The Evolutionary Foundations of Common Ground
Josh Armstrong
Department of Philosophy
UCLA

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*"Everything we do is rooted in information we have about our surroundings, activities, perceptions, emotions, plans, interests. Everything we do jointly with others is also rooted in this information, but only in that part we think they share with us. The notion needed here is **common ground.***

Common ground is a sine qua non for everything we do with others—from the broadest joint activities to the smallest joint actions that comprise them…[T]o coordinate, we have to appeal, ultimately, to our current common ground… and with each joint action—each utterance, for example—we try to add to it. To do that, we need to keep track of our common ground as it accumulates increment by increment." Herbert Clark, *Using Language*, p. 96

1. Introduction

Common ground looms large in contemporary work on pragmatics. From first-order pragmatic discussions of reference, presupposition, and vagueness to meta-pragmatic discussions of the ends and the means of communication itself, a wide-range of work in pragmatics makes an ineliminable appeal to common ground. This is particularly true of dynamic approaches to pragmatics (Karttunen (1974), Stalnaker (1978), Lewis (1979); Kamp (1981), Heim (1982), Roberts (1996), among many others) which model the contribution of communicative actions in terms of their characteristic effects on common ground or their "context-change potentials."

Discussions of common ground have been dominated by a focus on humans and their use of language. This focus is understandable. We are—naturally—interested in ourselves. And the capacity to reliably acquire and fluidly use language is surely among our more distinctive and theoretically interesting characteristics as a species. Nevertheless, an exclusive focus on common ground as it arises in contemporary human linguistic interaction has led researcher to ignore a range of central questions about the evolutionary foundations of common ground. One set of such questions concerns the *comparative distribution* of common ground. Do other social animals apart from humans use common ground in their social interaction with one another? And if so, which specific groups of animals? Another set of such questions concerns the *functional origins* and *stabilization* of the use of common ground. What features or collection of features explains why the use of common ground would come to emerge and become stable within a

population of interacting agents, be they human or otherwise? In what ways, if at all, does the use of common ground increase the ability of agents to adapt to their physical and social environments?

In what follows, I will work to motivate the importance of these evolutionary questions for understanding common ground. My more specific aim is to provide an initial development and defense of three core claims about common ground:

1. CONTINUITY: Common ground is widely (though not universally) distributed among social animals. Humans are not alone in using common ground in the course of their social interactions with one another;

2. RECURRENCE: The use of common ground is favored (i.e. is predicted to emerge and subsequently persist) among populations of animals whose members face recurrent interdependent decision-making problems in which the benefit of their courses of action are contingent on the variable choices of their stable social partner(s);

3. UNIQUENESS: Humans deploy cognitive and social mechanisms for establishing and updating common ground that are not deployed by other living animals—the use of common ground has not only persisted within the human lineage but been amplified as well.

These claims are more or less independent from one another: it is possible to rationally accept one of them without thereby being committed to accepting the others. But taken as a package, these claims about common ground are mutually supporting. RECURRENCE helps to elucidate the animals included in the scope of CONTINUITY, and CONTINUITY and RECURRENCE, taken together with well attested facts about changes in the demands of interdependent decision-making over the course of human evolutionary history, provides a straightforward rationale for UNIQUENESS.

In developing all three of these claims, I will emphasize the importance of distinguishing common ground as a target social phenomenon from a widely accepted psychological *construal* or *explication* of common ground. This widely accepted psychological construal begins with the recognition that information which is common ground in a group is different from information that each member of that group happens to accept or believe, and goes on to characterize this difference in terms an *iterative structure of higher-order mental states* which the members of the group adopt concerning one another's states of mind. In what follows, I will argue that there is an important theoretical difference between information which happens to overlap among a group of agents and information which common ground between those agents. Nevertheless, I'll

argue that we can and should capture this theoretical difference without appealing to the iterative construal of common ground. Instead, I propose an alternative psychological construal of common ground in terms of what I will call *reciprocal responsiveness.*[1] This alternative psychological construal of common ground does not require that agents form higher-order attitudes about the contents one another's mental states in order to utilize common ground in their social interactions with one another. I will show that this alternative construal of common ground makes good sense not just of the comparative distribution of common ground among social animals but also of the role of common ground in contemporary human language use.

The plan for the rest of the chapter is as follows. I'll begin in §2 with an extended discussion of the nature of common ground. After introducing the target phenomenon of common ground, I'll develop two related criticisms of the standard construal of that target phenomenon and sketch my alternative construal. In §3 I detail the ways in which my alternative construal supports CONTINUITY and is in turn supported by RECURRENCE. This will set the stage for my discussion of UNIQUENESS in §4 in which I argue that changes in the demands of interdependent decision making within the human lineage help explain the expanded role that common ground plays in human practices of social interaction in general and linguistic communication in particular. I close the paper in §5 by taking stock of the theoretical consequences of my discussion for questions about the place of common ground within pragmatic theory.

2. What is Common Ground?

In this section, I want to do some initial ground-clearing. More specifically, I want to open up the theoretical space for CONTINUITY. I'll do this in three steps. First, I will highlight an often-neglected distinction between common ground qua target phenomenon and a widely adopted

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[1] Some may be unhappy with this terminology choice concerning the label "common ground," preferring to see the iterative construal as a stipulative definition of the term "common ground" rather than a substantive hypothesis about a naturally occurring social phenomena. I believe that this move should be resisted because it renders it an entirely open theoretical question whether common ground has any role to play in pragmatic theory or whether any living creature—human or otherwise—ever uses common ground in their social interactions with others. In any case, those preferring to treat the iterative construal as a stipulative definition of the term "common ground" can read the discussion that follows as pertaining to a related term "common ground*" which is understood functionally as defined in the paper. Nothing essential in what follows will turn on these terminological matters.

iterative construal of that target phenomena. Second, I will develop general argument against this iterative construal of common ground. This argument turns on cases in which the presence of common ground dissociates from the presence of iterative states of meta-representation. Third, I will sketch an alternative construal of common ground which does not require agents to form—or even be capable of forming— iterative states of meta-representation about their own and others' psychological perspectives on the world.[2] Although I have discussed these points in other work (Armstrong 2018), what I provide here provides a somewhat more streamlined and explicit statement of the central claims.

2.1 Common Ground: Target and Construal

What is common ground? Although it has rarely been noted explicitly, the term 'common ground' has come to be used in two distinct ways within contemporary discussions of pragmatics.[3]

In one sense of the term, 'common ground' denotes a broad social phenomenon in which the members of a group utilize a body of *shared social information*—specifically, a body of *mutually accepted social attitudes*—in their interactions with one another. In a second sense of the term, 'common ground' denotes a social situation in which there is a particular kind of *iterative relation* holding between the psychological states of two or more interacting agents. Although this iterative relation has been characterized in a number of different ways, a standard approach takes this iterative relation to hold among a group of agents when each agent in the group accepts some particular representational content P for the purposes of the interaction, each agent believes that they each accept that P, each agent believes that they each believe that they each accept that P, and so on *ad infinitum* (Stalnaker (2002).

