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Introduction

What This Book Is Good For

How do individuals coordinate their actions? Here we consider "coordination problems," in which each person wants to participate in a group action but only if others also participate. For example, each person might want to take part in an antigovernment protest but only if there are enough total protesters to make arrests and police repression unlikely. People most often "solve" coordination problems by communicating with each other. Simply receiving a message, however, is not enough to make an individual participate. Because each individual wants to participate only if others do, each person must also know that others received a message. For that matter, because each person knows that other people need to be confident that others will participate, each person must know that other people know that other people have received a message, and so forth. In other words, knowledge of the message is not enough; what is also required is knowledge of others' knowledge, knowledge of others' knowledge of others' knowledge, and so on — that is, "common knowledge." To understand how people solve coordination problems, we should thus look at social processes that generate common knowledge. The best examples turn out to be "public rituals," such as public ceremonies, rallies, and media events.

Public rituals can thus be understood as social practices that generate common knowledge. For example, public ceremonies help maintain social integration and existing systems of authority; public rallies and demonstrations are also crucial in political and social change. Social integration and political change can both be understood as coordination prob-

lems; I am more likely to support an authority or social system, either existing or insurgent, the more others support it. Public rituals, rallies, and ceremonies generate the necessary common knowledge. A public ritual is not just about the transmission of meaning from a central source to each member of an audience; it is also about letting audience members know what other audience members know.

This argument allows specific insights in a wide variety of social phenomena, drawing connections among contexts and scholarly traditions often thought disparate. One explanation of how public ceremonies help sustain a ruler's authority is through their "content," for example, by creating meaningful associations with the sacred. By also considering the "publicity" of public ceremonies — in other words, how they form common knowledge — we gain a new perspective on ritual practices such as royal progresses, revolutionary festivals, and for example the French Revolution's establishment of new units of measurement. It is often argued that public ceremonies generate action through heightened emotion; our argument is based on "cold" rationality.

Ritual language is often patterned and repetitive. In terms of simply conveying meaning, this can be understood as providing redundancy, making it more likely that a message gets through. But it also seems to be important that listeners themselves recognize the patterns and repetition. In terms of common knowledge generation, when a person hears something repeated, not only does she get the message, she knows it is repeated and hence knows that it is more likely that others have heard it. Group dancing in rituals can be understood as allowing individuals to convey meaning to each other through movement. But group dancing is also an excellent common knowledge generator; when dancing, each person knows that everyone else is paying attention, because if a person were not, the pattern of movement would be immediately disrupted.

I then look at examples of people facing each other in circles, as in the kiva, a ritual structure found in prehistoric structures in the southwestern United States, the seating con-

figuration of various U.S. city halls, and revolutionary festivals during the French Revolution. In each of these examples, the circular form was seemingly intended to foster social unity. But how? Our explanation is based on common knowledge generation. An inward-facing circle allows maximum eye contact; each person knows that other people know because each person can visually verify that others are paying attention. I then look at how inward-facing circles specifically, and issues of public and private communication generally, appear in the 1954 feature film *On the Waterfront*.

Buying certain kinds of goods can be a coordination problem; for example, a person might want to see a movie more the more popular it is. To get people to buy these "coordination problem" goods, an advertiser should try to generate common knowledge. Historical examples include the "halitosis" campaign for Listerine. More recently, the Super Bowl has become the best common knowledge generator in the United States recently, and correspondingly, the great majority of advertisements on the Super Bowl are for "coordination problem" goods. Evidence from regular prime-time television commercials suggests that popular shows are able to charge advertisers more per viewer for commercial slots, because popular shows better generate common knowledge (when I see a popular show, I know that many others are also seeing it). Companies that sell "coordination problem" goods tend to advertise on more popular shows and are willing to pay a premium for the common knowledge they generate.

