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PROVINCIALISM IN PRAGMATICS

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0. Introduction

What is the explanatory scope of pragmatic theory outside the context of uses of language in general, and of linguistic communication in particular?

This question has typically been approached by considering the extent to which the concepts and models of pragmatics are needed to get a theoretical grip on non-linguistic devices of human social interaction—for instance, in acts of ostension or pantomiming, in the use of pictures and diagrams, in acts of dance or the like. In what follows, I will approach the question from a distinct but complementary angle. My focus will be on the extent to which pragmatics is needed to get a theoretical grip on the non-linguistic devices of *non-human* social interactions—for instance, the vocalizations of monkeys, the rituals of pair-bonded birds, or the gestures of apes.

The central claim of my paper is that pragmatics has a wider scope of application than has been generally appreciated. In particular, I will argue that many discussions of pragmatics are guilty of a problematic form of *provincialism*. The provincialism at issue restricts the class of target systems of study to those involving groups of developmentally typical humans (or slightly idealized versions thereof), either explicitly as a matter of principle or implicitly as consequence of how it construes the underlying pragmatic notions. In what follows, I will argue that this kind of provincialism is problematic because there are patterns of non-human animal social interaction that cannot be properly explained without recourse to the theoretical tool-kit of pragmatics. Crucially, rejecting provincialism about pragmatics does not entail that there are not important theoretical differences between human and non-human systems of pragmatics. It does, however, require that our core philosophical theories of social interaction and communication be centered on features independent not merely of those at work in human languages but also of uniquely human features of cognition and sociality more generally.

Questions about the scope of pragmatics are difficult to access, much less answer, without some concrete characterization of pragmatics itself. Accordingly, I will begin in Section I by sketching an influential dynamic framework— associated with the work of, among many others, David Lewis ((1969), (1979)), Robert Stalnaker ((1978), (2014)), Robert Brandom (1994), Craige Roberts (1996), and Herbert Clark (1996)—that models pragmatic phenomena in relation to a *common ground* or a *conversational scoreboard*.[1] I will aim to establish both a negative claim and a positive claim about these models of pragmatics.

The negative claim is that it is a mistake to identify the common ground with information that is commonly known or commonly presupposed among a group of agents—that is, in terms of iterative states of meta-representation among the members of a group of interacting agents. This negative point is the focus in Section 2, in which I show that there are creatures that satisfy the functional requirements of common ground but which are not capable of engaging in meta-representation in any form, much less common knowledge or common presupposition. In particular, I present evidence that the alarm calls and the affiliative vocalizations of non-human primates are actions that have contents or communicative upshots varying with the prior state of the context of interaction, and which serve to update the context of interaction in characteristic ways.

In Section 3, I offer an alternative analysis of the common ground in terms of what I call *mutually responsive attitudes* among the members of a group. Although these states do essentially involve distinctive social and cognitive competences, they do not require meta-representation. This leads to the positive claim of the paper: that *when properly construed*, dynamic models of pragmatics can yield fruitful explanations of the communication systems of social animals apart from humans. This positive claim is developed in Section 4, in which I describe how the dynamic framework can illuminate the variety of ways in which primate alarm calls and affiliative vocalizations interact with the common ground. Section 5 concludes the discussion by situating these claims about non-human systems of pragmatics in relation to uniquely human dimensions of social interaction and communication.

1. Profiling Pragmatics

There are ways of understanding the term 'pragmatics' that obviously only apply to human social interactions. For instance, some have defined pragmatics as a component of the broader study of the human language faculty, or as the study of how humans use language to communicate, or even as the study of the features that distinguish humans as sapient from all other merely sentient animals.[2] Similarly, pragmatics has sometimes been defined in a way that makes it co-extensive with Speech Act Theory, or the study of how people use words to accomplish a rich set of non-linguistic deeds such as "asserting, requesting,

commanding, questioning, promising, testifying in court, pronouncing marriage, placing someone under arrest, and so on."[3] If any of these construals are adopted, then it is quite clear that the subject matter of pragmatics will be restricted to language-using humans.

My question is not whether there is a theoretically interesting project of pragmatics *qua* theory of human language use; I take the theoretical interest of such a project to be beyond dispute. Instead, my question is whether there is a theoretically interesting project for pragmatics outside the case of human language use. In order for such a question to even be worth asking, one needs a conception of pragmatics that has some degree of *autonomy* from the features at work in human languages. I will therefore focus in what follows on approaches to pragmatics according to which it is possible and fruitful to theorize about the nature and function of communication independently of the mechanisms provided by human languages.[4]

In a celebrated set of essays, H.P Grice initiated an approach to pragmatics along these lines. The project of pragmatics, according to Grice's approach, is to characterize the role of intelligent agency in mediating social interactions in general and communication in particular—that is, to elucidate what it is that intelligent agents need to *do* in order to perform acts of *public meaning*.[5] To put it more carefully, Grice attempted to isolate the features of an action in virtue of which that action constitutes an instance of either literal meaning—as in episodes of *saying*—or more indirect instances of meaning, as in episodes of *implicating* or *suggesting*.[6] According to Grice's favored analysis, the class of meaning constituting actions could be identified with complex intentions on the part of an agent to generate some specified response on the part of her audience members, and for that specified response to go by way of the audience members' recognition of the agent's intention.[7] Natural language is obviously one core medium by which human agents interact and communicate, but the central upshot of Grice's approach is that pragmatic phenomenon is not constitutively tied to its presence.

Following Grice, I take the business of pragmatics to consist of understanding the role intelligent agency in mediating social interaction in general and communication in particular. Grice's own way of attempting to carry out this business has been influential, and for good reason. Nevertheless, it is beset with rather serious difficulties. One general problem is that the account has seemed to many to be guilty of a kind of over-intellectualization, or of systematically overstating the cognitive requirements on acts of public meaning or on episodes of successful communication.[8] As I will illustrate in some detail below, this concern arises for many other approaches to pragmatics as well. But there are at least two other more specific worries with Grice's account that have lead people to try to capture his ideas about pragmatics in an alternative agent-based theoretical framework. These concerns have often been lumped together under the charge that Grice's account needs to be supplemented with a notion of social convention. However, it is worth making clear that the two problems are distinct and

that—for reasons I elaborate in Armstrong (2016b)—neither problem necessarily requires an appeal to social convention (at least, not as the notion of social convention is explicated in Lewis (1969)).

The first worry concerns the central role that speakers' intentions play in Grice's account. It was argued early on that Grice's account paid insufficient attention to the reciprocal role of audience members in explaining the processes by which actions come to be bearers of public meaning. The claim here is that public meaning is more than a matter of speakers' audience-directed intentions: it is also a matter of audience members' responses to speakers' actions.[9] These objections are persuasive. Pragmatics should indeed be genuinely social in its orientation, focusing on the states of mind of more than a single agent at a single time. Accordingly, our theoretical accounts of pragmatics should center on structures that are audience-*involving* and not merely audience-*directed*. The intelligent actions of speakers may well be a central part of the story, but it is wrong to treat them as the whole show.

The second worry concerns the lack of diachronic relations in Grice's story. There is nothing in this account that straightforwardly illuminates the role of prior history—particularly, contingent aspects of prior history involving social interactions—in constraining what agents' actions mean in the present. Nor is there anything in the account that illuminates the role that the meanings of agents' actions in the present play in constraining what those actions or related actions might mean in the future. Of course, Grice and those following him could maintain that the audience-directed communicative intentions of intelligent agents are implicitly sensitive to these diachronic features. The point, however, is that there is nothing in the Gricean model of pragmatics that makes these diachronic relations explicit: it does not provide an appropriate parameter that allows these temporal dimensions of meaning to be isolated and manipulated.

Each of these pitfalls can be avoided by adopting a so-called *dynamic* approach to pragmatics.[10] Dynamic approaches to pragmatics, as I will understand them here, model pragmatic phenomena in relation to a socially situated context of interaction or what Stalnaker (2002) calls a *common ground*. The common ground is a body of information that reflects the shared or coordinated cognitive perspectives of a group of interacting agents; more specifically, the common ground is a running body of information that is taken by each member of a group of agents to be *publicly* available in the course of their interactions with one another and with the world more generally.

The common ground plays two central functional roles within these models of pragmatics. First, a *content-constraining* role: the contents or communicative upshots of agents' actions are taken to be partially determined as a function of the state of a common ground. Accordingly, a single type of action can serve to convey distinct contents across distinct states of the common ground. Second, a role in content-reception or *context-updating*: both the fact that a given action was performed and the fact that it had the content or communicative upshot it did changes the state of the common ground in characteristic sort of

ways—paradigmatically, by adding the content of the action to the common ground and by making the necessary adjustments to preserve consistency with the prior state of the common ground. It is these twin features of the common ground that lead Lewis (1979) to speak of the common ground as a kind of *conversation scoreboard*, which changes dynamically in rule-governed ways on the basis of the actions of the members of a group.