In order to avoid any terminological confusion, I will use the term "common ground" exclusively to denote the first sense of the term and will refer to the second sense of the term as providing one way (among others) of providing a theoretical "explication" or "construal" of common ground. The conceptual distinction between these two senses of the term 'common

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[2] See Armstrong (2018) for relevant discussion and Armstrong (2021) for a similar view of communication in general.

[3] In a series of insightful discussions, Lederman (2018a) and (2018b) has highlighted the importance of making a similar distinction between theoretical usages of "common knowledge." My discussion here builds on the distinctions that Lederman marks.

ground' is central for the discussion that follows. This is particularly true for evaluating the plausibility of the claim that other animals apart from humans utilize common ground. For reasons that will shortly emerge, I think it is highly implausible that non-language using animals satisfy the conditions imposed by the iterative relation. Indeed, I will suggest that, even when considering neurotypical adult human language users, the iterative relation has a far less central theoretical importance than has generally been appreciated. But before turning to these issues concerning CONTINUITY and UNIQUENESS, let me say a bit more about common ground as a target phenomenon.

Since the term 'common ground' was first introduced into pragmatic theory by H.P. Grice (1967)—and subsequently elaborated and refined by other authors (Stalnaker (1978), (1998), (2002), (2014); Lewis (1979) Clark and Marshall (1981); Roberts (1996) and (2004); Clark (1996))—has been taken to be a configuration of psychological states (e.g. states with propositional or proposition-like semantic content) that exhibits a characteristic functional role. I'll call this functional role *dynamic social guidance*. After describing the role of dynamic social guidance and explain how it is supposed to be constrained by a feature that I call *publicity*.

As a target phenomenon, common ground is supposed to provide a background body of attitudes that the agents in a group can use to guide their social interactions at time and, further, which each agent updates incrementally over time as they interact with another and with the world more generally. Some of these attitudes will pertain to what the world is like—for instance, to a set of facts that each agent accepts or treats as true for the purposes of the interaction. Other of these attitudes will pertain to what issues are currently relevant (or "under discussion") or to the ways each agent would like the world to change in light of their preferences. Although each agent will have their "private" or individually-indexed attitudes, common ground is supposed to provide a group-level configuration of psychological states that each agent in the group accepts or is disposed to endorse at least for purposes of their interaction with one another. As the agents interact with one another, what they each accept changes with the result that the longer a group of agents interact with one another the richer their common ground. In these respects, common ground is supposed to provide a shared informational context that provides a background for agents' choices in the course of a social interaction with one another and which changes in regular ways as the interaction unfolds. This functional role of common ground is what I call *dynamic social guidance*.

Dynamic social guidance is not specific to communication, much less to linguistic communication. As Herbert Clark notes in the quote with which I began, dynamic social guidance can (in principle) arise in nearly any social interaction, "from the broadest joint activities to the smallest joint actions that comprise them" (1996, p. 96). Nevertheless, dynamic social guidance is particularly important for understanding richly *context-dependent* forms of communication in which the meaning or representational content of an act of communication depends on more than the communicator's choice of signal (or expression-type) and the objective state of the environment. Consider a few familiar examples from the literature on human linguistic communication:

(1) That book is my favorite novel in the English Language;

(2) They are ready to go;

(3) I'm going to the Daintree, too;

(4) Are you going to come over here, or do you plan to stay there?

Sentences like (1)-(4) can readily be used in successful episodes of communication. But in order to coordinate on the contents conveyed by the act of uttering such sentences, the members of a conversation need to rely on a background of mutually adopted assumptions; for example, to help resolve the person or persons denoted by the pronoun 'they' or to specify who else is going to the Daintree. And coming to coordinate on the contents of these utterances will normally serve to update that background body of assumptions in characteristic ways; for example, by getting others to accept that some particular book is my favorite English novel or by adding the question of whether you are planning to say where you are to those that are currently under discussion.

Within linguistics and philosophy of language, capturing this two-fold interaction between discourse context and content—the fact that the specific contents we communicate often depends on a background body of shared attitudes and, in turn, serves update that body of shared attitudes with the contents we communicate—has been the central reason those working in pragmatics have appealed to common ground (Stalnaker (1978), (1998), (2014); Lewis (1979); Clark (1992) and (1996); Roberts (2004)).

Common ground is, as I said, a social phenomenon. This is true in the weak sense that common ground pertains to the mental states of more than a single agent at a single time. But in order to serve as a resource for guiding social interaction, common ground needs to be social in a

stronger sense. What's common ground between agents needs to be "public" or "open" in ways that an isolated individual's perceptions, preferences, and expectation are not.

The literature of common ground is replete with concrete examples that are supposed to illustrate the importance of this feature. (Heil (1978); Lederman (2018a) and (2018b)). Let me introduce an example of my own.

Suppose that you and I are sitting quietly together at a coffee shop after a long conversation about wildlife in Indonesia. In a moment of quiet reflection, you and I each happen to think about the exquisite color pattern of the Atlas moth. Now contrast this scenario with one in which our moment of quiet reflection is interrupted by an Atlas moth coming to land in the middle of our table in full view of each of us or, alternatively, by one of us coming to say "The Atlas moth has an exquisite color pattern." In the first scenario, although our states of mind do overlap vis-à-vis the color pattern of the Atlas moth that is not enough to make the color pattern of the moth common ground between us. But in the second scenario, the color pattern of the Atlas moth would (under normal circumstances) come to be common ground between us.

The central difference between the cases is not difficult to describe. In the first scenario there is no publicly available environmental cue pertaining to the color pattern of the Atlas moth while in the second scenario there is. This difference matters for what is common ground between agents. As a relatively theory-neural way to capture this observation at the outset of theoretical inquiry, we can propose the following generalization: the psychological states that comprise common ground between a group of agents should not merely overlap but should overlap in virtue of environmental cues that are *publicly available* or *mutually manifest* to the agents (or their cultural communities) (Stalnaker (1998) and (2002). I'll call this the *Publicity* condition on common ground. This condition ensures that what is common ground between a group of agents is cognitively accessible or within reach for those agents and, thereby, can serve resource to guide their social interactions with one another over time.

Dynamic social guidance with publicity constitute the core functional profile of ground as a target phenomenon. What psychological and social relations need to hold among a group of agents in order for those agents to realize this functional profile? To provide an answer to this question is to provide a foundational *explication* or *construal* of common ground. It is, in other words, to provide an explanans to the explanandum of dynamic social guidance with publicity.

