without central authority, human life was utterly miserable.

³² In social choice theory, rationality is defined as a preference ordering among three choices, A,B,C, taking the form $A > B > C$ but *not* $C > A$. The impossibility of eliminating $C > A$ in voting systems under plausible rules (Arrow 1963) is the basis of a large literature arguing that democracy is untenable; see Riker 1982.

Hobbes famously argued that the only alternative to highly centralized political authority was a grim state of nature – one in which human existence would necessarily be “solitary, poor, nasty, brutal, and short.” Hobbes countenanced a direct form of majoritarian democracy (in which whatever was decided by direct vote of the majority, no matter how prejudicial to any minority, was law) and an equally tyrannical form of aristocracy among the possibilities for central authority. But he clearly favored monarchy as the most efficient solution. Hobbes’ core argument, that only a strong, legally unconstrained, central government can bring the order necessary to civilized life in a complex society, has seemed intuitively convincing to many of his readers ever since. His line of thought has a very long history; the basic notion that order is both essential for decent human life and impossible without central authority was prominent in political thinking long before Hobbes (cf. Egyptian wisdom literature, cited above) and has remained influential despite many attempts to show that Hobbes was wrong.³³

Strong centralized authority not only helps to explain how a group may function as a collective agent through the guidance of a single will, but also explains why the individual members of an extensive group will rationally choose to cooperate with one another. As we have seen, modern social scientists have identified cooperation as a fundamental problem confronting any relatively large human society. If we assume that individuals are at least to a degree rationally self interested (i.e. each will seek to maximize his or her expected utility), cooperation at scale becomes problematic. Why does each individual not choose to free ride on the cooperative behavior of others, by contributing as little possible to the public good while taking from it as much as possible? And if some are free-riding, then why ought anyone else cooperate? This problem is not just a fiction of modern social science, it was well understood by the ancient Greeks themselves. The Hobbesian tradition has a very good answer.³⁴

In centralized-authority natural state, a King or ruling junta has both the incentive (rent-seeking) and the means (the rational cooperation of violence specialists who share the rents) to establish a system of monitoring and sanctioning such that free-riders were likely to be caught, and, when caught, punished. Moreover, many centralized-authority societies have the means to develop and promote ideologies that discourage free riding. If there is a general belief that the King is divine or has a unique access to divine will, if the divine order is believed to punish disobedience (perhaps in the after-life), and if free-riding is regarded as disobedience, each member of society has good reason to obey the King by obeying his commands. Moreover, and just as important, each individual has good reason to

³³ Morris 2014, is a notable example of a recent explicitly Hobbesian argument by a prominent historian (who happens to be my friend, colleague, and collaborator) who seeks to explain economic growth in the very long term. On Hobbes and the “personality” of the polis, see Anderson 2009.

³⁴ The effort by Tuck 2008 to show that free-riding is a uniquely modern idea seems to me to be wrong on the face of it; see Ober 2009. Likewise, Tuck’s (2007) attempt to show that Hobbes embraced an Aristotelian conception of democracy is chimerical: Hoekstra 2007; Skinner 2007.

believe that everyone else has good reason to obey. And thus, ideally, no one will free ride: All cooperate through obedience to the dictates of the King.

Of course in the real world, no system of monitoring is perfect and no ideology is seamless. But even though the command-and-control/ideological system is imperfect, it may be good enough to prevent a cooperation-destroying race to the bottom. This is, presumably, why centralized-authority political systems are so historically common. It is also, *mutatis mutandis* (more monitoring, less belief in a divine order, with the Party standing in place of the King) why highly centralized forms of political authoritarianism remain so common in the contemporary world -- long after the apparent victory in much of the world of Enlightenment ideals of individual freedom and equality.

The Greek city-states for the most part lacked the resources necessary to establish command-and-control bureaucracies. Nor did the Greek world develop an integrated master social or theological narrative that would have provided ideological support for the necessity of individual obedience to central authority – it was to correct that glaring lack of ideology that Plato, in the *Republic*, proposed to introduce the Myth of Metals as a Noble Lie that would sustain the rule of Philosopher-Kings in an ideal, highly hierarchical polis. As we have seen, there was no divine King capable of commanding obedience, either in Hellas or in the individual city-states. The laws of the Greek states were, for the most part, recognized by the Greeks themselves as products of human invention. While the Greeks did see their gods as a source of justice, and certain forms of criminal behavior were thought likely to incur divine wrath, there was nothing like the full-featured ideology of necessary obedience to a divine order that helped to sustain cooperation within societies predicated on a centralized royal authority.

Outside philosophical circles the idea of setting up an absolute ruler in the interests of promoting order was limited to would-be tyrants. Greek oligarchs and democrats alike sought to prevent the emergence of tyrants, but the Greek world had enough experience with tyrants to allow a rough natural experiment that tests Hobbes' theory of necessary absolutism. If Hobbes (and other Hobbesians) are right, poleis run by tyrants should consistently have out-performed citizen-centered oligarchies and democracies and, over time, tyranny should have driven out the other citizen-centered regimes. Although the history of Greek Sicily shows that tyranny was sometimes associated with local prosperity (chapter 8), tyranny certainly did not drive out oligarchy and much less democracy (chapter 9) and there is reason to believe that the highest-performing democracies (notably Athens and Syracuse in 465-412) out-performed even the best-performing tyrannies. Again, we are faced with the puzzle of why and how that could have been. To solve the puzzle, we need to dig more deeply into the behavior of ants.³⁵

Ants and information exchange

³⁵ Performance of Greek states: Ober 2008. Tyranny and state performance in the Greek world: Fleck and Hanssen XX.

