From epistemic diversity to common knowledge: Rational rituals and publicity in democratic Athens.

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Abstract: Effective organization of knowledge allows democracies to meet Darwinian challenges, and thus avoid elimination by more hierarchical rivals. Institutional processes capable of aggregating diverse knowledge and coordinating action promote the flourishing of democratic communities in competitive environments. Institutions that increase the credibility of commitments and build common knowledge are key aspects of democratic coordination. "Rational rituals," through which credible commitments and common knowledge are effectively publicized, were prevalent in democratic Athens. Analysis of parts of Lycurgus' speech *Against Leocrates* reveals some key features of the how rational rituals worked to build common knowledge in Athens. This paper, adapted from a book-in-progess, is fortthcoming in the journal *Episteme*.

From epistemic diversity to common knowledge: Rational rituals and publicity in democratic Athens.
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In a famous poetic fragment (Fragment 16 West) Sappho sets up a contest among things that might be considered the "most beautiful":

> Some say a host of horsemen is the most beautiful thing
> on the black earth, some say a host of foot-soldiers,
> some, a fleet of ships; but I say it is
> whatever one loves.

Sappho contrasts her own claim for "the most beautiful" with the answers offered by several imagined groups of others, who may be taken as representing ordinary Greek (male) opinion: each group proposes as its candidate for "the most beautiful" a different form of organized military formation – that is, in each case, a body of men and equipment whose extraordinary beauty inheres in their coordinated movement. The point is that coordination – especially military coordination, but also in dance, parades, and so other spectacles, was recognized in Greek culture as worthy of special attention.[1]

The question of how to achieve superior coordination through political and cultural practices, and thereby gain competitive advantage relative to rival states, was a key organizational design question confronting builders of Greek political institutions. Participatory democracy in the Athenian style, with its emphasis on individual liberty, its embrace of social and epistemic diversity, and its hostility to dominance-based hierarchies, does not seem, *eo ipso*, to render large-scale coordination any easier – indeed quite the opposite. The standard modern solution to coordination problems is command and control hierarchy: A leader gives orders and his subordinates pass those orders down the chain of command: The Syracuse of the tyrants Hieron or Dionysius I might fit that bill of particulars. In ancient Sparta, the solution was "ideology all the way down": a hyper-emphasis on standardized civic education as social indoctrination, such that

coordinated action and obedience to superiors became a sort of second nature. The Spartans described themselves as the Similars (*homoioi*): they staunchly opposed all forms of intra-group diversity.[2]

Neither dictatorial nor homogenizing of solutions were available to democratic Athens. Thucydides' Pericles claimed in the Funeral Oration (Thucydides 2.35-46) that Athens had self-consciously rejected such approaches and relied on choices freely made by free citizens to achieve its public ends. If, in Sparta, homogenization of life experiences promoted coordination, Athens was a polis characterized by social diversity – notably between elites and ordinary citizens. Athenians knew that difference mattered. Elites (i.e. persons distinguished for their education, wealth, and status) openly and covertly sought positions of dominance. Some Athenian elites favored the establishment of a hierarchical social and political order in which dominant positions would be permanently and exclusively held by a few. The emergence and persistence of a socio-political equilibrium in which elite ambitions were restrained, while Athenian productive capacity was optimized, underwrote the success of Athenian government by the people. A big question in Athenian history is how the "elite few" and the "non-elite many" together arrived at and sustained a productive social equilibrium described by the term *dêmokratia*.[3]

Aggregating diverse forms of social knowledge and technical knowledge for purposes of institutionalized decision-making was an essential aspect of Athenian productivity.[4] But knowledge aggregation was only the first step: alignment of action among the diverse citizenship was essential in order for aggregated knowledge to take effect, as policy. Democratic processes drawing upon epistemic diversity call for complementary processes for promoting coordination. One way of understanding coordination is in the sense of "following informed leaders accurately" But how and why did ordinary Athenians manage to appoint and follow leaders without threatening the democratic equilibrium? The equilibrium would have failed if ambitious elites with special claim to be especially well informed had been granted permanent positions of authority. It would also have failed if the democratic majority acted so as to alienate elites, prompting them to defect en masse. That happened at the end of the fifth century; the wonder is that it didn't happen endemically. One reason for the democratic equilibrium' surprisingly stability was the development of innovative institutional means for coordinating action by building common knowledge across a diverse community.

Coordinating the behavior of multiple actors, such that each individual acts cooperatively in order to arrive at an end preferred by most, has been an essential feature of human communities, across scales and across time. In many situations, pro-social behavior entails risks that are inversely proportionate to the number of expected participants: Say, for example, that polis A(ttacker) is attacking polis D(efender).[5] If only a few hoplites (heavy-armed infantrymen) from D muster, each man's chances of being killed increase dramatically. Each D hoplite will muster *only* if he supposes that enough others will muster too. Adequate numbers will muster if D's hoplites share certain knowledge in common: Each hoplite believes that it is necessary to oppose the enemy and therefore is willing to muster if others will too. But a successful muster requires more than a widely held belief that the enemy should be opposed. It also requires that *the fact that the belief is widely held is also widely known*. That is to say, the successful muster will take place if and only if each hoplite knows that the others believe the enemy must

be opposed and so intend to muster -- and if each in turn knows that all others know the same thing about him, and so on.