Since at least the trailblazing discussion of Robert Stalnaker (1970), (1998) (2002), it has widely been supposed common ground should be explicated in terms of the iterative attitudes of a group of agents.[4] According to standard lore within pragmatic theory, common ground qua social phenomenon should be identified with common ground qua iterative psychological relation. More exactly, this approach attempts to ground facts about dynamic social guidance with publicity in terms of iterative states of *metarepresentation* among a group of agents; that is, in terms of what each agent in a group accepts, believes that they each accept, believes that they believe about what they each accept and so on indefinitely. In the form of an explicit characterization, the iterative construal of common ground has it that some content P (e.g. a set of possible worlds) is common ground among agents A and B just in case the following conditions obtain:

(i) A and B each accept or presuppose that P;

(ii) A and B each believe that they each accept P;

(iii) A and B each believe that they each believe that they accept P, believe that they each believe that they each believe that they accept P and so on *ad infinitum.*

To help fix some terminology, we can call (i) the *mutual acceptance condition*, since it requires each accept to accept some content, (ii) *the base condition of metarepresentation*, since it requires agents to represent perspectival or representational features of their own and others states of mind, and, finally, (iii) *the iterative condition of meta-representation*, since it requires agents to form an infinite (or indefinitely extendable) series of meta-representational states about their own and others' representational states of mind.[5]

The iterative construal of common ground provides an elegant and formally perspicuous account of common ground. And for the purposes of my discussion here, I will not dispute the claim that the resources at work in this construal are sufficient to capture both publicity and dynamic social guidance. All the same, I think this consensus should be resisted: common

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[4] Not everyone has followed the consensus on this score. See especially Horton and Gerrig (2005) and (2016) and Geurts (2020) for alternative construals of the nature of common ground.

[5] Here, and throughout my discussion, I'll assume a minimally realist account of mental representation accordingly to which the appeal to mental representations is not simply a stance or an instrumental gloss that we attribute to creatures but rather a way of typing processes and structures that are genuinely physically realized by those creatures' nervous systems (See Burge (2010), Ch. 2 for a useful review). I say this is a minimally realist account of mental representation because it doesn't presuppose any specific claims about the manner in which nervous systems realize mental representations and doesn't make any assumptions about the existence of a Language of Thought or a symbolic neural architecture.

ground should not be characterized in terms of the iterative states of metarepresentation. Before turning to my arguments for this claim, let me first make a general point.

The standard construal of common ground in terms of iterative states of metarepresentation is *a substantive hypothesis* about the nature of common ground. The thesis is not a conceptual truth which follows a priori from facts about dynamic social guidance and publicity. And even if the appeal to iterative states of metarepresentation is not understood as a claim about the nature of common ground but, more modestly, as an idealized model of the norms governing social interaction, it can still be evaluated with respect to its fruitfulness in illuminating core features of the target system in question. Accordingly, the truth (or fruitfulness) of the iterative construal of common ground cannot be assumed at the outset of inquiry but is something that stands in need of theoretical evaluation. It is to an evaluation I now turn.

2.2 Against the Iterative Construal

Most critical discussions of common ground have focused on the iterative condition of meta-representation, the claim that common ground requires agents to represent an infinite array of attitudes about the contents of their own and others perspectives on the world. The claim that agent enter into states of this kind has been claimed to give rise to something akin to a paradox: how could a finite creature with limited amounts of time and computational resources represent an infinite array of psychological states?[6] The claim finite agents represent an infinite array of states seems to require deeply implausible psychological commitments. Some have taken this problem to motivate a thoroughgoing rejection of appeals to common ground in pragmatic theory (Sperber and Wilson (1986/1995)). Others have replied that the problem can be avoided by construing the iterative condition *normatively* in terms of what two or more agents are committed to believing another's mental states (Lewis (1969); Geurts (2020)) or useful idealization about the mental states of agents (Stalnaker (2014); Greco (Forthcoming)).

For my purposes in what follows, I'll simply set these very serious problems about iteration aside and focus on a more basic problem that arises for the appeal to the base condition of metarepresentation.

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[6] Clark and Marshall (1981)

Even without infinite iteration, metarepresentation is a cognitively demanding mode of social cognition. Not every creature that engages in social cognition is capable of representing representational states such as belief or presupposition. Moreover, not every creature that has the capacity to represent representational states of this sort needs to deploy this capacity when engaging in social cognition.

Metarepresentation requires agents to mentally represent their own and others' representational states *as such*. And in order to do this, agents must represent more than just the presence of other agents, the orientation of those agents in space and their movements over time, or the social relationships that those agents stand in to one another. Metapresentation requires that an agent mentally represent *perspectival* dimensions of their own or others' representational states of mind. In particular, a widely accepted condition on metarepresentation is that it requires agents to represent what has been called *decoupled representational content*: to be capable of representing their own or other's perspectives on the world in a way that allows those perspectives to inaccurately correspond to (or decouple from) the objective states of the world.[7]

The cognitively demanding nature of metarepresentation generates a problem for iterative construals of common ground. Common ground is supposed to be a highly general feature of social interactions that display the two-way interaction between context and content. But metarepresentation is a specialized form of social cognition, one which need not be deployed in every instance of context-dependent forms of social interaction. We thus have a problem: the features of common ground qua social phenomenon can dissociate from conditions imposed by the iterative construal. I'll call this the *problem of dissociation*.

One way to develop the problem of dissociation is by focusing on groups of agents that display dynamic social guidance and publicity in their interactions with one another but which lack the capacity for metarepresentation altogether. Comparative research on primate social behavior provides a number of vivid illustrations of this problem. Let me draw attention to one

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[7]See Dennett (1978), Harman (1978), Leslie (1987), Perner (1993), Sperber (2000), Tomasello (2018), and Burge (2018) among many others for version of this condition on metarepresentation. In an important recent paper, Westra and Nagel (2021) raise the prospect of *factive* forms of metarepresention which center on the attribution of states of knowledge which lack the presence of decoupled content. A discussion of Westra and Nagel's concept of factive metarepresentation is beyond the scope of the present discussion and, in any case, does not itself provide a way to avoid the challenges I raise for iterative approaches to common ground since I think there are creatures that use common ground that do not attribute metarepresentation to others in *either* factive or non-factive form.

such case that I've discussed in other work (Armstrong 2018)), namely the use of *affiliative* devices of communication among free-ranging baboons.