The pattern of friendships among a group of people, its "social network," significantly affects its ability to coordinate. One aspect of a network is to what extent its friendship links are "weak" or "strong." In a weak-link network, the friends of a given person's friends tend not to be that person's friends, whereas in a strong-link network, friends of friends tend to be friends. It seems that strong-link networks should be worse for communication and hence coordinated action, because they are more "involuted" and information travels more slowly in them; however, empirical studies often

find that strong links are better for coordination. We can resolve this puzzle by observing that, even though strong links are worse for spreading information, they are better at generating common knowledge; because your friends are more likely to know each other, you are more likely to know what your friends know.

Finally, I consider Jeremy Bentham's "panopticon" prison design, in which cells are arranged in a circle around a central guard tower. Michel Foucault regards the panopticon as a mechanism of power based on surveillance, as opposed to spectacle or ceremony. Foucault and most other observers, however, neglect the fact that Bentham's design includes a central chapel above the guard tower, so that the prisoners can take part in service without having to leave their cells; in other words, the panopticon is to some extent also a ritual structure. The panopticon generates common knowledge in that each prisoner can see that other prisoners are under the same kind of surveillance.

In considering this variety of applications, no attempt is made to treat any single topic, writer, or text comprehensively. The goal instead is to explore unexpected connections, connections that span wide divisions in the social sciences as currently disciplined. Ideas of rationality and culture are often considered as applying to entirely different spheres of human activity and as having their own separate logic. This book argues instead for a broad reciprocal connection. To understand public rituals, one should understand how they generate the common knowledge that the logic of rationality requires. To understand how rational individuals solve coordination problems, one should understand public rituals.

This book draws on scholarly literatures that are subject to ever increasing methodological specialization. I hope that the connections here suggest that an argument can bring together not only diverse subject matter but also diverse methodologies. This book considers, for example, new data (the prices of network television slots, Super Bowl advertising), suggests new explanations for existing empirical regularities (why "strong links" are better than "weak links"), offers

new interpretations of aspects of ritual practices (group dancing, repetition, inward-facing circles) and cultural products (the film *On the Waterfront*), and compels a closer reading of classic texts (Bentham's and Foucault's panopticon).

After considering these applications, I briefly consider competing explanations of how rituals affect action, either through direct psychological stimulation or through the emotions that come from being physically together with other people. Next I try to respond to the common objection that common knowledge is not really applicable to the "real world" because people do not actually seem to think through several layers of "I know that he knows that she knows" and so forth.

I then further elaborate on the basic argument. Although one of the main points of this book is that common knowledge generation is an interesting dimension of rituals that can be analytically separated from content, in practice content and common knowledge generation interact in interesting ways; I discuss some examples from marketing and sculpture and the "Daisy" television ad for Lyndon Johnson in 1964. Common knowledge depends not only on me knowing that you receive a message but also on the existence of a shared symbolic system which allows me to know how you understand it.

Because common knowledge generation is important for coordinated action, it is something people fight over; for example, censorship typically cracks down hardest on public communications. Recently political struggles have adopted techniques of modern advertising; for example, in 1993, domestic violence activists successfully pressured the NBC television network for Super Bowl air time. The fact that common knowledge generation is a real resource suggests that "symbolic" resistance should not be underestimated.

Common knowledge is generated not only by communication but also by historical precedent. Political protests and advertising campaigns when trying to generate common knowledge thus draw on history as a resource. Just as history can help create common knowledge, common knowl-

edge can to some extent create history through mass rituals and commemorations. Similarly, common knowledge not only helps a group coordinate but also, to some extent, can create groups, collective identities, "imagined communities" in which, for example, each newspaper reader is aware of millions of fellow readers.

In sum, this book tries to demonstrate three things. First, the concept of common knowledge has broad explanatory power. Second, common knowledge generation is an essential part of what a public ritual "does." Third, the classic dichotomy between rationality and culture should be questioned. This third point is explored more fully in the conclusion. In an appendix, I look at a simple example that illustrates how the argument is made mathematically.