I suggested, above, that Aristotle’s theory of humans as political animals can help to explain the classical efflorescence. But Aristotle’s natural/moral account of politics lacks an adequate explanation of ultimate motivations for cooperation. Nor does it describe an underlying mechanism that would account for how many individual social insects and humans could produce complex public goods in the absence of centralized direction. Modern biological science fills the gap, providing explanations of both motivation and mechanism. As we will see, ants belonging to a single nest are motivated to cooperate by their close genetic kinship. In regard to the mechanism: Ants are able to achieve their complex ends because they constantly and actively exchange information with one another. Albeit these are very simple bits of information, the aggregate effect of the many information exchanges is high-level coordinated behavior much more complex than the movements of schools of fish or flocks of birds – animals that are “social but not political” in Aristotle’s scheme.

The discussion of ant behavior in this section (and elsewhere in this book) is based on the work of my Stanford colleague Deborah Gordon, a leading evolutionary biologist, who directs a long-term study of the behavior of nests of harvester ants at a site in the Chiricahua Mountains of southeastern Arizona. Gordon’s research explores how ant-nests function as quasi-organisms, sustaining highly complex forms of collective activity without resort to anything remotely resembling centralized control. Gordon demonstrates how the collective behavior of the nest emerges, and adapts over time in response to environmental change. It does so through countless exchanges of simple bits of information among thousands of individual ants.

In the following paragraphs, the world of harvester ants, as described by Gordon, is imaginatively adapted to Plato’s simile, and thus to the physical world of the Greek city-states, by situating the nests in the immediate proximity of a pond, rather than in a desert. The imaginary “Platonic pond-ants” discussed below have the behavioral traits of Gordon’s desert-dwelling harvester ants. Thinking about nests of ants as an extended thought experiment in collective action, imaginatively getting down on our hands and knees to peer more closely at the miniature ant-world into which Plato’s simile and Aristotle’s taxonomy invite us, highlights for us what is most historically distinctive about the city-states of ancient Greece and offers us information exchange as a basic mechanism underpinning decentralized productive cooperation.³⁶

Ants, as a taxonomic family of something like 14,000 species, have been extremely prevalent across most of the land surface of the earth for tens of millions of years. Today ants comprise a large, if not accurately measurable, part of the total biomass of land animals. Ants have, in short, flourished. One key to their flourishing is their social behavior: Ant nests are hives of collective activity. The obvious point is that ant-like social behavior is one route (of course not the only route) to collective flourishing for social animals. Comparing Greeks to ants risks confusing

³⁶ Gordon 1999, 2010, 2014. My thanks to Deborah Gordon for many helpful and enjoyable discussions of ant behavior, and how it might help us to think about features of ancient Greek history.

analogy with explanation. Yet if we employ the analogy carefully, as a heuristic device, it can help us to distinguish more clearly why the political and social organization of the Mediterranean/Black Sea world of the Greek city-states produced a historically remarkable efflorescence.

Entering the micro-realm of ants dwelling around a pond, we notice that some of the ant-hills that interest us are located right on the shore of the pond, others lie back a ways, but all are quite close to the water. Once we move any distance from the pond's edge, we find that all the ant-nests belong to other species. These other ant species are in some ways quite different from the pond-ants with which we are primarily concerned. The nests of ants of different species differ in appearance and behavior – the various ant species go about food gathering in distinctive ways, treat their dead differently, use different means to attack their enemies, and so on. By the same token, the nests of each species are alike in many salient ways. The species that we are focused upon has adapted to the immediate environs of the pond as its unique ecological niche.³⁷

The nests of our pond-ants vary considerably in size: Each nest is inhabited by several thousand to several hundred thousand ants. All ants belonging to a given nest recognize one another as nest-mates. They interact with their nest-mates in specific ways, behaving quite differently toward all other ants. Each nest has its own more or less well-defined territory. Within that territory the ants belonging to a given nest work cooperatively; their activity prominently includes foraging to extract resources from their environment. Because there are many nests, because the nest-territories are not perfectly well defined, and because resources are limited, there is periodic violent conflict among the ants from neighboring nests. The conflicts are both intra- and inter-species: The pond-ants of a given nest protect their territory against pond-ants from other nests – that is, against animals that are behaviorally like themselves – as well as against ants of other species, animals that differ substantially from them.

The nests constructed by our pond-ants are all superficially alike in that each has a standard physical infrastructure. Yet each nest is a world of its own, with its own multi-generational history, beginning from the day its founder-queen flew away from her home-nest, came to earth in a new place, mated, and began the new colony. If all goes well, the new nest will live for dozens of (one-year) ant-generations. A successful nest will grow in size over the generations. As the nest matures, the collective behavior of its ants changes in subtle ways – most notably, the instances of violent clashes with same-species ants of neighboring nests are likely to decline.

The ants of a given nest take on very different tasks: foraging for food, properly disposing of dead nest-mates, attending to the immature ants, working on the tunnels and other infrastructural features of the nest. If we observe closely and manage to distinguish one individual ant from another (perhaps, as Deborah Gordon's research assistants do, by daubing them with spots of non-toxic paint) we will notice something remarkable: an individual ant takes on different tasks at

³⁷ Forel 1930 offers an entrancing and detailed (if now dated in its science) description of the varied "social worlds" of many different ant species.

different times of day and on different days. Yet their physical appearance and genetic makeup is very similar: most of the ants of the nest are morphologically near-identical. There is only one possible conclusion: The role assumed, day by day, by each ant in the work of the nest is specified by something supplementary to its genetic make-up. Yet, try as we may, we will not be able to find any form of top-down organization in any given nest, much less in the larger ecology of the ants living around the pond. No ant ever undertakes to organize the nests around the pond into a pond-ant empire. Nor does an individual ant ever determine what goes on within a given nest. In each nest a single queen lays eggs. She is the common mother of all the ants of the nest and the nest will die soon after she does. But she does not give orders, or advice, or direction of any kind.