Affiliative signals are device of communication that reduce intra-group conflict (de Waal, and van Roosmalen, (1979), Cheney et al (1995), Silk et al (2000)). These signals are used both prior to social interaction and following violent conflict. For present purposes, the important point about affiliative signals is that they are *targeted to an addressee*. Affiliative signals do not communicate that a signaler has benign dispositions in general or to ever other group members. Instead, affiliative signals are vocalizations or manual gestures that senders use to facilitate peaceful social interaction with a particular member or collection of members of the larger social groups in which they are embedded (Engh et al (2006), Wittig et al (2007), Seyfarth and Cheney (2017)).[8] Crucially, however, the target of an affiliative signal is a context-dependent affair: receivers have to work out the particular addressee of the sender's signals on the basis of a wide range of publicly available information; for example, the spatial orientation of the sender in relation to other group members, the rank and coalition relations of the sender and other group members, and the history of recent social interactions among the group. In other terms: producing an affiliative signal is a manifest communicative action which has a content or communicative import that both depends on a background body of public information and which serves to update that background body of public information in characteristic ways—namely, with the information that the sender will not act violently toward the target of the signal.

The use of affiliative signals has been documented among a wide range of social animals (Silk 2002). However, the use of these signals among baboons is particularly useful for illustrating the problem of dissociation. Baboons are highly gregarious animals that engage in robust forms of social cognition (Cheney and Seyfarth (2007)). But it is widely agreed that baboon do not mentally represent decoupled representational content in the way that would be required for the attribution of belief or presupposition, much less for higher-order representations of belief or presupposition (Cheney and Seyfarth (2007), Roseti et al (2010), Burge (2018)). Baboons have not been shown to successfully pass false belief tasks, even under various implicit

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[8] This is reflected in the differential rates of social interaction between the signaler and the addressee following the use of the signal. The differential effects of how likely it is that *specific* group members interact with one given the use of the affiliative signal is difficult to explain if these signals were generic expression of benign disposition not targeted toward specific addressees.

measures of those tasks. And baboons do not show evidence of tracking distinctions within states of belief, for example in attributing states of *disbelief* or of *suspension of belief*.[9]

Baboons thus provide a concrete illustration of the way in which the use of common ground can dissociate from conditions imposed by the iterative construal. But it would be a mistake to think that the problem is specific to non-human animal social interaction, for humans also display the relevant patterns of disassociation.

One systematic arena within which to view this disassociation between common ground and metarepresentation is human development. It is a matter of a good deal of current controversy whether or not humans' capacities for metarepresentation are innate or grounded in a domain-specific biological endowment. However, all parties to this discussion of human development recognize that the competent, on-line use of metarepresentation must develop in individual human minds as a function of their experiences and social interactions with others (Scholl and Leslie (1999)). And herein lies the problem: for there is good reason to suppose that context-dependent episodes of communication and social interactions are among the set of experiences human children need to participate in order to become competent at producing and processing states of meta-representation (Moll et al (2007); Matthews et al (2010); E. Clark (2016); Trueswell et al (2016); Moore (2017); Bohn (2017), Tomasello (2018)). Human children thus appear to build and incrementally update common ground with others prior to their ability to readily deploy states of metarepresentation and hence, on pain of a problematic regress, common ground cannot be identified with iterative states of metarepresentation.

What about adult humans who are able to competently generate and process metarepresentational states of mind? Does the central problem of disassociation arise for them as well? It does. Let me illustrate this problem by focusing on the case that has dominated attention

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[9] This provides one reason to be skeptical of the model of belief attribution provided by Stalnaker (2014) and Greco (Forthcoming). Within these models, belief attribution is equated with a set of possibilities that an attributor takes to be compatible or not ruled out by a subject's information state. The trouble is that this proposal collapses theoretically important distinctions concerning the capacities required to attribute belief states. For instance, if an attributor is to be credited with a capacity to attribute a belief to a subject then that attributor should also be capable of marking a range of related distinctions concerning the information state of the subject. For instance, any subject that is capable of attributing a state of belief should also be capable of attributes states of *disbelief* (or *rejection)* and of *suspended judgement*, thereby having the capacity to distinguish between possibilities that a subject has considered and endorsed (or rejected or suspended judgement) and possibilities that a subject has not considered at all.

within the theoretical literature on common ground—namely, neurotypical adult human language use.

A striking result of a number of recent studies on human linguistic interaction is that human do not attribute decoupled representational content automatically or by default (Keysar et al (2000), Keysar (2007), Apperly (2018)) Rather, mature human language users with the capacities to attribute decoupled representational content deploy those capacities only when they deem them to be needed for successful communication (Hawkins et al (2021). To illustrate this general point with a specific example: a speaker may order a plate of food at a restaurant by pointing to a picture on a menu and saying "I'll have this one" without thereby attributing a decoupled content to the server. Of course, if the server replies by saying, "I don't know what you mean," or if the speaker anticipates a difference in visual perspective that would otherwise undermine the prospects of successful communication, that may prompt the speaker to generate a decoupled representation of the server's state of mind. But it does not follow from the fact that a group of language users can generate decoupled representational contents in some conversational context that the language users actually do generate those contents in that context.

In this toy example, we see the characteristic features of common ground at work. The speaker's actions of pointing and speaking were manifest environmental cues mutually available to the members of the conversation. Those actions served to communicate a particular to the audience member. This communicated content both depended upon a background body of shared assumptions—e.g. concerning local customs for ordering food, a picture in mutually perceptible physical space, the direction of the demonstration, and the like—and served to updated that background body of assumptions with information about the speaker's food preferences vis-à-vis the menu. However, absent a specific rationale for doing so, there is no reason why the members of the conversation would need to form beliefs about one another's beliefs in order to communicate with language in the way that they did. The coordinated actions of food ordering and food delivery through the use of language did not need to proceed via the use of metarepresentational resources in order to be successful.

The problem with the iterative construal of common ground is thus not simply that it involves a potentially dubious appeal to psychological states with infinite iterations. The problem with the iterative construal is that it entails that that common ground is used by a group of agents only if those agents actively deploy a capacity for metarepresentation. The social behavior of

both humans and other animals provides ample reason to suppose that common ground is not constituted by the use of metarepresentational states: that common ground can be used by a group of agents that either cannot or do not represent beliefs and other metarepresentational states with decoupled content.

2.3 Common Ground as Reciprocal Responsiveness

How, then, should common ground be construed? I turn now to a statement of my own favored answer to this question. This answer retains the psychological orientation of the iterative construal but it focuses on a much more basic set of psychological states. The animating idea of the account is that common ground consists in a set of mutual attitudes that a group of agents accept because of a history of reciprocal cognitive responsiveness to the presence of one another and to the states of the world more generally. I'll call this the *reciprocal responsiveness* or, more simply, the *reciprocal responsiveness* construal of common ground.

Let me start by offering a more careful statement of this construal of common ground before elaborating its core features. According to the reciprocal responsiveness construal of common ground, some content P (e.g. a set of possible worlds) is common ground among agents A and B just in case the following conditions obtain:

(i)   A and B each represent the presence of the other as individually distinctive agents in the course of a social interaction;
(ii)   In the course of that social interaction, A and B each accept P;
(iii)   If the environmental cues present in that social interaction or in previous social interactions had been different, A and B would each have accepted some alternative content Q rather than P.