If each of B's hoplites held the same belief (the enemy should be opposed) but there was no common knowledge regarding that belief, each hoplite would have no reason to suppose that there would be a large-scale muster. As a result, each would imagine that he would face greatly increased risks should he chose to muster. The outcome is that relatively few might be willing to assume the risk. Thus, the muster will fail and polis A's invasion force would not be opposed – even though each of D's hoplites believed that the enemy *should* be opposed. The *lack* of common knowledge can therefore be fatal to the capacity of a community to act in a coordinated fashion to gain ends that all believe to be desirable and that are in fact achievable. This phenomenon helps to explain, for example, the survival of widely despised autocrats, just as the sudden emergence of common knowledge can help explain their sudden overthrow.[6]

Likewise, polis A will be much more likely to invade if A believes that the residents of D are not committed to opposing an invasion. If D is not committed to resist, the benefits of invasion will come to A at a low cost. But if the hoplites of D are committed to resistance, and if A knows that the costs of invasion will be high and its chances of success will be correspondingly low, then A's decision-makers are less likely to regard invasion as a feasible alternative. D may therefore achieve the desired outcome of deterring an invasion by A if its hoplites commit to resistance. That commitment must, however, be credible to the decision-makers of A. As in the case of the muster, credible commitment requires publicity: D's hoplites must find a way to publicize their commitment to A's decision-makers. If A is an Athenian-type democracy, the decision-makers will be a diverse citizenry. In this case the publicity by which D advertises its hoplites commitment must be of a sort that can gain the attention of a large and diverse citizenry: If publicity remains limited to "back-channel" private communication among foreign policy experts, it is likely to fail – which may help to explain the outbreak of the Peloponnesian War and the Athenian decision to invade Sicily in 415 B.C.

The archaic oath, sworn by the Athenian ephebes (18-year old hoplites-in-training: the youngest year-classes of Athenian soldiers), exemplifies the spirit of "if I know you all will fight, then I will too" – and so we will all achieve our goals in common: Each ephebe swore a sacred oath (witnessed by various divinities) that he would fight for his homeland, "as far as is in my own power and together with all my comrades." The public act of oath-taking made each young soldier's commitment to fight a matter of common knowledge. At the same time, the willful act of binding himself to a particular course of future action by the act of oath-taking helped to make the commitment to fight of each ephebe – and thus of the Athenian youth as a whole -- a credible one. Even in the face of the high risks and potentially high costs associated with Greek hoplite battle the ephebes themselves, the rest of the Athenians, and Athens' enemies, were all given reason to believe that the ephebes' commitment was credible. The public ritual of oath taking, along with its explicit commitment guarantee, built common knowledge among the ephebes that made each ephebe's decision to muster when called up a more rational one. Common knowledge and credible commitments are thus central and intertwined aspects of the oath-taking ritual.[7]

One particularly important *kind* of common knowledge concerns the commitment to sanction deviant behavior. This is a particularly salient part of the Athenian common

knowledge story, because democracies are often thought to face special problems in regard to making credible commitments to sanction.[8] We can flesh out this issue with a narrative drawn from Athenian legal practice. In 330 B.C. the prominent Athenian statesman Lycurgus prosecuted an otherwise obscure Athenian trader named Leocrates on charges of leaving Athens when he ought to have remained. Lycurgus claimed that Leocrates had chosen defection at a historical moment, eight years before, when coordinated cooperation among the residents of Athens had been imperative. Lycurgus charged Leocrates with having disobeyed a law against abandoning Athens immediately following Athens' defeat at the battle of Chaeronea in 338. According to Lycurgus in response to the battlefield defeat, "all of you [citizens] quickly foregathered in Assembly," and passed emergency legislation for the defense of the polis (Lycurgus, *Against Leocrates*, section 16). New measures included a decree forbidding Athenians to leave the territory of Attica; the decree effectively extended the definition of treason to include the act of "fleeing from risk on behalf of [one's] country."[9]

At the moment of crisis, claimed Lycurgus, "every citizen" experienced terrible personal misfortunes (41). Yet the response of the residents of the polis was an alignment cascade of coordinated action for the common good (44): Men of every age volunteered for service. "Some charged themselves (*epemelountô*) with the task of building walls, others of making trenches and palisades. No one in the polis was idle." In Lycurgus' rhetoric, even inanimate objects become willful and cooperative agents (44): the land gave up its trees for palisades; the dead gave up their tombstones for walls; and the temples gave up arms and armor dedicated to the gods. Surrounded by this intense yet orderly flow of cooperative activity, Leocrates chose to ignore both the commands of the elected generals and the lead of his fellow citizens. He gathered his possessions, quietly slipped out a postern gate, and sailed away to Rhodes (17). According to Lycurgus, Leocrates' self-serving actions did not go unobserved – his choice to leave the city was noted at the time by his neighbors (19) and his abandonment of Athens supposedly became notorious throughout Greece – especially because it contrasted so strikingly with the reputation of the Athenian ancestors for ambitious patriotism (14).