As Gordon has documented, the extra-genetic something that determines the behavior of individual ants, and organizes a mass of individual behavioral choices into productive collective activity that is responsive to changes in the external environment, is the information exchanged among thousands of individuals, through a plethora of binary interactions. If we pay close enough attention, we will see that the ants of a given nest are constantly interacting with one another. When an ant encounters a nest-mate, she will typically touch the other's antennae. exchange information with her nest-mate, rather than, say, ignoring her, or trying to bite her head off, which are the two primary choices when encountering a conspecific non-nest-mate. The result of each touch is the transfer of a discrete bit of information. It is through the multitude of these individual encounters, and the information that is exchanged in them, that the seemingly highly organized activity of the nest is brought about.

Each bit of information exchanged by two ants meeting is very simple. Yet the sum of those many bits of simple information is profoundly powerful: It conditions what happens in the nest -- which ant does what and when, and thus what collectively gets done by the nest acting as a quasi-organism. The aggregation of a great many very simple bits of data ("ant now leaving nest to forage," "ant now arriving in nest with food," "ant now arriving at nest without food") -- in a process that in some ways mimics certain forms of machine-computational intelligence -- enables the nest to adjust its collective rate of foraging, for example. And if, as a result, the ants of a nest forage at a rate that is well suited to the environmental conditions, the nest does well as a collectivity: It brings in more in the way of essential resources (e.g. food, water) than is consumed by the energy-burning activity of the foraging individuals.

It is through many individual information exchanges that, collectively, the nest "knows" what needs to be done, and thus is able to respond to environmental change. It knows to change its collective behavior, based on a changing environment (e.g. more or less rainfall), and it "assigns" the necessary tasks to individuals in ways that conduce to the collective flourishing of the community. This emergent and decentralized collective intelligence, all the product of a mass of very simple information-exchanges, is the secret to the ants' success.

The "Platonic pond-ant" thought experiment offers a way to think about natural collective self-organization, through information exchange, as a way for an extensive ecology of beings to flourish over time in a challenging and changing

environment. It suggests that there is nothing preternatural about the efflorescence of the decentralized world of the Greek city-states. I would suggest, as a working hypothesis, to be tested in the chapters to come, that the ancient Greeks reproduced the ants' process of successful decentralized organization through constantly reiterated information exchange. The reproduction may be thought of as a sort of unconscious biomimesis, keeping in mind, of course, the very different scales of time and size that were involved, and the great increase in complexity of outcomes that are made possible by human reason and communicative capacity. If this information-centered hypothesis is right, the key to effective decentralized human cooperation in the context of a state is enabling a wide variety of valuable (at a minimum: accurate and pertinent) information to be exchanged, with great frequency, by the residents of the state. The hypothesis would be falsified, of course, if, relative to central-authority systems, citizen-centered Greek poleis tended discourage information exchanges. The evidence of Greek history does not, as we will see, support the falsification condition.

Limits to the ants/Greeks analogy

Even at the highest level of imaginative generality, the ants/Greeks analogy can take us only just so far. We must also attend to the striking disanalogies. Start with the pond itself: Although some species of ants are able to cross small streams by creating living ant-bridges, ants do not intentionally venture out onto the water by choice. By contrast, the Greeks constantly went down to the sea in ships, and did business in the great waters that defined their corner of the world. They exploited the bounty of the Mediterranean and Black Seas for fish and other marine products (e.g. shellfish for high-value purple dye), but even more importantly they used the sea as a means of easy transport from one port of call to another – and thus as a means of facilitating exchanges. Travel by land in the mountainous geography that defined much of the Mediterranean/Black Sea zone was notoriously difficult, slow, and expensive. But the Greeks moved readily and rapidly across the surface of the two seas, in sailed ships powered by wind and oared ships powered by the strength and skill of men. Moving goods and people over the water vastly facilitated mercantile trade and information exchange. Overseas travel enabled the Greeks to take advantage of the diversity of their Mediterranean-Black Sea world, interweaving the crazy-quilt of geographic, climactic, and social micro-zones into a complex network of cultural communication and economic interdependency.

Next and at a more basic level, although, as we have seen, individual ants do exchange information, and act accordingly, and although the behavior of the nest changes over time, ants do not learn in ways that would enable self-conscious innovation. The ant-nest has no long-term collective memory, no knowledge of its own history, no access to an accumulated non-genetic store of useful knowledge. Although the physical infrastructure of the nest persists across many ant-generations, each generation of ants is on its own; there is no inherited wisdom to call upon; no narratives of past successes or failures. Each generation makes do with its genetic inheritance and with the emergent properties of simple-information exchange. The experiences of each previous generation dies with that generation.

This makes explaining behavioral changes in the collective behavior of a nest over time a major puzzle for students of ant behavior. But there is less mystery about how and why the behavior of a Greek polis changed, some times radically, over the generations or even within a single human generation, through the iterated processes of information-based innovation and learning.

Innovation, in the world of the ants, is dependent upon the standard evolutionary mechanism of random mutation and adaptation. Unlike groups of humans, ants cannot innovate culturally. By contrast, human culture may change quickly, based on immediate experience, on a new idea, or on the interpretation of historical experience. The citizens of a Greek polis learned from the accumulated historical memory of their polis. They also learned from the historical experience of other city-states – and they borrowed and adapted institutions and cultural traits accordingly. Moreover, they learned from the historical experience of their non-Greek neighbors, in ways that proved to be profound and persistent. Finally, the unique human capacity to use reason and to communicate complex ideas through language, potentially enables very extensive forms of cooperation among as well as within communities. Although ants engage in complex forms of social cooperation with nest-mates, same-species ants of different nests are unable to cooperate on common projects that would be mutually beneficial to several nests, nor can they unite against common threats. In short, communities of ants cannot know, nor can they make, nor can they make use of their own histories, as communities of humans can and do – for good and ill.

The human capacity to employ information of complex kinds, historical as well as current, to innovate and thus to drive big changes over short time horizons explains differences in ant and human time scales: the rise and fall of the polis ecology happened over a span of hundreds of years. Ant development must be measured across the span of millions of years. Nevertheless, if the analogy holds (albeit at a very high level of generality), the information-exchange-driven collective social behavior of ants will help us to understand how the decentralized ecology of Greek poleis might have produced a remarkable efflorescence in the absence of the centralized organization that, as we have seen, is often taken as the necessary condition of human flourishing.