Again to help fix some terminology, we can call (i) the *represented co-presence condition*, since it requires two or more agents to represent the presence of one another as individual agents in a social interaction, (ii), *the mutual acceptance condition*, since it requires the agents to mutually accept the same (or relatively similar) representational content in the course of a social interaction, and (iii) the *content co-variation condition*, since it requires agents' representational states of mind to display a modally robust co-variation relation with both the states of the world and with one another's representational states of mind.

This construal of common ground involves a combination of psychological and environmental relations. The psychological relations concern conditions (i) and (ii), which require agents to utilize capacities not just for mental representation but for *social representation* and *social memory*. Taken together, these two conditions ensure that the fact that two or more agents each happen to accept the same (or relatively similar) content is not enough for that content to be common ground between them. The agents additionally each need to utilize a psychological capacity for representing the presence of one another *as agents* in the course of a social interaction.[10] And the agents each need to be capable of using their past experiences—including their past social interactions with one another or with others—to guide their present perspectives on the world. But the agents need not represent the fact that they each have perspectives on the world or the fact that their perspectives on the world mutually overlap: no beliefs about beliefs or about metarepresentational states are required. More specifically, the content co-variation condition (iii) need not itself be mentally represented by the agents in questions. In this sense, the co-variation condition is *external* (or *non-psychological*) condition governing the relations that connect two or more agents' cognitive systems to one another and to the environmental cues to which they are each exposed.

The reciprocal responsiveness construal of common ground centers on a far less psychologically demanding set of conditions than the iterative construal of common ground. For this reason, the construal allows for common ground to arise among a wide range of intelligent agents—in principle, to any group of agents which display the underlying capacities for social representation and social memory. At the same time, the reciprocal responsiveness construal of common ground is strong enough to capture both dynamic social guidance and publicity.

It may be helpful to begin with some examples. Return to the 'Atlas moth' case discussed previously. If you and I are discussing wildlife in Indonesia, and both happen to think, without saying it aloud, that Atlas moths have beautiful coloration, this belief about the moths is not

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[10] I presume here that *agency-representation* need not be characterized in metarepresentational terms. Following a good deal of recent work in cognitive and comparative psychological, I take agency representation to be a psychological natural kind of representation that clusters around a a capacity to represent spatially integrated bodies (i.e. individuals) that move in self-propelled and purposive ways that are sensitive to the constraints that the environment imposes on them; see Leslie (1994), Carey (2009), ch. 5, and Burge (2018) among many others. In Leslie's terminology, agency representation is governed by ToBy or mechanisms for body detection rather than ToMM or mechanisms for the detection of mental states as such.

common ground between us, even though we both happen to have it. This is because our individual states of minds are not covarying as a function of the environmental cues we are observing—the third condition of the account does not obtain. But now suppose that you and I begin to discuss the fact that the that Atlas moths have a beautiful pattern of coloration and that there is also someone at the table next to us that hears our conversation and comes to accept that that Atlas moths have a beautiful pattern of coloration. In situation, it is common ground between you and me that Atlas moths have a beautiful pattern of coloration but it is not common ground with person sitting next to us. For while you and I have come to satisfy all three conditions of the account, the person sitting next to us is a mere overhear and does not satisfy condition (i) with respect to the social interaction—we have not represented co-presence with one another.

As these cases bring out, when a group of agents satisfy the three aforementioned conditions, their perspectives on the world will not only overlap at a time but will continue to overlap over the course of their interaction with one another. The mutual acceptance condition ensures that there will be a common information state that governs the agents' social interaction. The common information state will determine, among other things, a set of "open possibilities" or "live options" for what the world is like—namely, the set of possibilities compatible with what the agents' mutually accept in that social situation. These open possibilities provide a background within which the agents think and act in the course of their social interaction. The mutual responsiveness condition ensures that these open possibilities will change in characteristic ways for each agent as the social interaction unfolds. If, for instance, there is a mutually manifest event in which a goat appears in the vicinity of the agents, possibilities in which there is no such object present will be excluded from active consideration by each agent. Likewise, if one agent performs a manifest communicative action, this will serve to update the set of open possibilities considered by each other agent—minimally to exclude possibilities in which no communicative action took place and, if things go well, to exclude possibilities incompatible with the content of that communicative action.

This familiar description of the dynamics of social interaction and public information is secured on the present construal of common ground by the fact that the relevant agents are embedded in an overlapping environment and have proper functioning cognitive capacities that enable them to robustly track the states of that environment and one another and which enable

them to use prior experiences to guide present decision-making. No appeal to iterative states of metarepresentation is required.

The reciprocal responsiveness construal of common ground also allows us to capture a further feature of common ground which I have not yet discussed. This is the *partner-specificity* of common ground. What is common ground between you and your close friend is different from what is common ground between you and your neighbor or your distant cousin. Different bodies of information will be relevant across the different interactions you have with these individuals. This fact can readily be explained by the represented co-presence condition together with the content co-variation condition. As a number of researchers have recently argued, partner-specific bodies of information can be stored in episodic memories traces that pair individuals with events that took place in each other's presence (Horton and Gerrig (2005) and (2016); Mezing and Brennan (2003); Galati and Brennan (2021)). Through these mechanisms of social perception and social memory, agents can use the identity of their interlocutor as a contextual cue for recalling which specific information has already been established between them and which information has not. Again, no appeal to iterative states of metarepresentation is required.

For reasons that I will return to in §4, none of this should be taken to suggest that metarepresentation plays no explanatory roles in our understanding of common ground. To the contrary, I suspect that metarepresentation does have important roles to play in explaining distinctively human patterns of social interaction. The central claim of this section has not been that metarepresentation is explanatorily otiose but that metarepresentation is not constitutive of common ground.