These functional roles leave it open exactly what kinds of objects or structures should be used to characterize the common ground. In Stalnaker's discussions, the common ground is often identified with a set of possibilities that are treated as *open* or *live* among the members of a group: possible worlds (or centered possible worlds) compatible with what the members of group have mutually presupposed or accepted as true. Stalnaker's approach provides a straightforward way to model the dynamic effects of assertions, while subsequent models have included additional structure, such as a stack of questions under discussion and a list of things that are to be done (the former modeled in terms of a set of partitions on the set of open possibilities, the latter in terms of a preference order defined over the elements of that partitioned space.) This additional structure is useful for understanding the dynamic effects of questions and commands.[11]

The animating idea of these dynamic approaches is that pragmatic phenomena can be fruitfully characterized either in terms of the constraints the common ground imposes on the success or felicity conditions of agents' communicative actions, or in terms of the particular ways such actions serve to update the common ground.[12] Although many of the specific details are hotly debated—including the degree to which the "context-change potentials" of devices of communication should be encoded at the level of compositional semantics or merely reflected in the principles of pragmatics—the broad framework has been widely adopted by philosophers and those working in adjacent areas of study.

In what sense are these dynamic models of pragmatics provincial or restricted to groups of developmentally typical humans? As I shall approach the issue, the restriction comes not directly from the models but from an assumption about how the models relate to the target systems of study—in other terms, not from the models themselves but from a particular *construal* of those models.[13] The assumption is that a body of information is publicly available among a group of agents only if that information is *commonly known* or *commonly accepted* among those agents.[14] For instance, it is maintained that a body of information is public between you and me only if:

1. You and I both accept that information as true,
2. Each of us believes that we both accept that information as true,
3. Each of us believes that we both believe that we both accept that information as true, and so on *ad infinitum*.[15]

More generally, the basic assumption is that in order for the members of a group to be able to utilize a common ground, the members of that group must

be able to mentally represent their own and others' mental representations—or, in the terms I will use in the rest of the discussion, to be capable of engaging in *meta-representation* and to be able to do so *iteratively*.[16] To be capable of engaging in meta-representation, an intelligent creature must be able to embed one representational state within another; that creature must also have a cognitive grip on the distinction between appearance and reality or, more carefully, the distinction between accurate representations and inaccurate representations. Furthermore, to be capable of iterative meta-representation an intelligent creature must be capable of recursively embedding such meta-representations in a way that could (absent limitations of memory, attention, or other performance factors) go on indefinitely.

This identification of the common ground with iterative states of meta-representation is extremely common within discussions of pragmatics. Indeed, following Lederman (2018b), we might call this *the default position* on the common ground within dynamic models of pragmatics. The default position on the common ground entails provincialism about pragmatics insofar as non-human animals are not capable of engaging in iterative meta-representation. The claim that non-human animals are not capable of engaging in meta-representation is the overwhelmingly dominant position in comparative studies of cognition.[17] And, indeed, even theorists who have floated the possibility that some non-human animals are capable of some kind of meta-representation (e.g. Krupenye et al (2016)) have not suggested that these non-human animals are in a position to do so iteratively in a way that is required by the appeal to common knowledge or common presupposition.

There is some irony in this situation. Many proponents of dynamic pragmatics—notably, Stalnaker (2014)—have motivated their approach by recourse to the alleged autonomy of the common ground from the features at work in human language. And yet, insofar as default assumption is accepted, the class of agents that can utilize a common ground and the class of agents that can utilize a natural language are (nearly) extensionally equivalent: namely, the class of developmentally typical humans.[18]

This fact makes it very difficult to access the claim that the common ground, or pragmatics more generally, is or is not explanatorily prior to natural language. In the rest of this paper, I will explore the prospects of an account of the common ground and of pragmatics that has a more thoroughgoing autonomy from the features at work in human languages.

2. Sociality and the Scope of Scorekeeping

Theoretical discussions of pragmatics have given very little attention to the communication systems of non-human animals. I suspect that this relative lack of attention is due to a sense that there is no real point in applying pragmatics outside the case of humans. According to a standard view, animal systems of

communication present a stark contrast to human systems of communication because they are purely instinctual, highly inflexible and largely context-independent. In other words, animal communication systems are seen as mindless, or "code" like, and hence not the sorts of systems for which the models reviewed in the last section would offer much insight.[19]

This simple picture of animal communication should be resisted. As I have argued elsewhere, most species of animals are capable of forming rich mental representations of the world and of coordinating those representations with other animals in acts of communication.[20] This paper develops a more specific version of this claim: here, I describe systems of animal communication that display the two-fold interaction with context or common ground that models in pragmatics have been developed to explain. In making this case, I will largely focus on patterns of social interaction found among non-human primates. This is not, however, intended to imply that pragmatic phenomena are unique to the primate order. Indeed, I'll suggest that we should expect pragmatic phenomena to arise among a quite broad variety of species of animals that engage in forms of sociality centering on the creation and preservation of long-term *social bonds*.

2.1 Primate Communication: Some Illustrations

Since the landmark study of Seyfarth, Cheney, and Mahler (1980), it has been widely known that free-ranging vervet monkeys produce acoustically distinct calls in response to distinct kinds of predators: one for aerial predators such as eagles, one for terrestrial predators such as leopards (or domestic dogs), and another for terrestrial predators such as snakes. Furthermore, it is widely known that the perception of these calls is associated with a characteristic response by other vervets: looking up and seeking cover in a bush in the case of eagles, running up a tree in the case of leopards, and looking down at the ground while jumping in the case of snakes. Subsequent work has revealed that many other animals utilize a similar system of alarm calls.[21]

It would be wrong to treat the use of these alarm calls as purely instinctual, reflex-like, deterministic patterns of action and response. For as Cheney and Seyfarth (1990), document through careful observation and controlled playback experiments, the production of alarm calls is governed by an *audience effect*: upon encountering a predator, senders produce a call only if they take there to be relevant audience members present and otherwise do not issue a call. The relevant audience in question generally consists in other conspecifics, but it might also consist in a narrower category of kin or close associates. Likewise, audience members' responses to these alarm calls are governed by a *reliability effect*: upon perceiving an alarm call, audience members will carry out the characteristic response only if they deem the call to be credible. If, for instance, a particular individual has proven to be unreliable in the past or is obviously wrong in the present, audience members go about their business as if no call had been

proffered.[22] Importantly, these effects are displayed by individual primates on specific occasions of alarm-call production and alarm-call response and are not merely generalizations about the way entire populations of interacting organisms tend to change over evolutionary time.

Vervet monkeys are thus socially discerning in their use of alarm calls: they pay attention to which other group members are present and to features of past interactions with those group members. Recent work in primatology has revealed a further degree of social discernment in the use of alarm calls: primates are capable of conditioning the production of their alarm calls on the information states of their audience members. For instance, male Thomas langur monkeys keep track of which members of a group have issued alarm calls in response to a threat and will continue to issue alarm calls until every other member of their group has issued an alarm call of their own.[23] This form of social discernment is particularly vivid among great apes.

Wild chimpanzees have been shown to selectively target *ignorant* group members with their alarm calls—that is, they do not bother to produce alarm calls in the presence of those they take to be already informed of the danger.[24] Interestingly, chimpanzees assess whether other group members are informed of the threat in a variety of ways: not just in terms of whether or not those group members have issued alarm calls of their own but also in terms of whether or not those group members have been positioned directly to perceive the dangerous object themselves. If other group members do not turn their gaze toward the object in question, or do not perceptually attend to the object in other ways, those group members are taken to be ignorant and to stand in need of being informed.[25]

Alarm calls are thus *functionally designed* to update audience members' states of mind in characteristic sorts of ways.[26] These calls bring about specific changes in audience members' states of mind, and it is because these actions bring about those specific changes that they perpetuate over time. Absent the presence of others, and absent the need for others to know, primates would not engage in such actions. In these respects, alarm calls are *bona fide* social actions.[27]

Alarm calls are not the only type of action that primates perform which are functionally designed in this way. Many primates produce discovery calls in the context of foraging for food that are likewise governed by an audience effect in their production and a reliability effect in their response.[28] In the case of both alarm calls and food calls, patterns of action production and action response are driven by external pressures—in particular, by the need to avoid predators and other kinds of environmental dangers and by the need to find food (usually at the same time). But primates also face various pressures that are internally related to the forms of social life that they exhibit—for instance, a need to stay in contact with other group members while on the move, a need to find mates and provision for one's offspring, and a need to mitigate the effects of conflict

with other group members. These pressures give rise to patterns of coordinated interaction that are particularly suggestive for the study of pragmatics.

Affiliative vocalizations and their counterparts, aggressive vocalizations are ubiquitous among primate groups.[29] Affiliative vocalizations are actions that signal benign intentions with respect to a social interaction, and have often been analogized to promises or trust-building expressions of commitment; aggressive vocalizations are actions that signal hostile intentions with respect to a social interaction, and have often been analogized to threats or fear-inducing expressions of commitment.[30] Two points about these vocalizations are worth bearing in mind.