Before that conclusion can be accepted, however, we still need to explain motivation: Why is quasi-ant-like cooperation at scale chosen by the individuals who make up human communities? Hobbes supposed that, absent a third party enforcer, humans would never choose to cooperate at scale. Even Aristotle, despite his teleological naturalism, declined to attribute human cooperation in complex communities simply to the fact of natural sociability – as we have seen, he supposed that law and education were essential to the successful maintenance of the kinds of social cooperation that conduced to human flourishing. The motivation (as opposed to the operational mechanism) of cooperation among ants is now regarded by natural scientists as unremarkable, insofar as all nest-mates are close relatives, and, as such, share a socio-biological “genetic interest” in collective flourishing. Moreover, lacking individual strategic rationality, ants have no way to distinguish individual from collective flourishing. If the ant analogy is to be of value, we need to explain how cooperation in a Greek polis, or even between poleis, might be well

enough motivated to enable the mechanism of information exchange to gain traction among many individuals who were not closely related to one another genetically and who were quite capable of distinguishing individual from common interests.

Motivating cooperation among non-relatives

All ants of a given nest are daughters of the queen, either sisters or half-sisters (before the nest is established, the queen mates with several males, reserving the sperm of these founder-males for the remainder of the life of the queen and nest). Given their shared genetic inheritance and thus their shared reproductive interest, cooperation among ants is, in evolutionary terms, adaptive. Although ants do not employ reason, we may say that ant cooperation is, in terms of expected utility maximization, completely rational. The survival of the nest ensures the survival of each ant's genetic inheritance – there is, in Aristotle's terms, no gap between the good of the whole and the good of each individual part. Residents of a given Greek polis were not, of course, genetically related to one another at anything approaching an ant-nest level of genetic closeness. So how could active cooperation have been motivated among the residents of a polis – who *shared* with the ants a lack of direction from any central authority, but who *lacked* the ants' strong genetic reasons for ongoing cooperation?

Ideology may provide a partial answer. Some city-states, prominently including Athens in the imperial mid-fifth century, tried, through the medium of culture, to promote an ethnic origins narrative that claimed something like the biological kinship of the ant nest. According to one strand of Athenian mythology, all native Athenians (and indeed, by extension, all Ionian Greeks) traced their ancestry back to a single earth-born Queen (Creusa: the story is told in Euripides' tragedy, *Ion*). So Athenians might suppose that by acting for the good of their fellow citizens, they were also acting for the good of close kin. But in the Greek polis this fictive kinship story did not enjoy a monopoly among narratives of origin. The "all Athenians as kin through a common-mother" myth faced rivals in competing and contradictory stories that emphasized that the population of Athens was heterogeneous, the result of immigration from many different regions of the Greek world (Thucydides 1.2.6). Many Athenians and their imperial subjects certainly recognized, at some level, that the myth of shared ancestry was a fiction. Ideologies of fictive kinship presumably gave some Greeks some reason to choose to cooperate with their fellows, but an ideology of kinship cannot, in and of itself, account for the phenomenon of general cooperation.³⁸

Another possible answer lies in attending to scale. As we have seen, Mancur Olson claimed that the problem of collective action does not arise, or not, at least, with the same urgency, in a very small, face-to-face community. In a community small enough for everyone to know everyone else, each can also keep an eye on what the others are up to. Free-riding cheaters are likely to be caught out, and just as likely, to be promptly punished. I suggested above that smallness of scale might

³⁸ On Greek ethnic identity and fictive kinship in the classical period, see Hall 1997, 2002.

help to explain cooperation in the many very small Greek city-states, but that most Greeks lived in city-states that were much too large to operate as face-to-face societies in which mutual monitoring would be effective. One of the challenges faced by large poleis, and a fortiori, super-poleis like Athens, was how managing scale by creating and encouraging face-to-face subcommunities, and doing so without loss of polis-level coherence. As we will see (chapter 7), that challenge was met at Athens through institutional reforms in the aftermath of a democratic revolution. Federalist and quasi-federalist institutional experiments allowed larger Greek states to operate as extensive “networks of social networks” – and thereby contributed to solving the problem of monitoring and punishing free riders.

The question of why self-interested individuals would ever choose to take the potentially costly option of punishing cheaters was long a puzzle. But recent work by social scientists on “reciprocal altruism” suggests that in a given population, there will always be a certain number of individuals who *enjoy* punishing cheaters. Those whose pleasure in dishing out just punishment is high enough will willingly assume the costs of punishing. The frequency of voluntary choices to engage in socially beneficial punishment of cheaters can be increased if the community offers rewards for those who lead efforts to punish malefactors. The social rewards offered to punishers can be material or in the form of honors and recognition. In the latter case, the reward will be greater if the community has successfully promoted an ideology that emphasizes the virtue of cooperative participation in monitoring and punishment, and the rightness of punishing defectors. As we will see, that sort of ideology was common in large and successful Greek poleis – including Athens and Sparta. Where there is known to be a ready supply of eager voluntary punishers, the group as a whole benefits, because, knowing that they are likely to be caught and punished, would-be cheaters are discouraged from cheating in the first place. And thus the community can sustain the sort of imperfect but workable cooperative order that we posited, above, pertains in efficient centralized-authority societies.³⁹

Neither ideology nor smallness of scale nor reciprocal altruism fully solves the puzzle of why Greeks were motivated to cooperate at scale, but together these conditions help to solve the motivation problem. Another part of the solution can be found by attending to the endemic nature of inter-community conflict in the city-state world. Each of the ca. 1100 Greek city-states was a potential rival of each other city-state, and therefore a potential threat to its neighbors. Conflict among neighboring poleis was common, and conflict could have deadly results. States that lost wars with their neighbors risked losing control of valuable resources. Victors would seize, as plunder, as much movable property that they could carry away. They might also take control of economically productive borderlands. If the defeat were severe enough, the victors might force the defeated polis to become a dependent ally of the victor. Or the winners might simply dissolve the state of the defeated rival, incorporating its territory and population into their own polis. In the worst case, if the victors breached the city walls or otherwise forced an unconditional surrender, they might eliminate the rival polis entirely: killing the men and enslaving the

³⁹ Reciprocal altruism: Gintis 2004, with literature cited.

women and children. The general point is that, in the general conditions of limited interstate cooperation that reigned for much of Greek history across much of the Greek world, the stakes of intra-Greek, inter-community conflict were high. When the choices are “costly cooperation” or “loss of livelihood and likely death,” cooperation becomes a rational choice.