Before closing this section, let me respond to a possible objection. The construal of common ground I have developed implies that a group of interacting agents can be ignorant or confused about what is common ground between them. In particular, neither so-called *negative introspection principles* (roughly, "if a group of agents do not believe X is common ground between them, then they believe that they do not believe X is common ground between them") or *positive introspection principles* (roughly, "if a group of agents believe X is common ground between them, then they believe that they believe X is common ground between them") are preserved as requirements on common ground as such. To illustrate: suppose you and I are once again sitting at a coffee shop and that you are facing a window and that my back is turned to the window. Now suppose that you happen to see a goat walking down the street outside the

window. And suppose that you think that I cannot see the goat because my back is turned to the window. Unbeknownst to you, the camera on my computer in front of me is on and it has enabled me to see the goat walk by clearly and distinctly. The iterative construal of common ground predicts that the presence of the goat is not common ground between us in this scenario because you don't believe (or accept) that I believe (or accept) that there is goat outside. In contrast, my reciprocal responsiveness construal predicts that it is common ground between us that there is goat outside the window because each of the three conditions of the construal have been satisfied.[11]

I accept this prediction of the present construal, and regard it to be a feature rather than a bug of the construal that it allows that a group of interacting agents can be ignorant or confused about what is common ground between them. Agents' social actions are guided by their *private* (or *individually-indexed*) information states in addition to the public information that they have at their disposal.[12] In special cases, like the one just discussed, your immediate interactions with me may be better explained by what you falsely believe about my information state than what is in fact common ground between us. This would show that common ground is irrelevant to explaining social action only if common ground were rarely, if ever, approximated by agents' private information or if agents had no means of calibrating their private attitudes in light of the publicly available social cues that other agents display. There is no reason to suspect this is so, and good evolutionary reasons to suspect that it is not so. The capacities of social animals to accurately represent and recall their worlds—including the behavior of other agents in those worlds—ensures that common ground has a central role to play in explain why individual perform the social actions that they do.

3. The Adaptive Significance of Common Ground

At the outset of my discussion, I said that one my aims was to develop CONTINUITY as a central thesis about common ground:

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[11] My thinking about cases like this one have benefited from helpful discussions with Christian De Leon
[12] This point has been a theme of a good deal of recent work on linguistic communication; see Camp (2018), Murray and Starr (2018), Harris (2020), and Peet (2021), among others.

CONTINUITY: There are other social animals apart from humans that use common ground in the course of their social interactions with one another—common ground is widely (though not universally) distributed among social animals.

The discussion in the last section took some initial steps in that direction. I argued that common ground is a body of mutually accepted attitudes that a group of agents adopt because of a history of reciprocal social-cognitive responsiveness to the presence of one another as individuals and to the states of the world more generally. Since the cognitive and environmental conditions imposed by this construal of common ground do seem to be displayed by many (though not all) social animals, CONTINUITY is thereby vindicated.

In this section, I want to extent my case for CONTINUITY by turning to an underexplored set of functional questions about the *adaptive significance* of common ground among groups of interacting agents.

Why has the use of common ground evolved? What is it, exactly, that common ground does for interacting agents such that doing those things would help explain why the use of common ground initially emerged and subsequently persisted over time? In the terminology introduced by Millikan (1984), what is the *proper function* of common ground or the effects of the use of common ground among interacting agents which been favored by selection?[13]

Questions of this kind have received virtually no explicit discussion in the vast literature on common ground in pragmatics. I suspect that one reason for this relative lack of explicit discussion is that many authors have implicitly assumed that these questions have rather a straightforward answer. This answer has it that the (proper) function of common ground is to enable coordinated social action; in other terms, that coordinated social action *requires* agents to make use of common ground. As Clark (1996), p. 96 puts the point "common ground is *a sine qua non* for everything we do with others….to coordinate, we have to need to appeal, ultimately, to our current common ground." Accordingly, common ground helps agents secure all the collective goods that coordinate social action provides and it is because of this connection to coordinated social action that common ground evolved.

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[13] Selection here is understood broadly. It includes any process centering on the variation, inheritance, and differential persistence or reproduction of elements in a population. The natural selection of elements in a genetic system is one paradigm form of selection, but it is not the only or even the most important form of selection for reasons developed at length in Jablonka and Lamb (2004).

This proposed answer contains a kernel of truth. As stated, however, it simply will not do. Coordinated social action can be achieved in variety of ways that don't require agents to make use of anything like a common ground. Some forms of coordinated social action can be achieved through the use of more-or-less instinctual responses, as when the yawn of one agent induces yawns in others or when a pair of agents each wait to speak until the other has finished speaking. Other forms of coordinated social action can be achieved through learned psychological cues, as when a series of lone hikers follow a coordinated path on a trail because they see that others have taken that path before them or when a group of agents come to match their food preferences to the food preferences of their neighbors. And indeed, a good deal of social coordination takes place in the living world without the organisms doing the coordinating having minds at all. For instance: bacteria join together to form a quorum that enables, among other things, quicker and more efficient forms of reproduction (Bassler (1999), Skyrms (2004)). Complex, eukaryotic, organisms are made possible by assemblages of cells that that coordinate with other cells and which are, in turn, build up out of entities that coordinate with each other (Maynard Smith and Szathmáry (1995), ch. 8) Birch (2017), ch 7).

I do not take these considerations do defeat the claim that common ground evolved because of its connection to coordination. However, I do take these considerations to suggest that the evolutionary origins of common ground are to be found in the role that common ground plays in enabling *specific kinds* of coordinated social action. What are these specific kinds of coordinated social action? RECURRENCE provides an answer to this question:

> RECURRENCE: The use of common ground is favored (i.e. is predicted to emerge and subsequently persist) among populations of agents whose members face recurrent interdependent decision-making problems in which the benefit of their social interactions are contingent on the variable choices of their stable social partner(s).

RECURRENCE centers on two core conditions. The first condition concerns recurrent social interactions that take place among *stable* social partners (i.e. partners that interact with each other repeatedly over an extended period of time). The second condition concerns recurrent social interactions in which the benefits of those social interactions for each agent are contingent upon the potentially *variable* choices of their partners. The claim is that it is this particular mix of stability and variation in situations of coordinated social action that explains why the use of common ground evolved among populations of interacting agents.

The rationale for this claim proceeds as follows. If two or more agents interact with one another repeatedly, and the benefits of those interactions for each agent turn on the variable choices of their partners, then agents which individually recognize their partners and condition their choices on their memories of their past interactions, will do better than agents that do not (cf. Trivers (1971), Axelrod and Hamilton (1981)), Axelrod (1984), Dugatkin (1997), Silk et al (2000), Sheehan and Bergman (2016)).[14] Furthermore, if the benefits of these repeated social interactions are genuinely interdependent, requiring the agents to coordinate their actions with one another in order to secure the relevant benefits, then agents which form mutually agreeing mental representations of the situation in which they find themselves will do better than agents that do not.[15] This is because agents that regularly fail to form mutually agreeing mental representations and come to occupy what has been called "defective contexts" of social interaction (Stalnaker (1978)), will less readily come to coordinate their actions with one another and so more often fail to procure the goods associated with the interactions. Accordingly, it pays for agents in such situations to form mental representations that robustly co-vary not just with the states of the world but also with one another's mental representations. And, finally, insofar as the underlying benefits of the interactions have consequences for agents' ability to differentially survive and reproduce, the use of common ground will take on an adaptive significance. Common ground qua reciprocal responsiveness will become a fuel for evolutionary success and, for that reason, can be expected to evolve and persist among populations of animals which have regularly found themselves in such situations of interdependent decision making.