Throughout the speech of prosecution, Lycurgus contrasts Leocrates' defection with the coordinated efforts and sacrifices cooperatively undertaken by virtually all other Athenians. He emphasizes the importance of each citizen's personal choices to the security of the entire polis: Athens' overall safety had rested with Leocrates because "the polis is a possession secured (*oikeitai*) through each person's individual share (*idia moira*) in guarding it" (64). Leocrates rests his case for the necessity of severely punishing (death or exile according to Aeschines 3.252) a misdeed by a nonentity some eight years past squarely on the value of credible commitments. In order for the treason law to be an effective sanction against the otherwise-favored choice of defection in the face of great risk, there must be a commitment on the part of the entire polis to punish those who defected from the cooperative regime of shared risk-taking in a time of common danger. In order for that commitment to be credible, it must be a matter of common knowledge among the citizens. Leocrates' act of defection further endangered the city because it undermined existing common knowledge among other Greeks regarding the patriotic Athenian commitment to defending their territory.

The core of Lycurgus' argument for punishing the seemingly inconsequential Leocrates is that the high-cooperation regime was the foundation of Athens' military

security. The high-cooperation, high-payoff equilibrium that sustained the polis required punishment of defectors. If the Athenian commitment to severely sanctioning acts of defection is not credible, other individual Athenians would choose the obvious course of ensuring their own safety in times of crisis. Moreover, absent a credible Athenian commitment to punishing defectors, rival powers will not regard Athenian military preparations as a credible deterrent to aggression. Notably, Lycurgus emphasizes that punishment of Leocrates will serve to educate the youth of Athens in proper behavior (9-10) *and* that the trial is being closely watched by other Greeks (14-15).

The necessity of preserving credible commitments is closely entwined in Lycurgus' speech with an argument for the instrumental value of common knowledge. The role of *publicity* in coordinating action across an extensive citizenry, and the reciprocal role of Athenian institutions in publicizing relevant information, are recurrent themes in Lycurgus' speech. As part of a series of historical digressions, meant to show that punishing Leocrates would be consistent with the polis' traditions, Lycurgus (117-19) tells the following story about a prominent Athenian of the early fifth century B.C.:

> When Hipparchus, the son of Charmus, did not stand his trial for treason before the people but let the case go by default, they [the Athenians] sentenced him to death. Then, as they did not secure his person to answer for the crime, they took down his statue from the Acropolis and, melting it down, made a stele of it, on which they decreed that the names of wrongdoers and traitors should be inscribed. Hipparchus himself has his name recorded on this stele and all other traitors too.

Lycurgus then directs the clerk of the court to read, first, "the public decree (*psêphisma*) which authorized the statue of Hipparchus to be taken down from the Acropolis and then [read] the inscription at the base of the stele and the names of the traitors later engraved upon it." After the documents had been read in court, Lycurgus poses a hypothetical question of the jurors: "What is your impression of them [the Athenians who punished Hipparchus], gentlemen? Had they the same [over-lenient] attitude as yourselves towards wrongdoers? Or did they, by obliterating the memorial (*mnêmeion*) of the traitor, since they could not command his person, punish him with all the means at their disposal?" Lycurgus concludes this section of his speech with an explanation of public intention: "The simple fact of melting down the bronze statue was not enough for them; they wished to leave to their successors a lasting example (*paradeigma*) of their attitude to traitors." That is to say, they sought to publicize the matter, at the time, and for the benefit of future generations.

Lycurgus is our only source for this story about Hipparchus, who was, however, famous as the first man to be formally expelled from the state by the democratic process of ostracism. But whether the story related by Lycurgus about the origins of the bronze stele is accurate in all of its particulars or not, Lycurgus' tale points to the importance of prominent monuments in the democratic state's "public economy of esteem and disesteem." It also highlights the direct role of the Athenian people in authorizing high-publicity monuments that were intended to create common knowledge among the populace at large. Hipparchus' treason trial (presumably by the process of *eisangelia*) would have been held in a special judicial session of the citizen assembly. It was the assemblymen (sitting as a treason court) who condemned him to death in absentia. But Lycurgus' point is that they added to this unenforceable capital penalty a striking act of

public dishonoring: they took down a bronze statue that Hipparchus had dedicated at the Acropolis, melted it, and recast the bronze in the form of a stele (a rectangular inscribed slab: the standard medium for public inscriptions erected by the state).[10]

The entire process may have been carried out publicly in the Agora.[11] The newly cast bronze stele was then set up at public expense, most likely on the Acropolis, with an inscription on its base explaining the nature of the list. At the head of the stele's roll call of infamy -- as, presumably, upon the base of the original statue – Hipparchus' name appeared prominently. But now, rather than recording an honorable individual act of piety, his name headed up a group of wrongdoers and traitors. Anyone doubting the credibility of the Athenian commitment to punishing traitors would immediately have his doubts put at rest by a visit to the traitor's stele.

The Athenian process of public dishonoring is immediately reminiscent of the Roman practice of *damnatio memoriae*: yet in the Athenian case the destruction of a statue of a condemned individual does not entail the *erasure* of the miscreant's name on public monuments, but the *erection* of a monument intended to keep his name in public memory. [12] The traitors' stele is not an aberration: the so-called "Attic stelai" were inscriptions set up in the agora to publicize the public sale of the confiscated property of those who had profaned of the Eleusinian mysteries in 415 B.C. The point is that Lycurgus' reference to the traitors' stele in his speech is not an erudite allusion to a bizarre archaic practice, but calls out a well-established punitive use of publicity by the democratic state.