First, these vocalizations are distinctive sound patterns—grunts or so-called girneys—without much by way of phonological structure. Nevertheless, the meanings of these vocalizations encode relational information about the target to whom the signaler is directing their vocalization: the message conveyed by one of these vocalizations is not a generic statement that the signaler is friendly or hostile in general, but a more specific message that the signaler is friendly or hostile *with respect to some particular individual or group of individuals*. Second, audience members—even audience members that are not directly involved—can reliably determine these features of the vocalizations.[31] Identifying the identity of the signaler is, in a sense, automatic because primates are generally able to identify each member of their group by the sound of her or his voice as well as by the pattern of her or his face and body.[32] However, identifying the intended *target* of the vocalization is not automatic in this way. To identify the intended target of the vocalization audience members must use a wide variety of social cues. These cues include the direction of the signaler's gaze but also the signaler's identity, known rank within the social hierarchy, and—of particular interest here—recent history of interactions with other group members. It has been shown, for example, that primates do not expect signalers to offer threat grunts to individuals that they were just grooming or to individuals that outrank them.[33]

Affiliative and aggressive vocalizations serve as a context-dependent means of reducing audience members' uncertainty concerning a signaler's future actions. In other terms, these vocalizations provide audience members with evidence of how a signaler will act with respect to some intended target in ways that vary with features of the discourse situation in which they occur. Among a troop of baboons, for instance, it matters whether Shashe's affiliative vocalization targeted Beanie or Martha, for Martha will let Shashe hold her baby only if she takes it that she was the target of Shashe's vocalization. And if Shashe's vocalization did indeed target Martha, and if Shashe was hostile to Martha's baby, this fact will be of note to other members of the group: it will make it less likely that they will let Shashe hold their own babies even if she happens to offer them affiliative vocalizations.

The form of context-sensitivity at work here is mind-dependent: it concerns features of the way primates represent their present circumstances, remember

their prior circumstances, or anticipate their future circumstances. One cannot hope to make sense of the foregoing types of signaling without controlling for the role that the primates' states of mind play in mediating their systems of communication. In addition to being mind-dependent, the form of context-sensitivity at work here is also public. This is brought out vividly in the role that affiliative actions play in post-conflict reconciliation.

Violent intergroup conflict is highly disruptive, both for those directly involved and for other members of the group: baseline rates of interaction among former alliances change, and others may reasonably fear that the violence will spill over to them. Among a vast array of primate species, individuals have learned to mitigate the effects of intergroup conflict by engaging in affiliative actions shortly after a conflict.[34] In the right context, peaceful post-conflict signals—for instance, the distinctive grunts and girneys mentioned above— can serve to return rates of interaction and stress to baseline levels among the members of the group.[35] Although this is a powerful mechanism of reconciliation, there is a complication. Individuals involved in a conflict, particularly lower ranking individuals in groups with a strong social hierarchy, may actively avoid the presence of their aggressor or aggressors; this policy of avoidance would seem to thwart the possibility of using communication as part of a strategy of conflict management. In response to this challenge, it has been shown that many primates (for instance, baboons and chimpanzees) engage in forms of *third-party reconciliation* in which the kin or close associates of the individuals involved produce or receive peaceful post-conflict signals on those individuals' behalf in a way that results in reconciliation.[36] These third-party cases make vivid a quite general point about affiliative and aggressive vocalizations: these signals are social actions, functionally designed to update the states of mind of an audience comprising more members than the signaler herself. In particular, the effectiveness of these signals turns on their ability to serve as public announcements—if not to the entire troop, minimally to the former adversaries and their kin or close associates.

2.2 Social Intelligence and Rates of Encephalization

Thus far I have developed an argument by cases. I have focused on particular patterns of social interaction among non-human primates, and I have attempted to show that they display functional features that fall within the explanatory purview of pragmatics. Some may be skeptical of the evidential value of these cases. They may worry that my discussion turns on overly anthropocentric glosses of the relevant data or that, even if accurately reported, the cases do not have the theoretical significance I have attached to them. I do not believe that these skeptical worries withstand close scrutiny. Nevertheless, I want to emphasize that the trouble with provincialism about pragmatics does not simply rest on an argument by cases: there are distinct paths to the same destination.

One such path goes by way of the so-called *social brain or social intelligence hypothesis*. The social intelligence hypothesis posits a link between social complexity and neurocognitive complexity. It states that social complexity drives neurocognitive complexity—more specifically, that the opportunities and demands of living in the world socially with others are a central part of the evolutionary explanation of the emergence of sophisticated brains with rich cognitive architectures.[37] Although many discussions have focused on the social intelligence hypothesis in connection with its promise to explain what makes humans cognitively special, the hypothesis is fundamentally comparative in its orientation: it makes a claim not just about humans or even just about primates, but about intelligent animals more generally.[38]

The social intelligence hypothesis is now quite well supported empirically. One standard measure of brain complexity is so-called encephalization quotients, or relative brain to body size ratios.[39] It has been found that the rates of encephalization are not constant or universal across the evolutionary history of different lineages of animals, particularly among birds and mammals: some lineages show greater rates of brain growth than others.[40] These increased rates of encephalization have indeed been shown to co-vary reliably with the degree of sociality displayed among animals in those various taxa—specifically, with the degree to which animals in those taxa invest in forming and maintaining long-term *social bonds*.[41] The ability to form and maintain lasting social bonds—pair-bonds in the case of many lineages of birds and mammals, or bonds among a small group of close associates in the case of many primate lineages—is cognitively extremely demanding. These comparative studies seem to suggest that the need to meet these demands was a major driver of rates of brain change within a wide variety of animal groups over time.[42]

Considerations such as these have made the existence of an evolutionary connection between social complexity and neurocognitive complexity beyond dispute within comparative discussions of cognition. Indeed, the central area of debate has concerned whether or not social complexity is *the* functional feature or simply *a* functional feature that explains the underlying neurocognitive rates of change over time—for instance, whether features of diet, foraging range, tool use, or life-history are equally important parts of the functional explanation.[43] However, even modest versions of the social intelligence hypothesis fit poorly with provincial approaches to pragmatics.

The social intelligence hypothesis begins from the recognition that there is a theoretically interesting form of sociality at work among non-human animals. This form of sociality is mid-range and it is long-term. It is mid-range in that, while not involving the complex social norms and symbolization that are characteristic of human cultures, the form of sociality is also not merely a matter of aggregation or grouping together as in herds, flocks, or eusocial colonies: it centers on members of a group differentiating one another as distinct individuals and keeping track of these distinct individuals over time, and acting in different ways at different times with these differentiated individuals. It is long-term in

that it centers on repeated interactions between recognizably distinct individuals over an extended period of time—indeed, often over the course of the individuals' entire lifespan. Social bonding is a special case of this kind of sociality in which individuals have strong emotional attachments to one another and are highly motivated to act in coordinated ways with one another other and on one another's behalf.

As I have noted, this kind of sociality is cognitively demanding for the creatures that engage in it. The formation and persistence of social bonds among two or more individuals requires those individuals to monitor one another's behavior and to engage regularly in distinctive and occasion-specific forms of communication. These complex interactions serve as kind of social glue, helping to bring those individuals together and keep them bound. This fact applies to humans as much as it does to other animals.

We started with the claim that pragmatics is in the business of characterizing the role of intelligent agency in mediating social interaction in general and communication in particular. I have now reviewed evidence—both micro-level evidence from particular patterns of social interaction and macro-level evidence from general trends in neurocognitive evolution—showing that non-human animals intelligently engage in distinctive forms of social interaction and communication. Our theoretical models of pragmatics need to be sufficiently general to help make sense of these distinctive forms of socality and communication. Standard approaches to pragmatics lack the relevant kind of generality—they are provincial—and so stand to be revised.[44]

3. Social Competence and Mutually Responsive Attitudes

I have argued that there is a conflict between facts concerning non-human animal social interaction and standard approaches to pragmatics. In the case of dynamic approaches to pragmatics, this conflict turns on two central assumptions. The first is the thesis that the context or common ground among a group of agents is identified with what is commonly known or presupposed among that group. The second is the thesis that non-human animals are incapable of forming the kinds of iterative meta-representations at issue in common knowledge or common acceptance or presupposition.

In what follows, I will attempt to resolve the conflict by developing a version of dynamic pragmatics that does not identify the common ground with what is commonly known or accepted. Others proponents of dynamic pragmatics might prefer to reject the thesis that non-human animals are incapable of iterative attitudes of the sort at issue in common knowledge—indeed, Stalnaker (2009) and Greco (2014) have both developed structurally analogous replies in response to worries about the role of common knowledge in human social interaction. While I cannot conclusively rule out this alternative strategy of response, I believe it to be quite implausible for the problems at issue. As I have already mentioned,

there is very little evidence that non-human animals are capable of entertaining first-order states of meta-representation, much less higher-order iterations of meta-representations. The problem here is not that models centering on common knowledge or acceptance involve highly non-trivial idealizations; after all, idealization is a reasonable part of theoretical practice writ large. Instead, the problem is that in the case of non-human animals the idealization has no basis whatsoever in the target system of study. In any case, I take it to be worth exploring the prospects of scorekeeping without common knowledge even if it turns out that some non-humans animals (for instance, great apes or corvids) are capable of some form of meta-representation.

My strategy will be to pry apart the models at work in dynamic pragmatics from their standard construal in terms of iterative states of meta-representation. I suggest that the structures at work in standard dynamic pragmatic models do approximately describe the behavior of social animals. However, I maintain that those models are linked up to those animals in virtue of cognitive relations far less demanding than those required by common knowledge. Specifically, I will offer a construal of the common ground in terms of what I call *mutually responsive attitudes*: states of mind that are mutually shared among the members of a group in virtue of those group members deploying capacities to represent the changing features of one another and the world more generally. In other terms, I propose a construal of the common ground in terms of states of information that are non-accidently mutual in virtue of the distinctively social competences of the agents involved. It is, I maintain, the distinctive kind of responsiveness made possible by these social competences that explains the public dimensions of the common ground and the characteristic roles that public-information states play in mediating novel forms of coordinated action.