The Argument

In some situations, called "coordination problems," each person wants to participate in a joint action only if others participate also. One way to coordinate is simply to communicate a message, such as "Let's all participate." But because each person will participate only if others do, for the message to be successful, each person must not only know about it, each person must know that each other person knows about it. In fact, each person must know that each other person knows that each other person knows about it, and so on; that is, the message must be "common knowledge."

This truism is a fact of everyday social life and is this book's central argument. It has come up in many different scholarly contexts, from the philosophy of language to game theory to sociology. David Lewis (1969), influenced by Thomas Schelling ([1960] 1980), first made it explicitly; Robert Aumann (1974, 1976) developed the mathematical representation that makes it elementary (see the appendix). It is best expressed in an example.

Say you and I are co-workers who ride the same bus home. Today the bus is completely packed and somehow we

get separated. Because you are standing near the front door of the bus and I am near the back door, I catch a glimpse of you only at brief moments. Before we reach our usual stop, I notice a mutual acquaintance, who yells from the sidewalk, "Hey you two! Come join me for a drink!" Joining this acquaintance would be nice, but we care mainly about each other's company. The bus doors open; separated by the crowd, we must decide independently whether to get off.

Say that when our acquaintance yells out, I look for you but cannot find you; I'm not sure whether you notice her or not and thus decide to stay on the bus. How exactly does the communication process fail? There are two possibilities. The first is simply that you do not notice her; maybe you are asleep. The second is that you do in fact notice her. But I stay on the bus because I don't know whether you notice her or not. In this case we both know that our acquaintance yelled but I do not know that you know.

Successful communication sometimes is not simply a matter of whether a given message is received. It also depends on whether people are aware that other people also receive it. In other words, it is not just about people's knowledge of the message; it is also about people knowing that other people know about it, the "metaknowledge" of the message.

Say that when our acquaintance yells, I see you raise your head and look around for me, but I'm not sure if you manage to find me. Even though I know about the yell, and I know that you know since I see you look up, I still decide to stay on the bus because I do not know that you know that I know. So just one "level" of metaknowledge is not enough.

Taking this further, one soon realizes that every level of metaknowledge is necessary: I must know about the yell, you must know, I must know that you know, you must know that I know, I must know that you know that I know, and so on; that is, the yell must be "common knowledge." The term "common knowledge" is used in many ways but here we stick to a precise definition. We say that an event or fact is common knowledge among a group of people if everyone knows it, everyone knows that everyone knows it, everyone

knows that everyone knows that everyone knows it, and so on. Two people can create these many levels of metaknowledge simply through eye contact: say that when our acquaintance yells I am looking at you and you are looking at me. Thus I know you know about the yell, you know that I know that you know (you see me looking at you), and so on. If we do manage to make eye contact, we get off the bus; communication is successful.

The key assumption behind this example is that we mainly enjoy each other's company: I want to get off only if you get off and you want to get off only if I get off. For example, say that instead of an acquaintance it is your boyfriend yelling; I care only about your company, but you would rather join him than me. I would thus get off if I knew that you hear the yell, but I need not care if you know that I hear it, because you will get off regardless of whether I do. Situations like the acquaintance example are called "coordination problems": each person wants to act only if others do also. Another term is "assurance game," because no person wants to act alone (Sen 1967). The boyfriend example is not a coordination problem because one person wants to act regardless of whether anyone else does.

In coordination problems, each person cares about what other people do, and hence each person cares about what other people know. Hence successful communication does not simply distribute messages but also lets each person know that other people know, and so on. Two examples illustrate this further.

Rebelling against a regime is a coordination problem: each person is more willing to show up at a demonstration if many others do, perhaps because success is more likely and getting arrested is less likely. Regimes in their censorship thus target public communications such as mass meetings, publications, flags, and even graffiti, by which people not only get a message but know that others get it also (Sluka 1992, Diehl 1992). For nearly thirty years, the price of a loaf of bread in Egypt was held constant; Anwar el-Sadat's attempt in 1977 to raise the price was met with major riots.