Success in high-stakes regional conflicts is at least part of the explanation for the emergence, in the archaic period of Greek history, of the super-poleis that will be one primary focus of the subsequent chapters. The super-polis grew at the expense of Greek communities that were, or might have become, fully featured poleis. The takeover by Athens of the town of Eleusis (home of an important mystery cult), and other major towns in the territory of Attica was remembered in legend. The Spartan takeover of the southwestern portion of the Peloponnesus, in the two hard-fought Messenian Wars of the early archaic period, was a defining event for Spartan history (chapter 6). Syracuse became the dominant Greek state of Sicily in the early fifth century through forcible relocation of the populations of defeated Sicilian poleis (chapter 7). And, in the late fifth and early fourth centuries, Thebes twice destroyed the small polis of Plataea, in an ultimately futile attempt to force all the poleis of the region of Boeotia into a single state (chapter 9).

The continuing attempts of bigger poleis to coerce their weaker neighbors gave the residents of both aggressors-states and potential victim-states more incentive to cooperate. In some cases, cooperation meant voluntary submission to the superior power. In the introduction to his history of the Peloponnesian War, Thucydides notes that in early times, Greek coastal communities rationally acquiesced to the rule of the first Greek imperial power, the Cretan King Minos, and, in the long run, they benefitted materially as a result (1.8.3: “love of gain would reconcile the weaker to the dominion of the stronger”). Yet not all Greek communities saw it that way, and despite all the fierce fighting and periodic destruction of communities, the consolidation of the Greek world went only just so far – even after the emergence of the kingdom of Macedon in the mid-fourth century BCE (chapter 10). The failed attempts of Athens, Sparta, Syracuse, and Thebes to sustain stable empires was due in part to the strength of local polis identities, and attempts at imperial domination further strengthened local identities. As such, the failed attempts at Greek empire-building helped to sustain decentralized cooperation and thereby the remarkable efflorescence of the Greek world.

Table 2.1: Territorial size, and population estimates for a hypothetical total of 1100 Greek city-states.

Polis size	Area km ²	Estimated Population range	Estimated average population	Polis count known size	Polis count total (est.)	Total pop. (1100 poleis)	% total pop. (1100 poleis)	% polis count (1100 poleis)
1	25 or less	525-2500	1000	148	277	277000	0.03	0.25
2	25-100	875-10,000	3500	256	483	1690500	0.20	0.44
3	100-200	3500-25,000	7,000	95	144	1008000	0.12	0.13
4	200-500	7000-50,000	17,000	107	124	2108000	0.26	0.11
5	500-1000	17,500-75,000	35,000	53	59	2065000	0.25	0.05
6	1000-2000	35,00-100,000	65,000	10	10	650000	0.08	0.01
7	Over 2000	75,000-250,000	150,000	3	3	450000	0.05	0.003
Total				672	1100	8248500		

Notes: “Estimated average population” based on Hansen 2006, modified by results in Hansen 2008. “Polis count known size” includes 636 poleis in the *Inventory* whose size is known or plausibly estimated, along with 32 additions in Hansen 2008 and 4 additions from E. Mackil (per litt.). 109 “size 1 or 2”, 37 “size 2 or 3”, 11 “size 3 or 4”, 8 “size 4 or 5” (including Pergamum and Xanthos from Hansen 2008) are divided evenly between the two relevant categories. “Polis count total” assumes that the distribution of known-size poleis is modeled in the total count as follows: size 1 and 2: 53% of total are known; size 3: 65% of total are known; size 4: 86% of total are known; size 5: 89% of total are known; size 6 and 7: 100% of total are known. N.B. Hansen 2008 adds to the *Inventory* totals 29 size 4 poleis and 3 size 5 poleis, but no size 1-3 poleis.

Table 2.2. Fame scores for 1035 poleis, measured by columns of text in Hansen/Nielsen *Inventory*.

Fame rank	Columns range	Polis Count	Aggregate columns	% Total poleis	% Total Text
1	0.12-0.37	238	63	0.23	0.05
2	0.5-0.87	329	216	0.32	0.15
3	1-2.87	355	539	0.34	0.39
4	3-5.87	87	354	0.08	0.25
5	6 -10.5	22	165	0.02	0.12
6	12 -20.87	4	60	0.004	0.04

Notes: Granularity = to 1/8 column. "Aggregate columns" rounded to whole numbers. Total columns of text for 1035 poleis: = 1396. 1 column = ca. 425 words. Total words = ca. 600,000.

Table 2.3. Limits to polis independence: some examples.