3.1 Private Scorekeeping Meets Social Competence

Consider a population of intelligent creatures that do not utilize a common ground in any of the relevant senses of the term. Let us suppose that these creatures are intelligent with respect to both backward- and forward-looking dimensions of their behavior. The backward-looking dimensions of their intelligence serve to connect their internal states with the states of their environment in distinctive ways—for instance, by displaying constancy mechanisms that allow those creatures to identify (and re-identify) distal environmental conditions despite significant variations in the proximal stimulation to which they are exposed and by enabling multiple sensory cues to be integrated and bound together to form a unified presentation of a complex environmental configuration.[45] The forward looking dimensions of their intelligence serve to connect their distinctive ways of tracking their environments with distinctive ways of acting in those environments, such as enabling them to respond in more than one way after having identified some environmental cue.[46] Taken together, these intelligent capacities

enable the creatures to represent the world in ways that contribute to flexible forms of agency.

Roughly following the dynamic tradition—in particular, Stalnaker (1984)—I will assume that the states of mind of creatures displaying both these backward-looking and forward-looking capacities can be approximately modeled in terms of a space of possibilities and various relations defined on those possibilities. In particular, I will assume that we can model the states of mind of creatures with capacities of this sort in terms of (i) a space of possibilities that the creature takes to be live candidates for the actual world; (ii), a partition of these possibilities into various issues or questions that the creature is addressing; and (iii) a preference order defined over that partitioned space. I will also assume that the actions of these intelligent creatures serve to realize their preferences given how they take the world to be—more strongly, that these intelligent creatures can be approximately described as if they were acting so as to maximize expected utility. Although nothing I will say depends on this way of modeling representational states of mind, I adopt it as a model because of the way it underscores holistic dimensions of intelligent agency: specifically, the fact that some representational states of the creatures are (for instance) consistent or inconsistent with other representational states both at a time, and, crucially, over time. In particular, the virtue of these models is that they illuminate the ways in which updating with some new bit of information can have systematic ramifications on the possibilities that intelligent creatures take to be candidates for actuality or rank the preferences that guide their behavior.[47]

Creatures whose behavior can be approximately described in terms of such a model of intelligence engage in what I will call *private scorekeeping:* they keep track of how their environments change with respect to features that matter for them. What makes this kind of scorekeeping private is the fact that it consists in an agent tracking features of its environments in ways that matter *for that agent* but not necessarily in ways that matter for other agents. Of course, this is not to say that the representational states of such agents do not essentially depend on interactions with other agents—be they potential predators, caregivers, or mates. Nor is it to say that such private scorekeepers might not regularly come to accept the same fact or preference as other private scorekeepers —that is, to realize instances of *mutual knowledge* or *mutual acceptance*. To the contrary, ecological or developmental conditions may make it highly likely that if one member of the population has learned some particular fact or adopted some preference, some other members of the population will too.[48]

Rather, private scorekeeping is so called because it need not be mediated by distinctive kinds of socio-cognitive competences, or what I will simply call *social competences*. Social competences are psychological capacities dedicated to the production, storage, and use of representations directed toward or about *agents and their features*. To be explicit: there is no single psychological capacity dedicated to representing agents and their features, no unitary "theory of mind" module. Rather, social competences involve a variety of psychological

capacities that may be somewhat differently distributed among different lineages of animals. But for the purposes of my discussion, I will focus on basic kinds of social competences that have been well documented among social animals and which are particularly relevant for our understanding of public information and common ground.

One core kind of social competence pertains to capacities for *individual recognition and associated behavioral control*, particularly as they relate to the formation and perpetuation of social bonds. These capacities turn on a quite general (though not universal) ability of many animals to perceptually attribute the category *body* to bounded and cohesive three-dimensional objects as they move across space over short intervals of time.[49] But the underlying social competences go further in enabling creatures to track *bodies* as being the same or different over extended periods of time and to enable agents to condition a wide range of their behaviors accordingly. In particular, these capacities enable agents to store representations of the bodies of different individuals in long-term memory and to have both the right kind of motivation and the right kind of control to use these representations of different individual bodies to differentially interact with those individual bodies—for instance, enabling those creatures to be willing and able to stand watch or provision food for some individual bodies but not others.

Other kinds of social competence build on and amplify these capacities for individual recognition and behavioral control. These include an ability to represent distinct individuals as belonging to distinct *collections*—for instance, as belonging to this group rather than another group—and an ability to attribute *rank* to individuals or collections thereof according to dominance or resource access. But they also include an ability to attribute a *target* or *goal* to individuals' actions as those actions are constrained by features of that individual's environment, as well as an ability to attribute *informational access* or *awareness* of various states of the environment to those individuals.[50] In each case, these social competences provide individual agents with expectations about how other agents will act given their social features (their rank or group), their goals, and the information they have at their disposal.

If our population of private scorekeepers were to evolve in such a way that each member of that population became equipped with this package of social competences, their perspectives on the world would change in important ways. Each agent's perspective on the world would now include a *social field*: a world populated with individual agents who have various features and stand in various relations which change over time on the basis of their interactions with one another and their shared environment.[51] Crucially, however, the social competences that make this kind of public scorekeeping possible do not provide our intelligent creatures with an ability to attribute meta-representations to themselves or others.[52] Nor do these capacities thereby enable the members of our population to be able recursively to embed such meta-representations at multiple levels of iteration.[53] In the useful terminology of Alan Leslie (1994), the foregoing types

of social competence concern *mechanical* and *actional* features of agents but they do not concern *attitudinal* or *cognitive* features of agents. Nevertheless, I will argue that these basic social competences provide a means of characterizing a theoretically important notion of common ground.

3.2 Publicity as Mutually Responsive Attitudes

Intelligent creatures whose worlds are populated with a social field engage in *public scorekeeping:* they track their environments in ways that matter for each of them and, in addition, are each tracking the other members of the group as they each interact with one another and with the environment more generally. I propose to understand the notion of publicity at work in this kind of scorekeeping in terms of special kind of mutual responsiveness in the attitudes of the members of a group: namely, as a mutual responsiveness in attitudes that is mediated, at least in part, by the use of social competences.

As we have seen, some information is mutually accepted among a group of agents if each member of that group accepts or conforms to that information for the purposes of their interactions with one another. We can say that a group of agents *non-accidentally* mutually accepts some bit of information just in case each member of that group accepts that information and the fact that each member of the group accepts that information is safe across a sphere of relevantly close possibilities. In other terms, a group of agents *non-accidentally* mutually accepts some bit of information when each member of the group accepts that information and the fact that they have each accepted that information is not merely a matter of luck or happenstance.

The difference between mutual acceptance and non-accidental mutual acceptance is a theoretically important one, particularly for understanding the rates by which information might be transmitted among a group of agents. Nevertheless, this difference does not illuminate a *psychologically* important distinction between private information and public information. As I noted above, a group of creatures might come to non-accidentally mutually accept some bit of information due to a variety of factors independent of the social character of those creatures' psychologies: the fact that the creatures have similar enough genes, or are governed by similar enough epigenetic or developmental processes, or that they live and learn in similar enough environments. While these similarities are obviously important for explaining how these creatures get on with each other and the world, they do not themselves provide what theorists have sought in an account of public information or the common ground.

My proposal is to characterize public information in terms of information that is available among a group of agents because of the social competences of those agents. In other terms, public information is information that is not cognitively accessed among a group of agents absent the use of social competences by those agents. In this sense, some body of information is publically available

among the members of a group only when each agent in that group has attitudes that are mutually responsive to one another's deeds.

Common ground can then be defined as a special case of public information, namely as public information that is not merely mutually accessed but actually accepted by each member of a group of agents via the use of social competences.[54] Somewhat more precisely, a body of information is *common ground* among two agents, Alf and Bea when the following two conditions hold: (1) Alf and Bea both accept that information, and (2) Alf accepts that information, at least in part, because he represents Bea and her activities and Bea accepts the information, at least in part, because she represents Alf and his activities. In the language of scorekeeping, the common ground consists in public information that is non-accidentally registered on each of the private scoreboards of the members of some group of interacting agents due, in part, to the fact that those agents are each employing psychological recourses for representing other agents and their actions.[55]

Rather than understanding the common ground in terms of synchronic states of iterative meta-representation (e.g. common knowledge) among a group of agents, I am suggesting that the common ground should be understood diachronically in terms of mutual attitudes among the members of a group that have a certain kind of history; namely, as mutual attitudes that have been arrived at and stabilized over time as a function of joint exercises of social competences. Accordingly, the common ground consists in the *mutually responsive attitudes* among the members of a group: attitudes of agents' that do not merely happen to overlap at a time but that change in coordinated ways together over time.