Since then, one government tactic has been to make the loaves smaller gradually; another has been to replace quietly a fraction of the wheat flour with cheaper corn flour (Jehl 1996). These tactics are more than just a matter of individual deception: each person could notice that their own loaf was smaller or tasted different but be unsure about how many other people also noticed. Changing the size or taste of the loaves is not the same public event as raising its price.

In January 1984 Apple Computer introduced its new Macintosh computer with a visually stunning sixty-second commercial during the Super Bowl, the most popular regularly scheduled television program each year. The Macintosh was completely incompatible with existing personal computers: Macintosh users could easily exchange data only with other Macintosh users, and if few people bought the Macintosh, there would be little available software. Thus a potential buyer would be more likely to buy if others bought them also; the group of potential Macintosh buyers faced a coordination problem. By airing the commercial during the Super Bowl, Apple did not simply inform each viewer about the Macintosh; Apple also told each viewer that many other viewers were informed about the Macintosh. According to the senior vice president of marketing for Walt Disney Attractions, the Super Bowl "really is the convening of American men, women and children, who gather around the sets to participate in an annual ritual" (Lev 1991; see also Real 1982).

Coordination Problems

I should make clear that a coordination problem is not a "free rider problem," also known as the "prisoners' dilemma." In a free rider problem, no person wants to participate under any circumstances: each person always prefers to "free ride" on the participation of others. We all want to keep the common field green, for example, but everyone has an incentive to let his herd overgraze. "Solving" free rider

problems hence requires enlarging people's possible motivations, by for example legal or social sanctions against free riders or repeated contexts in which free riding now might make people not cooperate with you later. "Solving" coordination problems, however, does not require changing peoples' motivations: when everyone cooperates, each person wants to do so because everyone else is. Although the term "collective action problem" is often used to refer only to free rider problems (Olson 1971), some argue that collective actions such as political protest are better described as coordination problems (e.g., Chong 1991; see also Moore 1995). Also, even when solving free rider problems via sanctions, for example, there is the "prior" coordination problem of getting people to participate in a system of sanctions, because usually a person wants to participate in sanctioning only if others do also.

A coordination problem also does not require complete commonality of interest; all that is necessary is that each person's motivation to participate increases (or at least does not decrease) the more others participate. For example, in a political protest, there might be "militants" who want to take part even if only a few others do, "moderates" who want to participate only if many others participate and make it seem a reasonable thing to do, and "hangers-on" who simply want to be part of a big crowd experience and are indifferent about the protest's political aims. As long as for each person "the more the merrier," we have a coordination problem. What is ruled out in a coordination problem is each person not caring what others do, thus making each person's decision completely independent, or each person wanting to participate only if others do not — for example, wanting to go to the beach only when it is not crowded.

In a coordination problem, each person wants to coordinate with others but there can be considerable disagreement about how to coordinate. For example, "many Ghanaians would prefer to rely on a common indigenous national language but differ as to which it should be" (Laitin 1994, p. 626). A given coordination might be very bad for a person,

but she still might choose to participate because this undesirable coordination is better than the even worse possibility of nonparticipation. For simplicity, we generally assume that the only issue is whether to participate; the issue of how people fight over how to coordinate is considered later.

Common Knowledge

Here I offer some examples to illustrate how common knowledge is a useful everyday concept, part of the commonsense meaning of "public," and also how common knowledge can to some degree be distinguished from "content" or "meaning."

A recent development in U.S. political campaigning is "push-polling," in which voters are asked leading questions in some impartial guise. As part of a contract with Bob Dole during the 1996 Republican presidential primary, Campaign Tel Ltd. employees identifying themselves with "Iowa Farm Families" made more than ten thousand telephone calls to Iowa voters attacking opponent Steve Forbes's flat tax plan. In response to criticism, a Dole campaign spokesperson defended the tactic, saying that the calls "amounted to messages that have mirrored our television commercials" (Simpson 1996). Regardless of whether the "messages" were the same, the crucial distinction is that the telephone calls are not common knowledge: each person who received a call had little idea of whether or how many other people were similarly called. A television commercial, on the other hand, is common knowledge at least to some degree because a person seeing a television commercial knows that other people are seeing the same commercial. This distinction holds even though a "mass audience" of at least ten thousand people received telephone calls, and would remain even if fewer than ten thousand people saw television commercials.