Organization	Century BCE	No. of poleis (approximate)	Population (estimated)
Peloponnesian League	5 th	150	1.1m
Athenian empire	mid-5 th	300+	2.5m
Persian empire	mid 4 th	200+	1.8m
Federal League	5 th or 4 th	200+	1.6m

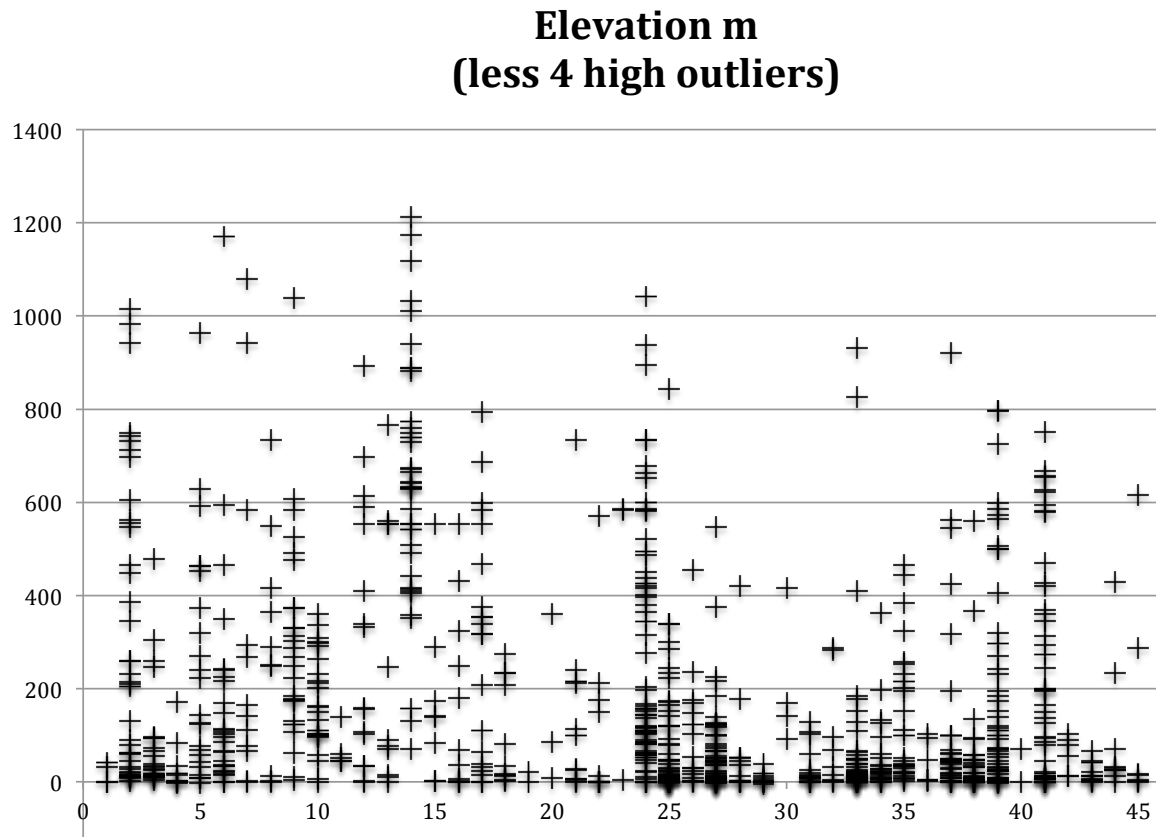
Notes. Data for Peloponnesian League: *Inventory* regions 10-18; for Athenian empire: *Inventory* Index 18; for Persian empire: *Inventory* regions 34-40; for federal leagues, *Inventory* individual entries, with corrections by E. Mackil (per litt.). Population estimates for Peloponnesian League, Persian Empire, Federal League derived from estimated regional populations (see Appendix). Athenian empire population = Delian League poleis (*Inventory* Index 18), excluding Attica. Athenian empire and Federal League populatios estimated by methods described in Appendix.

Table 2.4. Certainty of attribution of settlement as a polis and degree of Hellenization for 1035 poleis.

Polis-certainty rank	Polis count	% Total poleis	"Hellenicity" rank	Polis count	% Total poleis
A	506	0.49	α	822	0.79
[A]	112	0.11	β	85	0.08
B	200	0.19	γ	44	0.04
C	217	0.21	?	84	0.08

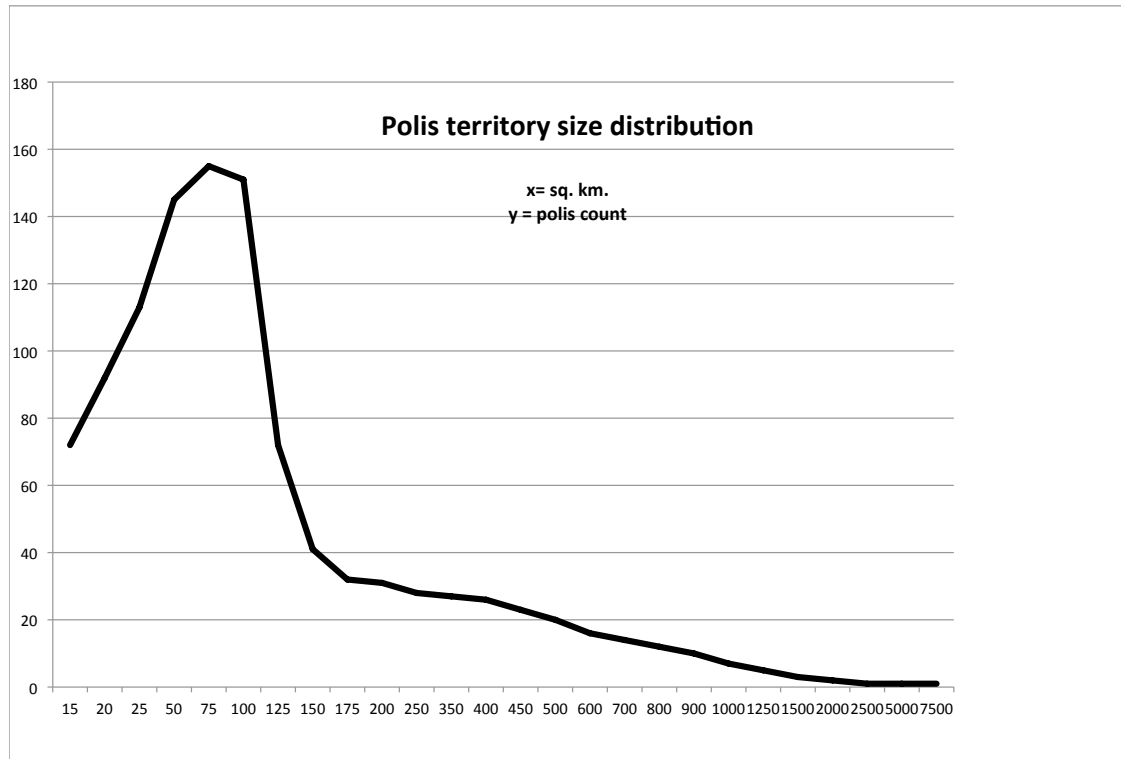
Notes: A = community is called *polis* in an ancient source. [A] = community is subsumed under the heading *poleis* along side other communities. B = community is believed to be a polis based on its known activities that are characteristic of a polis. C = known activity characteristic of a polis but identification as a polis is less certain or only a possibility. α = Hellenic polis with few or no elements of non-Greek civilization. β = mixed community in which Greeks and non-Greeks live side by side. γ = predominantly barbarian community with some elements of Hellenic civilization. N.B. many type β and γ poleis became fully Hellenized after the classical period (*Inventory* p. 7).