Let me try to make these ideas more concrete with an illustration. Suppose four intelligent agents are sitting at various distances from one another along a river. Suppose further that there is a crocodile nearby in the river. If all four agents happens to see the crocodile as they are each going about their business, then the presence of the crocodile is merely mutually known or accepted by each of them on the basis of the private information at each of their disposal. But if, instead, one of the agents happens to see the crocodile and jumps up in fear and the other three agents come to see the crocodile by following the line of the first agent's gaze, then the presence of the crocodile is a matter of public information among the members that group. Further, if the agents each come to accept that there is a crocodile nearby by tracking both the world and one another, then the existence of the crocodile will be common ground between them. In each version of the case, the agents came to be in the same state of mutual knowledge or acceptance vis-à-vis the presence of the crocodile. But only in the second version of the case is the mutual knowledge or acceptance guided by the resources at the agents' disposal for representing the activities of other agents: the line of their gaze, their movements, and their cries. In particular, it is only in the second case that the shared knowledge of the presence of the crocodile is non-accidental due to the use of social competences.

The foregoing provides a broad characterization of the common ground, one that is not restricted to agents that are capable of iterative meta-representation.[56] It is worth emphasizing that this broad approach does not divorce the common ground, or public information more generally, from a foundational role in mediating novel forms of coordinated action. In particular, the ability of a group of agents to establish common ground in this sense has important ramifications for how those agents might manage to coordinate their behavior in the future.

As I have noted above, social competences enable agents to re-identify individuals over time and to track their actions. By employing these social competences, agents can learn with whom they would prefer to interact and how they would prefer to behave in the course of those interactions. These forms of learning are essential for types of coordinated action that depend on the mutual trust or expectations shared among those involved.[57] In particular, the public states of information that these social competences make possible serve to ground *conditional* forms of *partner-specific* practices of coordination. In these practices of coordination, the way agents act toward one another is sensitive to how those agents perceive one another's type or category and, moreover, the type or category of an agent need not remain invariant over time. We see these practices of coordination at work when individual agents condition their actions—their willingness to provide aid when another is in need, for instance—on their default expectations concerning how others will act in return. As the literature on reciprocal forms of social interaction (including altruism) has attested, these forms of coordination play a central role in the lives of many animals, not least humans.[58]

While the possibility of these practices of coordination is made possible by the availability of public information mediated by social competences, the regular success of the practices depends upon the common ground. If two agents misidentify one another, or misremember how they each acted on previous encounters, this will disrupt their ability to coordinate on particular choices of action or on general default strategies of interaction. In any case, the central point is that neither public information nor common ground needs to be characterized in terms of iterative attitudes such as common knowledge or acceptance in order to make sense of core kinds of coordinated action.[59]

4. Steps Toward a Primate Pragmatics

The dynamic tradition takes the subject matter of pragmatics to center on the ability of intelligent agents to establish and update a common ground. In the last section, I developed an account of the common ground that turns on the ability of intelligent agents to utilize distinctive social competences to enter into mutually responsive states of mind. While this account is broad enough to apply to other social animals in addition to humans, it is not so broad so as to apply to any group of organisms whatsoever. In this section, I will exploit this fact about the present account of the common ground to offer a model of the communicative

acts of social animals in terms of the way these actions function to bring about specific changes the mutually responsive attitudes of the other member of their social groups. In other terms, I propose to model the communicative acts of social animals in terms of their "context change potentials."

My aim is not to defend any specific descriptive hypothesis about the meaning or structure of these communicative acts, at least not here.[60] Instead, my aim is to take some modest steps in developing a foundational framework that is suitable for address the cases of primate communication considered in Section 2, and to isolate some of the explanatory advantages that come from utilizing a foundational framework of the sort offered with the tradition of dynamic pragmatics.

4.1. Modeling Primate Pragmatics

At any given time among a group of baboons or a group of chimpanzees, there will be a body of information that comprises what is common ground among these groups: a body of information that specifies the shared or coordinated cognitive perspectives of these primates. I propose to understand communicative acts such as alarm calls and affiliative and aggressive vocalizations in terms of the way these actions function to update this common body of information—that is, as devices of public information that are designed to reduce audience members' uncertainty by updating the group's stock of mutually responsive representational states of mind.

The claim here is not merely that primate communicative acts happen to cause audience members to update their states of mind in characteristic sorts of ways. Rather, the claim is that it is the *function* of these animals' communicative actions to bring about specific changes to what is common ground between them and their audience members. This is to say, more fully, that the actions of these primates (i) bring about specific changes to what is common ground among the members of a group, (ii) the fact that the actions bring about these changes to the common ground is why primates perform these actions in the way that they do, and (iii) the fact that the actions bring about these changes to the common ground is why audience members respond to those actions in the way that they do.[61]

When a group of social animals have functional devices of this sort, they possess what Rothschild and Yalcin (2017) call a *conversational system*. A conversational system is a set of mappings from some set of expressions or action types to the characteristic changes those actions make to the common ground. Conversational systems will differ from one another in the set of available expression types or actions types, and in the set of update operations that they impose over a space of candidate common grounds. The appeal to conversational systems helps makes precise the intuitive idea of modeling communicative acts in terms of the way they update a common ground.

Of course, it is one thing to claim that specific episodes of primate communication can be modeled in terms of the common ground and quite another to

claim that these episodes *should* be modeled in these terms. So why, then, should we model primate communication in terms of the common ground? The answer is that there are generalizations about the patterns of interaction that we observe that are best explained by an appeal to the common ground. This is manifested in two related ways. First, the cases involve intelligent practices of action production and action response that display the relevant two-way interaction with the common ground. Second, the cases involve historical or diachronic dimensions for which the appeal to the common ground is designed to capture.

First, the point about intelligent practices of action production and action response. We can see the content-constraining role of the common ground at work in instances of primate communication governed by what I earlier called *audience effects*. For whether or not an agent produces a given communicative act in these cases is sensitive to how that agent represents the composition of its audience—specifically, whether or not that agent represents the presence of not merely other individuals but individuals of the right sort (for instance, closely related conspecifics or individuals that have proven to be reliable in the past). In this way, the mutually responsive attitudes that comprise the common ground constrain *whether* a primate produces a given communicative act. But the mutually responsive attitudes that comprise the common ground also constrain *what* content is conveyed in the context in which the act occurs. This is particularly clear in the case of affiliative and aggressive communicative acts. As we have seen, vocalizations of this kind have contents that target specific individuals. But which individual is targeted varies as a function of the public information included in the common ground—that is to say, varies as a function of what senders and receivers mutually recall concerning the history of prior interactions between the sender and other members of the group.[62]

Conversely, audience members use their distinctive social competences to intelligently update their mutually responsive states of mind on the basis of a sender's communicative act. As we have seen, audience members differentially respond to different communicative acts—they responded differently if the sender offered an alarm call that targeted an aerial predator instead of a ground predator, and they have different kinds of expectations about how the sender will act depending on which specific individual was targeted by the sender's affiliative vocalization. What makes these communicative responses sensitive to a common ground is the fact that they are mediated by prior communicative interactions—specifically, these responses are mediated by how audience members recall *that particular sender* acting in the past with that *particular device of communication*. If audience members estimate that a particular sender is unreliable with his/her use of a particular communicative act, they will not update their mutually responsive states of mind in characteristic ways if that particular sender uses that particular communicative act. However, audience members may well update in characteristic ways if other senders deploy that same communicative act or if the original sender deploys other communicative acts which that sender has used reliably in the past.

Secondly, by modeling these episodes of primate communication in terms of the common ground—in particular, as conversational systems—we explain social and diachronic dimensions of these episodes of communication that would otherwise be obscured: the fact that how senders and receivers act and respond is sensitive to who is doing the sending and who is doing the receiving, and also to which particular devices of communication have been used over the course of a shared history of interactions. As I noted at the outset of the discussion, it is precisely the ability to illuminate diachronic dimensions of communication of this sort that lead many theorists to adopt dynamic models of pragmatics in the first place.

Let me mention one further virtue of giving a dynamic pragmatic treatment of episodes of primate communication before concluding my discussion. There has been a good deal of debate in the literature on animal communication about whether or not primates use their communicative acts to describe or represent the world "referentially" or whether their communicative acts are better understood as directives that serve to influence (or manipulate) audience members' behavior.[63] In terms of dynamic models of pragmatics, the issue concerns how communicative acts do their work in bringing about changes to the common ground. One option would be to utilize Stalnaker's model of assertion, focusing on the way alarm calls and other communicative acts serve to narrow the space of possibilities that the members of the interaction take to be live candidates for the actual world. Another option would be to utilize recent work on imperatives and to model primate communicative acts as devices for adding to a temporary "to do" list, serving to update how each member of the interaction should prefer to act given the content conveyed. Alternatively, we might pursue a mixed strategy according to which some communicative acts (e.g. alarm and food calls) are modeled as quasi-assertions that have the function of eliminating possibilities and other communicative acts (e.g. affiliative and aggressive signals) are modeled as quasi-imperatives that have the function of revising preferences.

I maintain that these options need not be seen as in competition with one another, and dynamic models of pragmatics allow us to see why. As a number of recent discussions in linguistics have highlighted, dynamic approaches enable us to provide models in which communicative acts are associated with a *variety* of ways of simultaneously updating the common ground.[64] Accordingly, I propose that the foregoing cases of primate communication should be modeled in terms of the way the communicative acts serve both to *eliminate* live possibilities and to *revise* a list of preferences provided by the common ground. In this sense, the communicative effect of a primate's use of an alarm call as well as an affiliative vocalization has *both* assertoric and imperatival dimensions: these communicative actions serve to both describe the world as being a certain way and to direct others with respect to what to do in that described world. They do this not by providing a conjunction of two elements—an assertion and a command—that could in principle occur alone; rather, they do this by providing an amalgamated recipe for making each of these kinds of updates at once. This proposal is very much in the

spirit of Ruth Millikan's (1995) suggestion that many animal signals convey what she calls "pushmi-pullyu" representations. Dynamic approaches to pragmatics allow us to incorporate Millikan's suggestive idea in a well-understood and independently motivated model of intelligence and social interaction.