The New York Metropolitan Opera finally decided in 1995 to display translations of the libretto during performances. However, instead of "supertitles," in which transla-

tions are projected on a screen above the stage, the Met developed its own "Met Titles," in which each member of the audience has her own small electronic screen, which she can turn on or off. According to one reviewer, " 'Met Titles' are markedly superior to the systems of most theatres: . . . they don't become part of the performance's public discourse" (Griffiths 1995). Even if most people turned their screens on, the translations would not be common knowledge because a person reading them does not know if other people are reading (or will admit to reading) them.

For users of electronic mail, common knowledge is nicely described as the difference between cc: ("carbon copy") and bcc: ("blind carbon copy"). When one sends a message to several people at the same time via the To: address line or via carbon copy, each receiver gets the list of people to whom the message is sent. With blind carbon copy, however, each receiver gets a message such as "recipient list suppressed." In terms of the transmission of messages from one person to another, carbon copy and blind carbon copy are the same; they differ in whether they allow recipients knowledge of other recipients. Because carbon copy allows each recipient to have the email addresses of other recipients, it invites bulk email "spamming." But this disadvantage is sometimes outweighed by the need to generate common knowledge. For example, "Ms. Tadaki said having her e-mail list borrowed made her rethink how she addresses messages to a large list. 'Next time I send out a change of address, I will definitely do Bcc,' she said. Even so, Ms. Tadaki said there were still cases when she would use the To field for group messages— namely, an invitation to a party or some other social gathering. 'It allows people to see who else is coming or who is invited'" (Stellin 2000).

Common knowledge is affected not only by technology, but also by how people choose to communicate. Brian McNaught (1993, p. 53) tells of an accountant friend who says "I'm sure my boss knows I'm gay . . . but I'm also sure he doesn't want to talk about it and doesn't want me to talk about it." Here her boss knows that she is a lesbian, and

she knows that he knows, but she cannot talk about it with him, because then he would know that she knows that he knows. The accountant and her lover hosted a pretheater cocktail party for "the accounting firm's employees and their spouses. . . . Once the boss and his wife finally arrived, all the employees quickly headed out the door with their dates. Joining them was the lesbian accountant who took the arm of her male escort. Her lesbian lover stayed home. . . . In this case, everyone knows that there is a homosexual present but pretends that it isn't so." If the accountant went with her lover instead, people would know that everyone else knows; the fact that she is a lesbian would become public, common knowledge.

Common knowledge is in some sense the opposite of a secret. George describes how he came out as a gay man: "I told Peter first . . . then I told Fred . . . and told them not to tell anyone else or talk about it with anyone else until I did. . . . After I talked with other people in our circles, then they did, so after a while everyone was talking with everyone else about it instead of having this big secret that everyone bottled up inside" (Signorile 1995, p. 76). Initially, George told other people individually; even though everyone knew that George was gay, for each person it was still a secret. Once Peter and Fred initiated conversation, people began to know that other people knew; the secret evaporated only after common knowledge was formed.

Common knowledge is not always desirable; sometimes people deliberately avoid it. A male hotel butler who intrudes upon a naked female guest, instead of acting embarrassed and thereby letting the guest know that he knows, might say loudly, "Pardon me, sir." Dissimulation can prevent common knowledge (Kuran 1995), but, as the examples here illustrate, honesty alone is not sufficient.