Having described the monument's history and its purpose, Lycurgus instructs the clerk of the people's court to read out to the jurors three related public documents: first the decree of the assembly authorizing the transformation of Hipparchus' bronze statue into the traitors list stele, then the inscription on the base of the stele explaining its purpose, and finally the list of wrongdoers and traitors inscribed upon it. This public reading, in an Athenian courtroom, of both the authorizing decree of the People and the inscriptions on the stele calls attention to the close association of the form and content of the public monument and the highly self-conscious public act of authorization by which it came into being.

Lycurgus claims that the assemblymen specifically intended the reconfigured monument to be a model (*paradeigma*) for future generations: a public record of wrong individual action (treasonous defection), right collective action (punishment of a traitor), and essential political principle (credible commitment). Lycurgus does not claim to be not presenting the jurors with new facts. He mentions the "traitors list stele," not because the jurors were assumed to be unaware of the monument and its significance, but in order to recall to mind the product of public processes designed to publicize relevant information and thereby facilitate coordinated cooperative action by Athenians.

In Lycurgus' account it is a concern with creating and sustaining common knowledge regarding credible commitment to sanction that is the thread that ties together the choices of two chronologically distinct speakers in the public interest: the anonymous prosecutor of Hipparchus in the early fifth century and Lycurgus himself some 150 years later. The same concern ties together the assembly's act of authorizing a private monument to be replaced with a public one, and the monument itself. Finally, common knowledge ties together diverse Athenian audiences, across time and space: The jurors listening to Lycurgus in an Athenian courtroom in 330 B.C., their ancestors sitting in the

assembly-place a century and a half earlier, and the many visitors to the acropolis who had noticed the stele in the years in between were imaginatively brought together, through Lycurgus' words, into a unified community of knowing. That imagined and unified community shared knowledge about the iniquity of treason and the Athenian commitment to punishing traitors.

The result of calling to mind a unified diachronic community and its unifying common knowledge would be, Lycurgus hoped, the crystallization of a common conviction among the present jurors on the subject of how to deal with a particular act of wrongdoing. He hoped to take the role of informed leader of the moment, a leader who reminds the other members of the community of what they already tacitly know, and thereby invites them to follow his lead in judging Leocrates' actions as requiring punishment. When it came time to vote on the defendant, each juror was meant to think and act on his common knowledge of the unflinching standard of righteous punishment set by the ancestral body that had condemned Hipparchus and set up the monument, and in concert with the many subsequent visitors to the monument, each of whom had, we are to suppose, been properly instructed by the ancestral model on the topic of right collective action in the face of the threat of defection. Through his historical allusion to the traitors stele, Lycurgus sought to establish the preconditions for an alignment cascade of accurate following on the part of the jurors. Yet in the end, this was an outcome that he failed to secure– the jurors' votes were evenly split and Leocrates was narrowly acquitted.[13]

The institutions and the built environment of democratic Athens were designed to aggregate diverse forms of useful knowledge for decision-making, but also to align mass action in support of decisions. Common knowledge, understood as shared information gained through publicity, is an extraordinarily important asset for a participatory democratic community. It facilitates coordination among a diverse boy of individuals *sharing* an ex ante preference for a certain outcome and *lacking* strong partisan preferences for any particular set of policies for achieving that outcome. Under the right conditions, it facilitates large-scale accurate following of informed leaders. Building common knowledge is a strategic response to the problem of how to coordinate action by multiple persons who may all desire the same end, but who will not individually act to achieve that end unless each believes that others will act likewise on the basis of commonly shared information.[14]

In the trial of Leocrates, Lycurgus could safely assume that the jurors shared a preference for maintaining the security of the state. He could also assume that the jurors shared a belief that genuine acts of treason threatened the state, and thus deserved punishment. Moreover, they recognized the political importance of maintaining credible commitments in respect to punishment of malefactors. Yet Leocrates, an obscure trader who had perhaps left the city while it was still legal for him to do so and had been living quietly in nearby Megara for the last eight years, was probably not nearly as notorious as Lycurgus implies. The Athenian jurymen, drawn from across the social spectrum of the citizen body, cannot be assumed to have arrived in the court with any very strong preference about what to do about him.[15] Lycurgus recognized that few individual jurors were likely to vote to convict Leocrates of treason unless they were convinced that a guilty vote would indeed make the city more secure and that such a vote would be in keeping with each juror's conception of Athenian values and understanding of legal

practice. His appeal to the ancestral model of severity in the case of Hipparchus, to the importance of credible commitments, and to the (evidently) familiar traitors' stele were attempts to build up and simultaneously to build upon common knowledge among the jurors.