In short: primates have devices that are functionally designed to make changes to a public body of coordinated information: a common ground. These devices are used to update the common ground in a variety of ways—for instance, in ways that are *informative* so that some (but not all) of the possibilities included in the common ground get excluded from consideration, *relevant* so as to answer questions or issues that are mutually being assessed, and *practical* so as to address the choice of preferences at work among the members of the group. Principles of this sort have played an important role in guiding work on human pragmatics. When properly construed, similar principles can guide work on non-human pragmatics as well.[65]

5. Implications for Human Pragmatics

This paper has worked to make a case for a less provincial understanding of the subject matter of pragmatics. I have argued that we need a conception of public information in general and the common ground in particular that does not involve common knowledge or other forms of meta-representation. Building on these negative points, I have developed a positive conception of public information and the common ground in terms of what I have called mutually responsive attitudes. I have argued that this conception of public information and the common ground offers a fruitful way to understand the communicative interactions of social animals, particularly the alarm calls and affiliative and aggressive vocalizations of non-human primates.

Suppose, if only for the sake of argument, that the foregoing points are on the right track. Suppose, in particular, that one were to accept that the scope of pragmatic theory is not restricted to groups of developmentally typical humans. What would follow for our understanding of pragmatics when it is applied to developmentally typical humans? How, if at all, are models of primate communication relevant to explaining paradigmatically human cases of communication?

Answering such questions is difficult without some specific sense of the features that serve to demarcate human systems of communication from the communication systems of other animals. Although it is generally agreed that there are some such features of this sort, there has been considerable disagreement about their nature. Given the focus of the present discussion, two general differences between human and non-human practices of communication are worth making explicit.

One difference is the degree of *specificity* or *determinedness* present in human systems of communication.[66] Humans are able to not merely communicate a generic message that some type of entity is dangerous or that they have benign

intent toward another agent: they can communicate the highly specific message that an entity is dangerous to eat but not to touch or that they have benign intent toward another agent because that is what the norms of their group require. Moreover, these highly specific messages may be significantly removed from what is of immediate practical relevance. Accordingly, human can describe the world to their audiences without thereby directing those audience members how to act. In the terms of dynamic pragmatics, humans can perform communicative acts that serve to eliminate highly specific live possibilities from consideration without revising the prior order on what possibilities are most preferred: their communicative acts are not simply amalgamated recipes for making multiple updates to the common ground at once, but are genuine assertions, commands, or questions.

A related difference concerns the degree of *flexibility* present in human communication systems, particularly with respect to the set of basic elements or expression types that make up those systems of communication. The kind of context-sensitivity at work in non-human animal communication systems typically operates within a relatively fixed, developmentally canalized, species-typical communicative repertoire or lexicon. This is simply not true of human communication systems. There is no fixed, human-typical, communicative repertoire or lexicon; humans regularly add new basic devices to their systems of communication and utilize different repertoires among different groups for different purposes.[67] Correspondingly, the common grounds that comprise non-human animal communication systems are quite domain specific in terms of the set of possibilities, issues, and preferences that make them up. In contrast, the common grounds that comprise human systems of communication systems center on an open-ended and ever expanding set of possibilities, issues, and preferences.

These differences between human and non-human practices of communication are just the tip of a quite large iceberg. It might well turn out that these differences are explained by the fact that developmentally typical humans are capable of engaging in meta-representation in a way that non-humans animals are not. It might, in other words, turn out that it is because developmentally typical humans represent their own and one another's representational states of mind that they are able communicate using highly specific and flexible systems of communication. If this does indeed turn out to be the case, then pragmatic theories that center on capacities of iterative meta-representation are right to use those resources to illuminate human communication even if they have been wrong to treat them as constitutive of communication or social interaction *per se*.

Then again, the differences between human and non-human practices of communication might have nothing to do with iterative capacities of meta-representation. It might turn out that, despite appearances, developmentally typical humans are not able to engage in iterative meta-representation or that, even if they are, the differences between human and non-human practices of communication are explained by other means. The theoretical possibilities here

are fairly open, and need to be approached with care. One of the ways that models of non-human primate communication are relevant to our understanding of human communication is by providing a baseline from which questions about distinctively human features of communication and sociality can be clearly raised and potential answers compared and adjudicated between.

The general models of pragmatics discussed in this paper are relevant for human communication for another reason. Although humans do communicate in more specific and more flexible ways than non-human animals, there are many cases of human communication that do not involve this specificity and flexibility. When one uses one's fingers to gesture at a selfish driver in traffic, or warns one's friend about a snake next to their foot while hiking, the communicative exchange may be mediated by generic abilities of action production and action response that are not unique to humans—in particular, such episodes of communication may involve updating the common ground in ways that are straightforwardly analogous to those described in this paper. So, the picture of pragmatics that I have sketched may be directly relevant for explaining some cases of human communication even if that picture turns out to be less relevant for others.[68]

Finally, let me close with a point about the autonomy of pragmatics. At the outset of the discussion, I said that I would be considering approaches to pragmatics that have some degree of autonomy from the features at work in human languages. The cases of communication and social interaction that I considered are of this sort, and I have developed an account of the common ground that is genuinely independent of the features at work in human language. However, when one considers the differences in specificity and flexibility between human and non-human communication systems, it is far from clear that these differences are independent of human languages. As a number of theorists have maintained, it could well be that uniquely human capacities for public meaning and social interaction either depend on the prior existence of a human language faculty or co-emerge with the capacities that mediate the acquisition and use of human languages.[69] The issue is especially pressing in connection with the claim that the underlying capacities for meta-representation are iterative or recursive, given the pivotal role that capacities supporting recursive operations has played in the account of human language faculty developed by Noam Chomsky and collaborators[70]

I am not claiming that human language is prior to human social cognition, or, alternatively, that there is no priority in either direction between human language and human social cognition. The point is rather that these are subtle matters of considerable controversy in the context of explaining the features that distinguish human systems of communication from those found among other animals. However, the autonomy of pragmatics should not be a matter of controversy when it is used in the context of explaining features of the communication systems of non-human animals. It is indeed possible and fruitful to theorize about the nature and function of communication and social interaction independently of the mechanisms provided by human languages. Appreciating

the theoretical significance of this fact requires that we move past provincial outlooks toward pragmatics.***

Notes

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1. Hamblin (1971), Karttunen (1974), Kamp (1981), Heim (1982) and others are responsible for related developments in this broad tradition, though the relationship between these discussions and the subject matter of pragmatics (as I shall understand it) is not completely straightforward. For instance, the dynamic models provided in these discussions seem to me to be neural on whether the systems of study involve populations of communicating agents or the speech of a solitary individual or some individual's language of thought. The accounts of Lewis, Stalnaker, and company are not neutral in this way: they are explicitly designed to apply to social situations involving groups of communicating agents.
2. See Roberts (1996), Korta and Perry (2011), and Brandom (1994).
3. Harris, Fogal, and Moss (2018).
4. This is a slightly more general version of the thesis that Robert Stalnaker (2014) calls *the autonomy of pragmatics*.
5. Grice and those following him have typically used the word "rational" in places that I use the word "intelligent" or "cognitive." This isn't intended to be a sleight of hand on my part, but rather to reflect the diverse range of features that have come to be associated with the word "rational" and its cognates. In particular, it is intended to reflect the fact that some ways of using the term "rational" obviously only apply to either creatures with a natural language or creatures that engage in meta-representation and that such uses would have the effect of trivializing the questions about pragmatics at issue in my discussion.
6. This approach leads naturally to a corresponding characterization of the project of semantics as the attempt to understand the nature of meaning itself, whether public or private; e.g. to understand the connection between the meaning and truth/satisfaction-conditions and the manner in which complex meanings might be derived from their semantically significant parts and their modes of combination.
7. This is close to Grice's original (1957) proposal. Much subsequent work—by Grice and many others—has explored various revisions and refinements that might be made to this proposal. See Neale (1992) for a still quite useful review of these discussions.
8. For developments of this worry see, among others, Burge (1975), (1992), (2010); Millikan (1984), (2004); Skyrms (1995); Hurley (2001) and (2006); Bar-On (2013a) and (2013b).