Most interpretations of cultural practices focus on the "content" or "meaning" of what is communicated. Much of the point of this book is that cultural practices must also be understood in terms of "publicity" or, more precisely, common knowledge generation. This distinction, which cannot

be rigidly maintained (as discussed later), still is useful. To see the distinction, consider two examples. Abner Cohen (1974, p. 133) describes the Friday midday prayer in Islam as both "a demonstration of allegiance to the existing political order . . . [and] an ideal strategic occasion . . . for staging rebellion . . . in the presence of all the men of the community in one gathering." The public execution, described by Michel Foucault (1979, pp. 50, 58–60) as a "ritual of armed law," was actually quite unstable: "the people, drawn to the spectacle intended to terrorize it, could express its rejection of the punitive power and sometimes revolt. Preventing an execution that was regarded as unjust, snatching a condemned man from the hands of the executioner, obtaining his pardon by force . . . overturned the ritual of the public execution." An event's meaning can be "overturned," but the aspect of common knowledge, necessary for both mass legitimation and mass rebellion, remains constant.

Where the Argument Comes From

Without attempting a comprehensive survey, it is worth noting at least that the concepts here are basic enough to have come up in several different contexts. Lewis (1969, p. 6) finds the idea of coordination problem in David Hume's example of several people in a rowboat, each rower wanting to row at the same rate as all the others. The notion of common knowledge arises immediately when thinking about language (Clark and Marshall 1992, Schiffer 1972); knowledge of the knowledge of others and so on is necessary even for basic conversation. For example, to respond affirmatively to my friend's question, "Do you want some coffee?" I would say, "Coffee would keep me awake" only if I know that my friend knows that I want to study rather than sleep (Sperber and Wilson 1986). Coordination problems and how they are solved were considered early on by Schelling ([1960] 1980), and common knowledge was modeled mathematically by Aumann (1976); these issues have been pursued in game the-

ory (for a survey, see Geanakoplos 1992), as well as logic, theoretical computer science, and philosophy (e.g., Gilboa 1998). "Higher-order beliefs" (beliefs about the beliefs of others) and the distinction between public and private announcements are increasingly relevant concepts for economics and finance (e.g., Chwe 1999a, Morris and Shin 1999, Shin 1996). Common knowledge relies on people having a "theory of mind," an ability to understand the mental states of other people; how exactly the theory of mind works and develops is an important question for cognitive neuroscience (e.g., Baron-Cohen, Tager-Flusberg, and Cohen 2000). In the popular literature, common knowledge comes up periodically in recreational mathematics and logic puzzles (e.g., Stewart 1998).

Social psychologists developed the concept of "pluralistic ignorance," which refers to a situation in which people hold very incorrect beliefs about the beliefs of others, and is in this sense the absence of common knowledge. To take one of many examples, in a 1972 survey 15 percent of white Americans favored racial segregation, but 72 percent believed that a majority of the whites in their area favored segregation (O'Gorman 1979; see also Shamir 1993). Most see pluralistic ignorance as a distortion at the individual level (e.g., Mullen and Hu 1988; see O'Gorman 1986): a person reduces dissonance by thinking that her own view is the majority view, for example. Recently it has been applied to the Soviet Union and eastern European states, the idea being that dissatisfaction was widespread but that few people knew how widespread it was. These accounts focus on limited communication: criminal penalties for self-expression, a government-controlled press, and a lack of social ties. "The reduction of pluralistic ignorance," due to modern communication technology and increased foreign contacts, "led . . . to a political wave of tremendous power" (Coser 1990, p. 182; see also Kuran 1991) and the collapse of these regimes.

In his analysis of law, Niklas Luhmann (1985, pp. 26–28) emphasizes the "*double contingency* of the social world": not only is the physical world uncertain, but the actions of

other people are uncertain. Understanding "the perspectives of others . . . is only possible if I see others as another I . . . [who] is as free to vary his behaviour as I am." Hence there is a need, which social institutions help fill, to stabilize "*expectations of expectations*. . . . Moreover, it needs to be considered that there is a third, fourth, etc. level of reflexivity, namely expectations of expectations of expectations and expectations of expectations of expectations of expectations, etc." According to Luhmann, "the reciprocity of perspectives and the constituted meaning of the you for the I can be traced back to German idealism."