Lycurgus' failure to induce an alignment cascade may be set down at least in part to the legal weakness of his case: Too many jurors remained unconvinced that Leocrates was actually guilty of breaking the law. If Leocrates had not actually broken the law (i.e. had left before the decree forbidding leaving had been passed) the cascade of accurate following sought by Lycurgus would have resulted in an outcome that was contrary to the legal end of securing justice for the accused individual. This would have violated basic Athenian values. Moreover, the multiplication of such violations would also have threatened the Athenian social equilibrium. That equilibrium depended upon the credible commitment of non-elite jurors (who were invariably in the majority) to play by the established rules when casting their votes, rather than using their majoritarian power to seize (and thereby make available for redistribution) the assets of the wealthy. The socially essential maintenance of a credible legal commitment to punish defection, emphasized by Lycurgus, had to be balanced against another socially essential credible legal commitment: to judge fairly on the available evidence in an attempt to secure justice. The equal split in the votes for and against Leocrates might be taken as indicative the importance the jurors attached to both sides of the credible commitment equation.[16]

Athenian *legal* procedure, with its elaborate procedures to assure equal numbers of jurors from each of the ten tribal divisions of the citizenry, and to protect the secrecy of individual votes, seems designed to make cascading more difficult, especially when fundamental values were in conflict.[17] Alignment cascades were, however, essential in other Athenian *decision-making* contexts: The Athenian Assembly annually had to pass a very large number of decrees if the democracy was to accomplish its ends. Given the limited time that the Assembly had for meetings, many matters must have been decided by consensus – in effect the members of the Assembly must frequently have accurately followed the lead of informed individuals (like Lycurgus, who was very prominent in Athenian policy-making) or the collective advice of the Council of 500, by allowing recommendations of the Council to pass without dissent.[18] Athenian institutions discriminated carefully between legislative and judicial contexts: the processes for organizing knowledge promoted salutary cascading in quotidian decisions in the Assembly, but likewise discouraged cascading in the lawcourts. Both epistemic diversity and common knowledge had to be optimized if the system as a whole was to maintain its stability as a high performing social and political equilibrium.

In game theory common knowledge has a technical meaning that is implausible when applied to the real world: It is knowledge that is shared by a group of people "all the way down" – such that A and B know x, and A knows that that B knows x, and B knows that A knows x and knows that A knows that B knows x, and A knows that B knows that A knows that B knows x… and so on *ad infinitum*. The assumption that human rationality is a form of common knowledge in this unlimited sense is fundamental for formal rational choice models of various aspects of behavior. Choice-based models of coordination assume that it is because of their "all the way down" shared knowledge that each of the preference-sharing members of a group has reason to believe that others have reason to act as he or she prefers to act. All behave according to their perfect common

knowledge of one another's preferences and intentions and so the coordination problem is solved.[19]

In real-world practice, and especially when it is a question of a large and socially diverse groups of "common knowers," it is obviously a fiction to claim that each person actually knows others' preferences and intentions at every level and with absolute certainty: ordinary human cognitive capacities are limited. In the real world, common knowledge is imperfectly accurate and finite in terms of its depth. Before the trial of Leocrates, for example, some of the jurors probably had never seen the traitors list stele, or heard the story of Hipparchus, and were unsure how much others knew. Even after Lycurgus gave his speech, no one could be sure that each and every juror had taken it all in. But common knowledge need not be perfect in order to be socially effective in strategically addressing coordination problems: In a given group, coordination of mass activity will occur if a critical mass of people have good reason to believe that enough others know x, and to believe that enough others know they know, and so on. The actual size of that mass will vary according to various factors, including cultural variables and the anticipated individual costs of cooperation.[20]

The design problem for democratic institutions whose function is to produce common knowledge is assuring that a critical mass is maintained among the citizenry. When designing democratic institutions for coordinating via common knowledge, "more is better": Deeper and more accurate knowledge held in common by a greater percentage of the relevant group is more effective in promoting coordinated action.[21] Participatory democracy in Athens demanded coordinated action across an extensive citizenry over time, and depended upon effective processes for the construction and perpetuation of high levels of common knowledge. This meant, in turn, that Athenian democracy required "high publicity" media. Along with formal government institutions, Athenian public architecture, monuments, and religious rituals were all well designed to serve as media for publicity.

Publicity is facilitated by the "public presence" of information. Lycurgus implies that the traitors list stele was a striking monument that commanded attention and was set up in a public place visited by many Athenians, and thus its existence was a matter of common knowledge. Each Athenian could reasonably assume that many (if not all) other Athenians had "taken it in." Next, Lycurgus claims that the monument's message was clear in that it was easily understood by the viewer. Each Athenian could therefore assume that other Athenians had learned a similar lesson about the value of credible commitments from their observation of the monument. Finally, as Lycurgus realized, history – that is, historical events and stories that become known -- can be a form of common knowledge. Telling a story about the traitors stele and then having the three documents read out loud ensured that historical knowledge of the monument was at least potentially common to all jurors. This same "publicity triad" of prominent physical presence, clarity of message, and historical fame recurs in other Athenian monuments and in public rituals.[22]

If a monument is sufficiently prominent, if its message is clear enough, if it is associated with sufficiently famous historical events, it is not necessary that person A actually observe person B observing the monument for common knowledge to occur – A and B may have common knowledge of the monument and its message even if they have never met. Nonetheless, personal *inter-presence* and especially *intervisibility* among

inter-present individuals create a particularly effective environment for building common knowledge. Knowledge that is built at the level of inter-present and intervisible public practice is deeper and more accurate because each participant can personally observe not only *that* others know some piece of information in common, *but how others respond to* that information.