Figure 2.1. Distribution of 902 poleis, by region (horizontal axis) and by elevation.



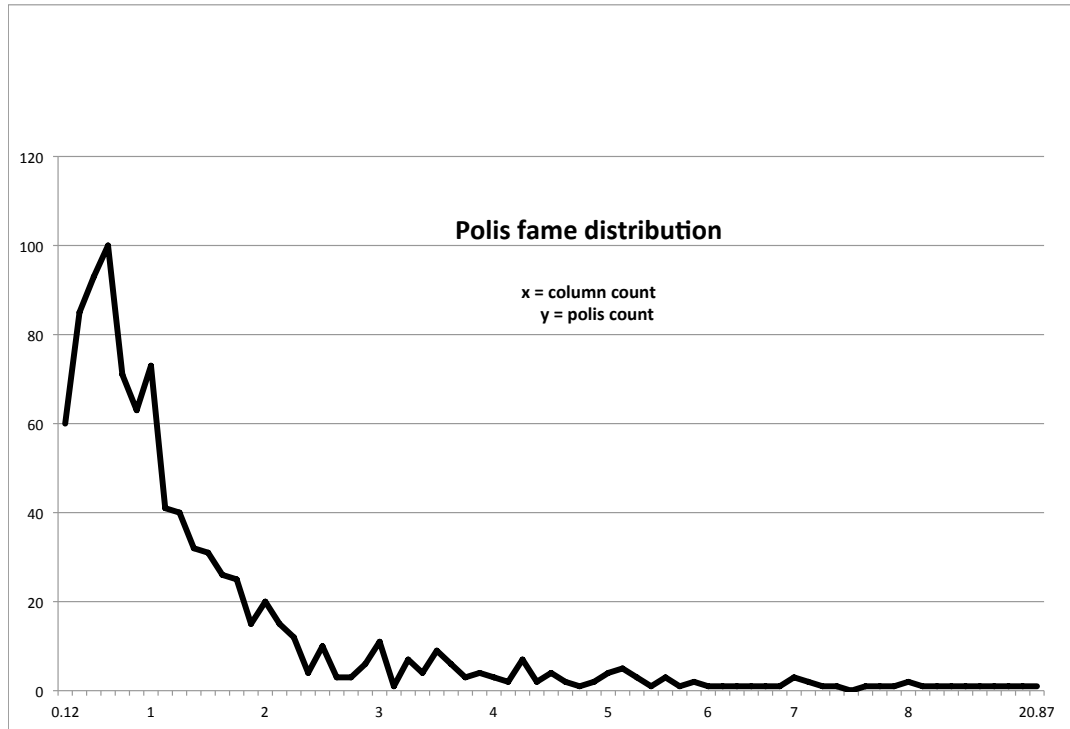
Notes: Regions featuring significant numbers of high elevation poles: 4 = Sicily, 14 = Arcadia, 39 = Caria, 41 = Crete. High outliers deleted = Sollion (i137) 1577 m, Chedrolioi (i566) 2044 m, Smila (i611) 2044 m, Kerasous (i719) 1922 m.

Figure 2.2. Polis territory size, 1100 poleis.



Notes: Model is based on 672 poleis whose size is known or can be estimated with some confidence. Count for each size is based on estimated total number of poleis in each of 7 general size categories, and the range of km² area-sizes within each general category. For data, see Table 2.1. Horizontal scale is compressed on the right side.

Figure 2.3: Fame score distribution of 1035 poleis.



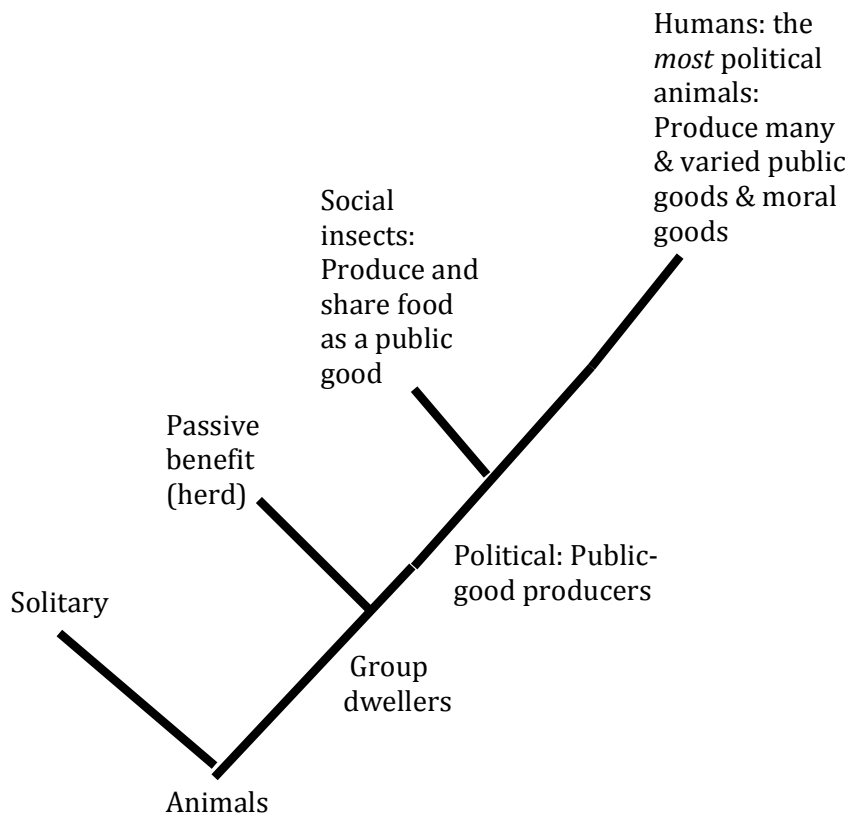
Notes. Fame measured by columns of text per polis in the *Inventory*. Granularity is at level of 1/8 column. Horizontal scale is compressed on the right side.