Or so I propose. RECURRENCE, and the considerations I have just offered in its favor, turn on complex empirical issues that cannot be established by theoretical intuition alone or even my considerations deriving from strategic models of social behavior. Accordingly, let me offer a

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[14] Sheehan and Bergman (2016) is particularly relevant for the present discussion. This paper motivates the importance of variable social choice in the context of repeated social interaction for explaining the evolution of what they call "reciprocal strategies of social assessment.: As Sheehan and Bergman note, the use of social assessment strategies have non-trivial evolutionary costs: they require the use energetically expensive neuro-cognitive machinery and they require animals to engage in potentially risky social interaction with others. Sheehan and Bergman find that the benefits of the use of these strategies will tend to outweigh their costs only in contexts of repeated social interaction in which there is variation in how another individual is likely to act that cannot be readily predicted on the basis of a highly quality (or "unfakable") signal. This is very much in line with RECURRENCE.

[15] See Richards (2001) and Godfrey-Smith and Martínez (2013) for game-theoretic developments of this point.

concrete illustration of these ideas that draws on an extensive body of work within behavioral ecology and comparative cognition on the adaptive significance of mutual aid in stable social relationships.

A number of ecological conditions can generate situations of recurrent interdependent decision-making in which animals must coordinate their variable choices with stable social partners. One ecological condition of this kind occurs in the context of *pair-bonding* as it has been documented among a wide number of avian species, ungulates, and in some other mammals (Reichard and Boesch (2003)). Another ecological condition of this kind occurs in the context of *coalition formation* among animals that live for extended periods of time within stable social groups organized around a dominance hierarchy as it has been documented among many different mammalian groups and particularly among primates (Harcourt and de Wall (1992) and Bissonnette et al (2015)). These two ecological conditions generate a common structure for social interactions. On the one hand, these conditions generate stable social relationships that can last over the course of many social interactions—indeed, over extensive periods of animals' lifetimes—in which animals are motivated to act on one another's behalf; for example, in defending one another from the threats of predation and rival conspecifics and in provisioning valuable resources to one another and each other's offspring. On the other hand, these conditions are highly contingent in two separate respects. There is a contingency in *partner choice* vis-à-vis with whom to pair-bond or forms coalitions and whether or not to terminate those relationships. And there is a contingency in *social choice* with a partner on a particular occasion of interaction; for example, in choosing whether to intervene in a violent encounter or to stay put.

RECURRENCE predicts that animals that occupy social-ecological niches of this kind should utilize common ground. This is exactly what we seem to find. Animals that engage in pair-bonding or coalition formation employ rich strategies of social assessment: they individually recognize their partners, they actively track one another's behavior over time, and, plausibly, they form overlapping representations of the situations in which they find themselves when deciding how to coordinate their behavior with their partner's behavior (Dunbar and Dunbar (1980), Bissonnette et al (2015), Cheney and Seyfarth (2007)). And as a growing body of results show, engaging in these forms of social behavior have powerful impacts on animals' fitness: animals that are better able to enter into such relationships with others are better able to survive and produce offspring which also survive and reproduce (Silk (2007) and (2014), Cameron et al

(2009), Seyfarth and Cheney (2012), Stainton and Mann (2012), McFarland et al (2017), Campos et al (2020), Dunbar (2021)). In one striking recent study of pair-bonds among a marine bird (*Sula nebouxii*), it was found that fitness increased with the length of the relationship between the animals involved. Animals that spent longer periods of time paired together were better able to coordinate a wide range of their choices with one another—from synchronizing their arrival at breeding sites to efficient turn-taking in offspring provision and territorial defense—in ways that made them better able to survive and produce viable offspring (Sánchez-Macouzet et al (2014)). As these cases show, the ability to form and incrementally update common ground can have a profound significance to the lives of animals.

We thus have a further motivation for CONTINUITY. Common ground is not likely to be unique to human social interactions because the social and environmental pressures that explain why the use of common ground would emergence and persist over time is not unique to human social life. While this general point could remain true even if RECURRENCE were false, RECURRENCE provides a clear and empirically well-supported way to develop it. At the same time, RECURRENCE helps to elucidate the scope of the social animals included in CONTINUITY and in the particular occasions of social interaction which those animals are likely to use common ground. Of course, what matters here is not where or not one is willing to use the term 'common ground' in the way that I've used it. What matters is that there is a natural kind of social interaction which is both important to the lives of humans and other animals and made possible through the use of reciprocal responsiveness. I have argued that there is indeed a natural kind of social interaction with these features and that RECURRENCE helps explain why.

4. Common Ground and Human Social Interaction

I have now developed an account of the nature of common ground, its comparative distribution among other animals, and its adaptive significance. I want to close this chapter by considering the implications of my account for the study of human pragmatics. What, if anything, do my claims about the evolutionary foundations of common ground suggest about *us* and the social and psychological resources we bring to bear in establishing and updating common ground with one another?

This question raises a large and complex set of issues which would require more than a chapter of its own to address. Here I want to briefly develop two central points, focusing on the

role of higher-order states of mind or what I've collectively been calling states of metarepresentation. First, I want to make clear that my claims about the nature and function of common ground do not undermine the familiar proposal that metarepresentation is a normal part of human social interaction. To the contrary, my claims about the evolutionary foundations of common ground provide a principled rationale for the importance of metarepresentation in the manner in which adult humans establish and update common ground in their social interactions with others. Second, I want to reiterate a point I have already made—namely, that the role of metarepresentation in human social interaction is highly constrained and need not be present in every context in which humans utilize common ground. In this respect, I'll argue that the broad construal of common ground I've offered in this chapter is important even if humans do regularly deploy metarepresentational resources in their social interactions.

Humans identify and update common ground in many ways which are unavailable to other living animals. For instance, humans are remarkably adept at forming common ground with individuals they have never previously met and will likely never interact with again. For instance, the mutual recognition of a regional speech pattern or style of dress is often enough for two agents to establish a large body of common ground between. Humans also deploy a wide range of techniques for explicitly registering the extent to which their communicative actions did or did not successfully update the common ground via acknowledgments, requests, and other mechanisms of so-called "conversational grounding" (Clark and Brennan (1991) and Clark (1996)). Moreover, adult human language users have the means of explicitly representing the extent to which the other members of a conversation have coordinated their states of mind at various levels of iteration. To take a particularly vivid example, a competent speaker of English can utter (5) and readily expect to communicate its message successfully with audience members:

(5) Alf wonders whether Bea believes that he is happy about the election results.

To successfully communicate with an utterance of this kind, conversational participants must not only represent one another's representations about each other's mental states but they must also have the linguistic means of expressing those higher-order states of mind. This capacity is plausibly unique to humans.