A given juror sitting in the courtroom at the trial of Leocrates could not be sure that other jurors had *ex ante* knowledge of the Hipparchus story or the monument. But he *could* be reasonably sure, *ex post*, that the other jurors had heard Lycurgus telling the story, the clerk reading the decree and the monument inscription, and Lycurgus' explanation of the intentions of the ancestral Athenians. Because they were jointly present in the court, the jurors shared the experience of the litigants' presentations. Moreover, they could observe other jurors and learn from what they observed - e.g. by making eye contact and paying attention to facial expressions. They could also hear one another: Athenian juries were famously vocal in their response to litigants. Through picking up an array of visual and audible cues, experienced jurors could accurately gauge one another's response to each part of each litigant's presentation. These constant visual and verbal cues would give each member of the audience (and the speaker) quite a good sense of how others took a given argument or rhetorical ploy – as well as a sense of how the speech had gone down overall.[23]

The People's courts were well designed as an institution for disseminating various kinds of common knowledge: Juries were large and bystanders common. Major trials were much discussed and (in at least some cases) speeches were subsequently circulated in written form. References to notable monuments and past events by litigants added substantially to the repertoire of Athenian common knowledge. Publicly announced at the conclusion of the trial, the verdict itself became an item of common knowledge – and could be cited as such in other public actions. For example, the prosecutor Aeschines (3.252) cited the Leocrates trial verdict in his prosecution of Ctesiphon later in 330 B.C.[24]

An Athenian jury's final judgment in a standard criminal trial was publicly announced in the form of as a certain number voting guilty and not guilty.[25] This judgment expressed something more than the aggregated preferences of a mass of atomized individuals. It was a public expression of the preference of an informed subset of the citizenry as a group: an invitation with a specific "weight" (the size of the majority) to the rest of the citizens to follow a particular lead. The jury's vote was at once a product of aggregating the latent and newly learned knowledge of the individual jurors *and* a product of coordination among the jurors based on their *ex ante* and *ex post* common knowledge. The jurors served as collective "informed leaders" and other group members were offered a strong or weak behavior cue based on the outcome of the vote.

Although the jurors in any given trial had very considerable legal discretion in respect to their judgment, overall and over time, the Athenian legal system enhanced the predictability and performance of democratic governance by enhancing the capacity for rational individual choices leading to coordinated action on the basis of broadly shared common knowledge.[26] Legal arguments by litigants and final judgments of juries were taken up by a large number of citizens – by the jurors themselves and bystanders at the trial in the first instance; through gossip and the circulation of texts of speeches thereafter. Conjoined with each citizen's personal take on the claims of the litigants and the jury's judgment was knowledge that other citizens had heard the same speeches, the

same judgment, and how others had responded to them. All of this became part of Athenian citizens' storehouse of common knowledge of politics and law.

People's courts were only one of many public fora in which common knowledge was built up by publicity and interpresence of citizens. The same citizens served on juries, on the Council of 500, and on teams of magistrates; along with their younger fellows citizens they also attended the Assembly. The reiterated and overlapping experience of participation in public decision-making bodies had the effect of giving an Athenian citizen a great deal of practice at assimilating new information and judging the response of his fellows to it – thus increasing the depth and accuracy of what was commonly known. Like Athenian political institutions, public spaces and buildings, communal rituals, and major public monuments served to maximize, through publicity and interpresence, the proliferation of common knowledge. Athenian public architecture thereby promoted public purposes by facilitating coordination among the socially diverse population. Recognizing that publicity and interpresence are consistently expressed principles of institutional design, recognizable across the Athenian polis as an organization, helps to explain how the Athenians succeeded in solving collective action problems. And this in turn explains thus how Athenians were able to act cooperatively, more or less consistently and over time, in seeking common ends.[27]

One of the leading theorists of collective action, Michael Chwe, has recently drawn attention to the role of what he calls "rational rituals" in building common knowledge and thus furthering coordination. As W.R. Connor and others have emphasized in work since the 1980s, Greek poleis featured a wide array of public rituals that combined religious, civic, commemorative, and celebratory functions. Major Athenian rituals included cross-town (Panathenaic) and cross-country (Eleusinian) parades, ceremonies commemorating soldiers fallen in war (the Athenian *patrios nomos*), and dramatic festivals – as well as public sacrifices, communal feasts, dances, and explicitly political rituals (notably ostracism). Major public rituals were performed at various scales – some by demes (or other local units, e.g. the Apatouria festival by phratries), by tribes, by the citizenry, by women, or by the polis as a whole. Meanwhile, local associations performed a wide variety of smaller scale rituals. Right to participate and level of participation was often limited or regulated – e.g. by residence, kinship, cultic initiation, gender, or civic standing.

While all Greek poleis performed public rituals, the Athenians were famous for the extraordinary density of their annual ritual calendar: Athens was not only renowned in classical antiquity as a successful and as a democratic community – but also as an intensely *festive* community, remarkably committed to the public performance of rituals of many kinds. All told, at least 120 days each year, and perhaps as many as 170 days, featured some Athenian state-sponsored ritual.[28]

In light of the relative lack of formal regimentation of private life (at least compared to Sparta), the social diversity of the population, and the class-sensitive costs and benefits of participation, a given Athenian might choose a higher or lower level of ritual participation. Yet standard Athenian convictions about piety and patriotism clearly regarded it as essential for every Athenian to participate in various ways in the ritual life of the polis.[29] Although we cannot say how many ritual events each year an average Athenian would have experienced, at state or local levels, the number would surely have be very high by modern standards – and, more relevantly for high purposes, higher than

if that same individual had lived in some other polis. If we accept Chwe's core argument, to the effect that rituals may serve a rational function of promoting coordination through building common knowledge, then Athens would appear to be extraordinarily well equipped relative to later democracies and relative to its polis rivals.