9. Austin (1962), Searle (1965) and (1969), Strawson (1964), and Lewis (1969) among others.
10. The term "dynamic pragmatics" has been floating around for some time, but has recently been used explicitly in the way I'm using it here by Portner (2018), Stalnaker (2018), and Yalcin (2018).
11. See Hamblin (1973), Ginzburg (1995) and especially Roberts (1996/2012) for the questions under discussion, and Portner (2004) and especially Starr (2016) and Murray and Starr (2018) for the preference structure.
12. Indeed, Craige Roberts (2004), p. 201 has conjectured that *all* pragmatic phenomena can be understood in relation to these two ways of interacting with conversational context or common ground. Or, even more strongly, Clark (1996), p. 92 claims that the "Common ground is a *sine qua non* for everything we do with others—from the broadest joint activities to the smallest actions that comprise them."
13. See Godfrey-Smith (2006) and Weisberg (2007) and (2013) for extensive discussion of the relationship between target systems, models, and construals.
14. Following Stalnaker (1984), I will use 'acceptance' and 'presupposition' to denote genetic pro-attitudes of endorsement toward a representational state of which temporally extended and evidentially responsive states of belief and desire are special cases.
15. See Stalnaker (2002), pp. 706–707 and (2014), p. 25 for explicit statements of this kind. In (1969), Lewis originally defined common knowledge in terms of iterative *reasons to believe or accept* rather than iterative states of belief or acceptance *per se*. As Clark (1996) emphasizes, this difference is not at all a trivial one; however, the differences in formulation will not matter for the central arguments of this paper.
16. Note that similar assumptions occur within many other approaches to pragmatics that do not make a central appeal to the common ground, for instance in the characterizations of communicative intentions offered by Grice (1957) and many of those following him including Schiffier (1972) and Bach and Harnish (1979) and Relevance Theorists such as Sperber and Wilson (1986/1995) and Scott-Phillips (2014).
17. See Cheney and Seyfarth (1990) and (2007) for extended discussion; see also Penn and Povinelli (2007), Call and Tomasello (2008), Rosati et al (2009), Lurz (2011), Andrews (2012), Fischer and Price (2016), and Burge (2018) for developments and refinements.
18. I say "nearly" extensionally equivalent because there appear to be human agents in possession of a natural language who also lack the capacities for iterative meta-representation. See Glüer and Pagin (2003) and De Villiers, Stainton and Szatmari (2007) for some discussion of this point.
19. See Davidson (1982) for a standard statement of views of this kind, and Sperber (1995) and Scott-Phillips (2014) for more recent developments.
20. Armstrong (ms).
21. See Zuberbühler (2009) for a useful recent review.
22. This feature of vervet responses to alarm calls is especially vivid in the data set collected in Ducheminsky et al (2014) in their successful replication of Seyfarth,

Cheney, and Mahler's original study. See also Seyfarth & Cheney (2015, 2018a, 2018b) for other relevant discussion.

23. Wich and de Vries (2006).
24. Crockford et al (2012).
25. Crockford et al (2017).
26. Indeed, many of these calls (particularly among great apes) meet the standard criteria for being *intentionally* designed by the agents involved. See Schel et al (2013) and Townsend et al (2016) for discussion.
27. In roughly the sense of Thomas Reid: "I call those operations social, which necessarily imply social intercourse with some other intelligent being who bears a part in them . . . .. [S]ocial acts of mind . . . can have no existence without the intervention of some other intelligent being, who acts a part in them. Between the operations of the mind, which, for want of a more proper name, I have called *solitary*, and those I have called *social*, there is this very remarkable distinction, that, in the solitary, the expression of them by words, or any other sensible sign, is accidental. They may exist, and be complete, without being expressed, without being known to any other person. But, in the social operations, the expression is essential. They cannot exist without being expressed by words or signs, and known to the other party." (1788/1969), V.6, 478-438. Thanks to both Richard Moran and Lucy O'Brien for drawing this passage to my attention.
28. See Pollick et al (2005), and Kalan and Boesch (2015)
29. The focus on the auditory modality should not be overstated. For as Liebal et al (2013) have emphasized, much primate signaling is multi-modal. Moreover, most primates engage in non-auditory based actions that have structurally similar features to the ones that I discuss.
30. In defense of the use of these analogies, Joan Silk (2002) has noted, " . . . signals of intent fit the definition of strategic commitments because they entail an obligation to behave in certain ways and preclude certain alternatives. When females give grunts or girneys, they are effectively guaranteeing that they will behave peacefully. These kinds of calls function as pledges or promises to behave peacefully, even when it might be in their short-term interest to behave aggressively. It is females' confidence in the reliability of the promise that makes them effective."
31. Engh et al (2005), Cheney and Seyfarth (2007).
32. Rendall et al (1996), Parr et al (2000), Silwa et al (2017), among many others.
33. Cheney and Seyfarth (2007).
34. As de Waal (1990) has emphasized, many primate groups use quite distinctive signals for this purpose—for instance, kissing, wrapping their arms around each other, touching another's genitals or hands, etc.
35. See, example, Cheney, Seyfarth and Silk (1995), Silk, Cheney, and Seyfarth (1996), Castles and Whiten (1998), among others.
36. See, for example, Das (2000), Call, Aureli, de Waal (2002), Kutsukake and Castles (2004), Wittig et al (2007), Silk (2002b) and Wittig and Boesch (2010).
37. See Jolly (1966), Humphrey (1976), and the papers collected in Byrne and Whiten (1988) and (1997) for canonical statements of this position.
38. One should not get carried away with the modal force of the hypothesis. At least as the hypothesis has operated in comparative studies of evolution (to say nothing of how it might function in the work of philosophers such as Hegel or

Wittgenstein), there is clearly an implicit restriction of the scope of the hypothesis to worlds sufficiently like our world at the level of both its underlying laws and its history up to the point of the emergence of the focal trait under study.

39. See Jerison (1973) and especially the discussion in Striedter (2005) for treatments of this sort, and Logan et al (2018) for a recent attempt to correct some of the simplistic inferences often found in these discussions that move quickly from relative brain size to brain complexity or from increases in relative brain size to increased intelligence.
40. Shultz and Dunbar (2010a).
41. Shultz and Dunbar (2007), Emery et al (2007), Shultz and Dunbar (2010b).
42. These claims also receive support from the now well-documented adaptive value of social bonds within mammalian groups—that is, the fact that forming and maintaining social bonds increase individuals' chances of surviving and having their offspring likewise survive; see Silk (2007), Silk et al (2009), Seyfarth and Cheney (2012).
43. See, for instance, Barton (2004), Reader et al (2011), van Schaik et al (2011), and Dunbar and Shultz (2017) for discussion.
44. In Armstrong (ms), I argue that we should also avoid the converse mistake of utilizing models for these purposes that are *too general* or *maximally inclusive*, for instance by abstracting away from the differences between minded and non-minded populations of communicating agents.
45. See Sterelny (2003) and especially Burge (2010) for extended discussion of these dimensions of environmental tracking.
46. See Sterelny (2003) for critical discussion of these mechanisms of behavioral control.
47. This way of modeling representational states will give this result so long as the space possibilities has the structure of a Boolean Algebra and the preference order is consistent and complete. As Field (1986) has emphasized, one can preserve these structural features of the model while being quite neutral concerning the metaphysical status of the underlying possibilities or possible worlds.
48. See Avital and Jablonka (2000) and Jablonka and Lamb (2014) for many cases of this kind, and for a sense of the generality and evolutionary power of such processes.
49. See Burge (2010), chapter 10 for extension discussion of these abilities.
50. See Rosati et al (2009) for a useful review of these competences within the primate order.
51. The metaphor of a social field is due to Bourdieu (1993), but was applied to primate social cognition by Tomasello and Call (1997).
52. This is the case even though these social competences serve to track the features that vary with the representational states of mind of other agents. The reason why these states of mind do not constitute instances of meta-representation is that they do not require the agents that enter in to them to have a cognitive grip on the distinction between appearance and reality or the distinction between accurate representations and inaccurate representations. So even when these states of mind are used to represent whether an agent has or does not have access to some bit of information they cannot be used to represent whether that agent has access to false or otherwise inaccurate information. Moreover, at a more syntactic or

structural level meta-representation requires a sentential-like propositional state to be embedded within another sentential-like propositional state; in contrast, the social cognitive states being discussed syntactically behave more like relations or predicates than full sentential clauses.

53. And as Camp (2009) has argued in some detail, neither do these social competences equip the creatures with a natural language or a language of thought.
54. I have no wish to fight over the label "common ground'" or to argue about which characterization *really* gets at the essence of common ground. One could call my notion "common ground^{-}" or the standard notion "common ground^{+}", if one was so inclined. The important point is about the role that these various notions play in our understanding of social phenomena.
55. Although not understood in these terms, Ginzburg (2012) develops a computational model of linguistic pragmatics that utilizes a notion of common ground along the lines I am suggesting here.
56. Indeed, the present construal of the common ground does not require that the agents in a group be *transparently aware* of the fact that they are all accepted a body of information in order that information to be common ground among them. One could, of course, add a mutual awareness *sans* meta-representation condition to the above definition if one wished. But in my view that would limit the explanatory power of the account, for it would make the account unsuitable for understanding uncooperative instances of communication involving forms of manipulation or insinuation of the kind recently explored by Lepore and Stone (2015) and Camp (2018). For these reasons—as well as other reasons developed in Hawthorne and Magidor (2010)—I take the broad character of the present construal to be a feature rather than a bug.
57. Versions of this point go back at least to Hobbes (1668/1994) and Hume (1738/1975), but they have more recently been emphasized by Brian Skyrms in (2003).
58. See Trivers (1971) and Axelrod (1984) for classic statements, and Cheney (2001) and Schino and Aureli (2009) and (2017) for discussion of the role of reciprocal interaction in non-human animal social cooperation. The discussion in Silk et al (2000) is especially relevant for the present account in showing that the social competences reviewed above can ground the reliability of low-cost signals (e.g., the affiliative vocalizations of baboons) even in situations of conflicting interests.
59. See Lederman (2018a) and (2017) for further developments of these claims, particularly as they relate to classical game-theoretic and rational choice models.
60. However, these descriptive questions have begun to be explored in careful detail by Philippe Schlenker and collaborators; see Schlenker et al (2014), Schlenker et al (2016a), and Schlenker et al (2016b).
61. This is roughly the account of function developed by Wright (1973), and as applied to communication by Millikan (1984) and (1998) and in particular by Maynard Smith and Harper (2004). See also Godfrey-Smith (1993) for a useful discussion of this picture of function in general and (2014) and (2017) its relevance to questions about communication.
62. There is a parallel kind of context-dependence at work in the content conveyed by primate alarm calls and food calls concerning the relevant time and location of the environmental trigger; however, this is a kind of "automatic" indexicality

associated with the contents of these signals. What makes the context-dependence at work in affiliative and aggressive signals particularly connected to the common ground is that it does not have this automatic character: the content conveyed by these signals cannot simply be read off the concrete situation in which the communicative acts occur.