There is thus good reason to believe that human social interaction is quite distinctive from the point of view of comparative pragmatics. In particular, there is good reason to accept UNIQUENESS:

> UNIQUENESS: Humans deploy cognitive and social mechanisms for establishing and updating common ground that are not deployed by other living animals; the use of common ground has not only persisted within the human lineage but been amplified as well.

These cognitive and social mechanisms include but are not limited to increased emotional capacities for social tolerance, linguistic capacities for structured expression and interpretation, and social-cognitive capacities for cooperation, turn-taking, and (decoupled) metarepresentation.

One might wonder whether these points about human uniqueness show that we need an altogether different account of common ground for humans than the one I have developed in this paper. Unsurprisingly, I am unmoved by this thought. What these points about the differences between humans and non-humans show is that common ground has been sufficiently important for social interaction in our lineage that we have evolved mechanisms for internally representing and regulating the external relations of mutual responsiveness which common ground requires. Quite clearly, these evolved mechanisms enable humans to form and incrementally update common ground in ways that are not present in other animals. But they do not make common ground in humans *sui generis* or fundamentally different in kind—they are very much variations on an evolutionarily ancient theme.

The account I have offered of the nature of common ground is fully compatible with the thesis that humans employ unique cognitive and social resources for building common ground with others. Indeed, my discussion of the comparative distribution and adaptive significance of common ground can help explain *why* these unique cognitive and social resources evolved in the human lineage.

Recall RECURRENCE, the thesis that common ground evolved to support recurrent interdependent decision-making problems in which the benefit of an individual's social interactions is contingent on the variable choices of their stable social partner(s). According to this thesis, it is the combined demands of stability in social partners and variation in the choices of those partners that selects for the need to maintain common ground.

RECURRENCE provides a natural explanation of the presence of expanded mechanisms for forming and incrementally updating common ground in our lineage for two related reasons—one concerning novel social networks pressures and a second concerning novel pressures of communication and of cultural exchange. First, on the network pressures. Over the course of human evolutionary history, there has been an expansion of the size and complexity of our social worlds: not only did our hominin ancestors need to interact with a greater number of stable social partners, they needed to interact with partners who lived in different geographical areas and possessed substantially different background skills and experiences (Hawks (2008); Rodgers et al (2017); Sterelny (2012) and (2021)). Second, on the pressures of communication and cultural exchange: In addition to expansions in the size and complexity of our social worlds, there have been expansions in the need to communicate efficiently and reliably with others about a wide-range of subject-matters, including temporally and spatially displaced subject-matters. For instance, there was an increased need to communicate about food resources not located in the immediate environment, about difficult to acquire subsistence skills and practices, about how one ought to act in light of the social norms of the cultural group, and about the preferences and the future-orientated actions of group members in the context of collective actions (Richerson and Boyd (2006), Sterelny (2012), Henrich (2015), Wrangham (2019), Planer and Sterelny (2021)).

Taken together, the demands of successfully coordinating on the variable choices of one's stable social partners in light of these network and content pressures makes sense of why distinctive cognitive and social mechanisms for building common ground would have evolved within our lineage. More specifically, these pressures would explain why metarepresentation would come to be so central to human social interaction: given the problems of coordination that members of our lineage needed to solve, metarepresentation was a powerful fuel for success. As a fuel for success, metarepresentation would not merely function retrospectively as a strategy of repair or explanation when normal means of communication and social interaction broke down, as some have proposed (Millikan (1984), Keysar (2007), Andrews (2012). Instead, metarepresentation could come to function *prospectively* as a means of anticipating the demands of communication and the specific needs of other conversational participants and, thereby, increasing the reliability and efficiently of such exchanges. [16]

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[16] Conversely, the presence of metarepresentation in human communication is likely important for understanding marked or otherwise infelicitous discourse patterns. To take a familiar example, the

For all that, we should not overstate the importance of metarepresentation in human social interaction. This takes me to the second central point of this section.

As I argued in Section 2.2, humans can communicate in richly context-sensitive ways without thereby using entered into metarepresentational states of mind. This is true in the case of human children who have yet to develop a full capacity to engage in metarepresentation and in the case of adults who have full capacities to engage in metarepresentation but do not employ them in the course of their social interactions with others. In this cases, basic social-cognitive capacities for representing co-presence in a shared physical environment augmented with linguistic capacities production and interpretation suffice to explain the patterns of context-dependent communication (Horton and Brennan (2016)).

Any adequate account of the nature of common ground in human social life needs to be able to capture the full range of social interactions that humans display—this includes the social interactions in which states of metarepresentation are deployed but also those social interactions in which states of metarepresentation are not deployed. Standard construals of common ground which focus on iterative states of metarepresentation illuminate only a subset of the situations in which humans utilize common ground. The construal of common ground I have developed in this paper fills this lacuna by providing a characterization of common ground that has sufficient generality to cover the full range of cases without thereby undermining the unique ways that identify and update common ground.

Of course, many pressing issues remain to be addressed. A more complete account would offer definite predictions about specific factors that lead normal human adults to identify and update common ground on the basis of their metarepresentational resources, despite the computational cost of those resources.[17] A more complete account would also include a discussion of the role of conflicts of interests, manipulation, and relations of dominance and power in shaping how common ground is established and updated among humans and also

conversational infelicity at work in Moore's paradox of asserting "It is raining, but I don't believe it is raining" are difficult to explain if conversational participants did not—at least on occasion—form expectations about the relations between communication actions and the metarepresentational states of the agents performing those communicative actions.

[17] See Hawkins et al (2021), Westra and Nagel (2022), and Harris (This volume) for relevant discussion.

among other animals.[18] I hope future work will explore these and other issues in light of the evolutionary questions foregrounded in this chapter.

Conclusions

In this paper, I have developed and defended three core claims about common ground:

> 1. CONTINUITY: Common ground is widely (though not universally) distributed among social animals. Humans are not alone in using common ground in the course of their social interactions with one another;
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> 2. RECURRENCE: The use of common ground is favored (i.e. is predicted to emerge and subsequently persist) among populations of animals whose members face recurrent interdependent decision-making problems in which the benefit of their courses of action are contingent on the variable choices of their stable social partner(s);
>
> 3. UNIQUENESS: Humans deploy cognitive and social mechanisms for establishing and updating common ground that are not deployed by other living animals; the use of common ground has not only persisted within the human lineage but been amplified as well.

As I said at the outset of my discussion, one could accept one of these claims without thereby being rationally committed to accepting the others. But the three claims do form a mutually reinforcing package. Whatever the ultimate fate of these claims—taken individually or collectively—this chapter has worked to make the case for the relevance of evolutionary issues for understanding core questions concerning common ground.[19]

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[18] See Camp (2018) and Swanson (2022) for relevant discussion

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