Recent scholarship on civic aspects of Greek ritual has tended to focus on "the politics of meaning" – employing, variously, the hermeneutic and practice-centered cultural anthropologies associated with Clifford Geertz and Pierre Bordieu. The common knowledge centered approach to "rational ritual," advocated by Chwe, is not intended to *replace* that work. Rather it offers a complementary perspective: Meanings are acknowledged by Chwe as very important, but they are not his primary object of analysis. Rather his primary concern is with rituals as publicity media that enable common knowledge to be built up among the members of a community. In addition to those deeper meanings emerge in the iterated performance of a given ritual, each participant also learns, through his or her participation, the simple fact that others are witnessing just what he or she was. As in other common knowledge building media, if person A and person B are interpresent at a cultic performance and observe (say) a ritual epiphany, A knows that B knows that the epiphany has occurred, and knows that B know that A knows and so on. A and B share common knowledge of the epiphany – and that common knowledge is and important political supplement to the various social meanings A and B may each take away from the ritual.

All Athenian rituals (like rituals elsewhere) featured a certain amount of basic informational content: things were done, said, shown, and so on. All participants shared common knowledge of that basic informational content. Moreover, a great many Athenian rituals (again, like rituals elsewhere) were repetitive. They were reperformed in more or less the same way on a regular schedule. As Chwe points out, repetition enhances common knowledge: rather than having to grasp the informational content of a ritual and others' response to it, once and for all in a one-time event, the participant has a chance to revisit content and responses, often in the company of many of the same participants, over and over again. That which is commonly known becomes deeper and more accurate.

Recognizing the role of repeated "rational rituals" in building common knowledge among a diverse citizenry, and thereby enabling coordination in a democratic community committed to maintaining epistemic diversity as an essential source of innovative policy-making, helps to explain how and why the Athenians did as well as they did, over time and across a wide range of domains. The Athenians were able to access a deep and extensive body of common knowledge without resorting to the sort of knowledge-homogenization that comes from privileging social learning over innovation. They were therefore in a better position to trust one another's commitments to collective enterprises, and more willing to join in the work of sanctioning those who chose selfish defection over pro-social cooperation. And so a more productive social equilibrium was achieved and Athens did better over time.

By freely intermixing social scientific and humanistic modes of explanation, this paper is meant as an example of the methodological employment of epistemic diversity for the purpose of understanding how a democratic organization can reap the benefits of epistemic diversity without losing the capacity for coordination. I have tried to show that a social scientific approach to thinking about how the Athenians addressed certain

collective action problems can help humanists to better appreciate striking aspects of ancient texts and to make progress in solving the historical puzzle of how democracy actually worked in classical Athens. Contemporary social science could be added to the repertoire of methods that humanists currently employ in seeking to grasp the intricacies of literature, culture, and history. The street goes both ways. The standard methods of social science are often insufficient to explain complex historical and cultural phenomena. Employing the resources of history, literature, and philosophy can help social scientists to explain how collective action works in the real world. Conjoining attention to causation and the clarity that emerges from the rigorous simplification procedures of social science modeling with the search for meaning and the respect for complexity that is the hallmark of the humanities, can be a daunting project. Yet it is also highly rewarding and potentially offers a way forward into a more expansive interdisciplinary future.

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Ober. Notes.

[1] On coordinated dancing, and its cultural contexts, see Wilson 2000.

[2] For Spartan culture and concern for similarity, see Cartledge 2001.

[3] Explaining the remarkably dynamic and robust Athenian socio-political equilibrium is the goal of the trilogy of which this book is the final installment: see Ober 1989, 1998 for the first two parts of the argument. For Thucydides' Pericles on democracy: Ober 1998 83-89.

[4] See, further, Ober 2005a, 2006.

[5] Stipulate that A and B are roughly equivalent in potential military capacity. A is attacking with a large force that will require a similarly large force to repel. Given the defender's advantages in hoplite warfare (short lines of communication and supply, knowledge of terrain), if B fields a force equivalent to that of A, there is a very high likelihood that the invading force will be repelled.

[6] Kuran 1991: example of the Eastern European revolutions of 1989.

[7] Archaic oath of the ephebes: Rhodes and Osborne 2003, no. 88. For attempts by modern American educators to employ variants of the archaic oath for nationalistic common-knowledge building, see Hedrick 2004.

[8] Credible commitment issues in Athenian law-making: Schwartzenberg 2004. The importance of credible commitments in political history: Bates et al. 1998; Haber, Mauer, and Razo 2003.

[9] The speech and Lycurgus: Allen 2000. The emergency legislation of 338: MacDowell 1978, 178-79, 185, citing a fragment of Theophrastus' *Laws* (= Pollux 8.52; *Lexicon Rhetoricum Cantabrigiense* s.v. *eisangeleia*).