Map 2.1. The geographic distribution of the ancient Greek city-states.



Notes: 907 of 1035 total city-states listed in the *Inventory* with known (or plausibly inferred) locations. Most, but not all of these were in existence in the later fourth century BCE; some had gone out of existence before that time. 128 of 1035 poleis in the *Inventory* have not been located with enough confidence for mapping.

Figure 3.1: Aristotle's behavioral taxonomy of solitary and social animals



Notes: Up and to the right: more communication, more richly social (i.e. political) behavior, more public goods.

Appendix. 45 regions of the Greek world: Demography, size, and prominence (fame).

Region number	Region name	Estimated population	Known poleis #	Known size #	Average size	Average fame
1	Spain & France	18125	4	3	2.33	2.03
2	Sikelia	655625	47	18	4.00	2.26
3	Italia & Kampania	307000	23	19	3.11	4.04
4	Adriatic	139625	11	6	3.50	1.46
5	Epeiros	230750	26	7	3.00	0.61
6	Akarnania & Ajacent	207875	30	27	2.26	1.40
7	Aitolia	60375	15	8	1.75	0.56
8	West Lokris	35125	12	7	1.43	0.73
9	Phokis	83750	29	23	1.61	1.34
10	Boiotia	202625	26	25	2.20	1.64
11	Megaris, Korinthia, Sikyonia	121000	5	5	3.00	3.12
12	Achaia	69375	16	13	2.00	0.96
13	Elis	143125	20	7	2.14	0.84
14	Arkadia	283125	39	26	2.65	1.32
15	Triphylia	29375	8	5	1.8	0.76
16	Messenia	47125	11	10	1.8	1.44
17	Lakedaimon	217125	24	19	1.54	1.57
18	Argolis	170000	11	11	2.91	2.67
19	Saronic Gulf	30000	3	3	1.67	2.00
20	Attika	251500	3	3	2.67	8.33
21	Euboia	153375	14	11	2.27	2.03
22	East Lokris	19125	11	10	1.20	1.08
23	Doris	4000	4	4	1.00	1.21
24	Thessaly & Adjacent	318625	78	54	1.98	0.88
25	Aegean	296250	57	55	2.24	1.63
26	Makedonia	145375	17	10	3.40	1.09
27	Thrace: Axios - Strymon	495125	82	38	2.11	0.74
28	Thrace: Strymon - Nestos	78250	13	11	2.82	1.33
29	Thrace: Nestos - Hebros	127375	12	9	3.11	1.57
30	Thrace: Inland	40000	6	0	0.00	1.39
31	Thracian Chersonesos	61125	15	10	2.10	0.91
32	Propontic Thrace	159500	9	9	2.78	1.69
33	Black Sea	610375	53	29	3.10	1.24
34	Propontic Asia Minor	283875	30	11	3.36	1.27
35	Troas	227500	29	22	2.45	0.91
36	Lesbos	93500	6	6	3.67	3.19
37	Aiolis & SW Mysia	164500	35	12	1.67	0.67
38	Ionia	383125	34	25	2.48	2.33
39	Karia	351625	72	27	1.59	0.66
40	Lykia	24125	2	1	4.00	2.31
41	Crete	256625	49	48	2.25	1.56
42	Rhodos	150500	8	4	4.50	2.64
43	Pamphylia & Kilikia	127750	11	5	4.20	1.20
44	Cyprus	268375	9	9	5.00	1.04
45	Syria to Pillars of Herakles	105875	8	5	3.00	2.47

Notes: Regions taken from *Inventory*; region numbers assigned according to order of *Inventory* regions. Each region's population calculated as follows: Multiplying poleis of known size by estimated population per size category (see Table 2.1). Adding known poleis of unknown size by formula based on Table 2.1 estimate of total number of unknown-size poleis of each size category (standard size of unknown size polis calculated at $0.3 \times 1000 + 0.53 \times 3500 + 0.114 \times 7000 + 0.04 \times 17000 + 0.14 \times 35000 = 4125$). Adding 6 unlocated poleis and 64 hypothesized poleis, each assumed to be standard size, to reach hypothetical polis total of 1100 (per Table 2.1). Unlocated and hypothesized poleis assigned to Regions 5, 25, 27, 33, 35, 37, 39. Total added = 288750. Population added to some regions based on high average size of known poleis and large number of unknown poleis (Regions 2,3), and on basis literary/documentary population figures cited in Hansen 2008 or other evidence suggesting undercount (Regions 4, 7, 10, 11, 18, 19, 20, 30, 36, 39, 40). Total added = 439375. Population of Region 30 (Inland Thrace) is a guess, since there are no known-size poleis there. Population reduced in Region 44 (Cyprus), based on unusual distribution of size 5 poleis. Sum of regional totals = 8,248,500, per Table 2.1. Average size (based on 7 size categories) is of known-size poleis only. Average fame (based on *Inventory* text columns) is of known poleis.

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