[10] Ostracism of Hipparchus, a relation of the Pisistratid tyrants: [Aristototle] *Athenaion Politeia* (= *Constitution of the Athenians*) 22 and Plutarch., *Nicias* 11. See further discussion in Forsdyke 2005. Economy of esteem: Brennan and Pettit 2004. Legal process of *eisangelia*: Hansen 1975. Archaic bronze statuary: Mattusch 1988.

[11] There is evidence of bronze-casting operations on the slopes below the site of the Temple of Hephaistos – who was at once the mythical divine ancestor of the Athenians and the god of metallurgy and technological innovation. Metallurgy near the temple of Hephaistos: Mattusch 1982.

[12] For an enlightening treatment of *damnatio memoriae* in the later Roman empire, see Hedrick 2000.

[13] Lycurgus supposedly received exactly half the votes; and the tie favored the defendant: Aeschines 3.252. At least one reason for Lycurgus' failure to achieve conviction may have been the legal weakness of his case: there is reason to believe that Leocrates departed from Athens *before* the decree forbidding leaving Attica was passed: see MacDowell 1978, 178-79.

[14] Chwe 2001 offers a clear and persuasive account of common knowledge, coordination problems, and the role of common knowledge in public rituals. See further, below.

[15] Even if Leocrates were technically guilty of violating a public decree that had required citizens to remain within the city in the aftermath of the battle of Chaeronea in 338 B.C., treason was a crime ordinarily associated with major politicians, and Leocrates was an overseas trader who had a plausible excuse for leaving the city. The eight-year time lag between Leocrates' act of "desertion" and the trial also weighed against the prosecution.

[16] On justice as fairness in Greek culture and Athenian legal practice, see Ober 2005b.

[17] Unlike assembly voting, which was ordinarily by show of hands, voting in the People's courts was by secret ballot. Had judicial cascades been common in actual Athenian legal (as opposed to legislative) practice, prosecutors would frequently have been subject to the penalties associated with failing to secure 20% of the votes. Arguably the fear of a cascade discouraged weak prosecutions and led to defendants with weak cases to settle out of court or leave the city before trial.

[18] Hansen 1991, 139-40, 149 discusses concrete motions proposed by the Council as *probouleumata* and passed by consensus in the Assembly through *procheirontonia*.

[19] See, for example, Gintis 2000, 13-14, noting that the idea that common knowledge could really go all the way down is a "ridiculously implausible assumption."

[20] Common knowledge may be said to be perfectly accurate when x is precisely the same for all participants. Common knowledge can be described as infinitely deep when it moves through an infinite number of levels of mutual knowing, i.e., per above, Level 1 = when A knows x, Level 2 = A knows that B knows x. Level 3 = B knows that A knows that B knows x , Level 4 = A knows that B knows that A knows that B know x, and so on *ad infinitum*. A recognition of the limits of common knowledge informs the conception of bounded rationality, especially models of cognitive boundedness; see Simon 1955. See Chwe 2001, 76-79, on the cognitive problems involved with common knowledge in practice, and how they might be solved. Kuran 1991 demonstrates how difficult it is to determine in advance how much common knowledge is enough to produce a history-changing alignment cascade.

[21] It might be possible to design experiments to determine the relative importance of accuracy, depth, and percentage of group for optimizing the coordination benefits

associated with common knowledge, but for our purposes, these various factors are treated as mutually entailing and not as amenable to internal trade-offs.

[22] Publicity: Chwe 2001, 13-16 and passim. Chwe 2002, 87-91, treats history as like publicity in its relationship to common knowledge. Here, I consider history to fall under the general category of publicity, but I do not suppose that this points to any meaningful difference in approach.

[23] The importance of eye contact: Chwe 2001, xx, Vocal Athenian juries: Bers 1985. Architectures of Athenian courtrooms: Boegehold 1995. There has been some debate over whether Athenian public fora were designed to encourage "one-way" (speaker to audience) or "two-way" (speaker to audience and audience to speaker) communication although there is no doubt that two-way communication was in fact standard practice; see Ober 1996, chapter 8, with references cited. A focus on common knowledge suggests, however, that the communication *among* the members of the audience (and among "bystanders": Lanni 1997), was equally important.

[24] Citations of history by litigants: Pearson 1941; Nouhaud 1986; Worthington 1994, chapter xx. On the use of arguments from precedent in Athenian trials, see Lanni 2004.

[25] In the trial of Leocrates the vote was evidently 250 to 250 (with one juror perhaps failing to vote); at the trial of Socrates in 399 the vote was ca. 280 for Meletus the prosecutor, 220 for Socrates as defendant.

[26] The role of judicial discretion in Athens: Lanni 2006.

[27] This does not of course suggest that the Athenians had a worked out formal theory of collective action, coordination, and common knowledge – but it does suggest that there was a strong and pervasive intuitive recognition of the value of what we are calling common knowledge and the ways in which institutions and physical structures could optimize it.

[28] Good introductions to Athenian state religion and ritual practice include: Connor 1987, Garland 1992, Parker 1996.

[29] Socrates' failure to participate in state rituals has been plausibly suggested as among the factors that made him vulnerable to charges of impiety in 399 B.C. See Brickhouse and Smith 1989, Connor 1991 for discussion. This paper was first presented at a Wellesley college symposium in honor of W.R. Connor and then at the 2006 meeting of the Canadian Classical Association; my thanks to the organizers of both events, and to the participants whose comments have helped me to improve the paper.