63. See Dawkins and Krebs (1984) for an early statement of this issue, and Owren et al (2010), Seyfarth et al (2010), and Scarantino (2013) for more recent discussion.
64. See, for instance, Murray (2014) and Murray and Starr (2018) among others.
65. See Roberts (2004) and (2018) for clear statements of the place of principles such as these in human pragmatics, and Schlenker et al (2014), Schlenker et al (2016a), Schlenker et al (2016b) for applications of the informativity constraint to the study of primate communication systems.
66. The significance of this difference has been somewhat obscured in recent discussions in pragmatics by a focus on what Carston (2002) and others have called the *underdetermination thesis*: the thesis that the meaning conveyed by a speaker' message is typically underdetermined by the conventional meaning of form of the speaker's signal and the context of the speaker's communicative act. This thesis may well have much to say in its favor, as Carston and others have aptly demonstrated. Yet, the thesis should not detract from degree of determination that is found within human communication systems relative to the communication systems of other animals. In particular, it seems to me to be as important to highlight the vast numbers of things a speaker *cannot* use a conventional form to mean in context as it is to highlight the vast number of things the speaker can mean with that conventional form in context.
67. I consider these features of human communicative flexibility in some detail in Armstrong (2016a) and (2016b).
68. Moreover, human capacities for iterative meta-representation (supposing we have them) are not present at birth and they do not appear overnight. On any reasonable theoretical account, human capacities for meta-representation arise through a substantive developmental trajectory—perhaps of as little as eight-month or as much as six-years, but a process of development nonetheless. I strongly suspect that the social competences I have described in this paper provide an ineliminable scaffolding around which other capacities of social cognition develop and mature. A more complete development of this connection between comparative social cognition and human development will have to wait for another occasion; however, see Breheny (2006) and Moore (2017) for initial discussion.
69. See Sellars (1969), Davidson (1975), Brandom (1994), Bermudez (2003), and especially Bar-On (2016) and (Forthcoming) for relevant discussion.
70. See, for instance, Hauser, Chomsky, and Fitch (2002) and Berwick and Chomsky (2016).

References

Andrews, K. (2012). *Do Ape Read Minds? Toward a New Folk Psychology*. Cambridge, MA: MIT Press.

Armstrong, J. (2016a). "The Problem of Lexical Innovation," *Linguistics and Philosophy*. 39(2): 87–118.

———. (2016b). "Coordination, Triangulation, and Language Use," *Inquiry*, 59(1): 80–112.
———. (ms). "The Evolution of Minded Communication," *UCLA*
Austin, J. (1962). *How to Do Things with Words*, Oxford: Oxford University Press.
Avital, E. and Jablonka, E., (2000). *Animal Traditions: Behavioural Inheritance in Evolution*, Cambridge: Cambridge University Press.
Axelrod, R. (1984). *The Evolution of Cooperation*, New York, Basic Books, Inc.
Bach, K. and Harnish, R. (1979). *Linguistic Communication and Speech Acts*, Cambridge: M.I.T. Press.
Barton, R. (2004). "Binocularity and brain evolution in primates," *PNAS* 101(27): 10113–10115.
Bar-On, D. (2013a). "Origins of Meaning: Must We 'Go Gricean'?" *Mind and Language*, 29.3: 342–375.
———. (2013b). "Expressive Communication and Continuity Skepticism," *Journal of Philosophy*, 110 (6): 293–330.
———. (2016). "Sociality, Expression, and This Thing Called Language."*Inquiry* 59(1): 56–79.
———. (Forthcoming). "Crude Meaning, Brute Thought," *Journal for the History of Analytic Philosophy*.
Bermúdez, J. (2003). *Thinking Without Words*. Cambridge MA, MIT Press.
Berwick, R. and Chomsky, N. (2016). *Why Only Us: Language and Evolution*. Cambridge, MA: MIT Press.
Bourdieu, P. (1993). *The Field of Cultural Production: Essays on Art and Literature*, New York: Columbia University Press.
Brandom, R. (1994). *Making It Explicit: Reasoning, Representing, and Discursive Commitment*. Cambridge, MA: Harvard University Press.
Breheny, R. (2006). "Communication and Folk Psychology," *Mind and Language* 21.1: 74–107.
Byrne, R. and Whiten A. (1988). *Machiavellian Intelligence: Social Expertise and the Evolution of Intellect in Monkeys, Apes, and Humans*. New York: Oxford University Press.
Burge, T. (1975). "On Knowledge and Convention," *Philosophical Review* 84(2): 249–255.
———. (1992). "Review of Studies in the Way of Words," *The Philosophical Review*, 101 (3): 619.
———. (2010). *Origins of Objectivity*, Oxford: Oxford University Press.
———. (2018). "Do infants and nonhuman animals attribute mental states?" *Psychological Review* 125(3): 409–434.
Call, J., Aureli, F., & de Waal, F.B.M. (2002). "Post-conflict third party affiliation in stumptailed macaques," *Animal Behaviour* 63: 209–216.
———. (2008). "Does the chimpanzee have a theory of mind? 30 years later." *Trends in Cognitive Sciences* Vol. 12, No. 5, p. 187–192.
Camp, E. (2009). "A language of baboon thought?" In Robert Lurz (ed.), *Philosophy of Animal Minds*. New York: Cambridge University Press.
———. (2018). "Insinuation, Common Ground, and the Conversational Record," in Fogal, D., Harris, D., and Moss, M. (2018).
Carston, R. (2002). *Thoughts and Utterances. The Pragmatics of Explicit Communication*, Oxford: Blackwell.
Castles, D. and Whiten, A. (1998). "Post-conflict Behaviour of Wild Olive Baboons. I. Reconciliation, Redirection and Consolation," *Ethology* 104.2, pp. 126–147.
Cheney, D. (2001). "Extent and limits of cooperation in animals," *PNAS* 108. 2, pp. 10902–10909.
Cheney D. and Seyfarth R. (1990). *How Monkeys See the World: Inside the Mind of Another Species*. Chicago: University Of Chicago Press.
———. (2007). *Baboon Metaphysics: The Evolution of a Social Mind*. Chicago: University Of Chicago Press.
Cheney, D., Seyfarth, R., and Silk, J., (1995). "The role of grunts in reconciling opponents and facilitating interactions among adult female baboons," *Anim. Behav* 50: 249–57.

Clark, H. (1996). *Using Language*. Cambridge: Cambridge University Press.
Crockford, C., Wittig R., Mundry R., and Zuberbühler K. (2012). "Wild chimpanzees inform ignorant group members of danger." *Current Biology* 22(2): 142–146.
Crockford, C., Wittig R., and Zuberbühler K. (2017). "Vocalizing in chimpanzees is influenced by social-cognitive processes," *Science Advances* 3(11).
Das, M. (2000). "Conflict management via third parties: Post-conflict affiliation of the aggressor. In F. Aureli & F. B. M. de Waal (Eds.), *Natural conflict resolution* Berkeley, CA, US: University of California Press, pp. 263–280.
Davidson, D. (1975). "Thought and Talk." In S. Guttenplan (ed.), *Mind and Language*. Oxford: Oxford University Press. 7–23.
———. (1982). "Rational Animals," *Dialectica* 36(4): 317–327.
Dawkins, R. and Krebs, J. (1984). "Animal signals: information or manipulation?" in J.R. Krebs, N.B. Davies (Eds.), *Behavioural Ecology:an Evolutionary Approach*, Blackwell Scientific Publications, pp. 282–309.
De Villiers, J., Stainton, R., and Szatmari, P. (2007). "Pragmatic abilities in autism spectrum disorder: A case study in philosophy and the empirical," *Midwest Studies in Philosophy* 31(1): 292–317.
de Waal, F. (1990). *Peacemaking Among Primates*. Cambridge, MA: Harvard Univ. Press.
Ducheminsky, N., Henzi, P., and Barrett, L. (2014). "Responses of vervet monkeys in large troops to terrestrial and aerial predator alarm calls," *Behavioral Ecology* 25.6: 1474–1484.
Dunbar, R. and Shultz S. (2007). "Understanding Primate Brian Evolution." *Philosophical Transactions of The Royal Society B Biological Sciences* 362(1480): 649–58.
———. (2017). "Why are there so many explanations of primate brain evolution." *Philosophical Transactions of The Royal Society B Biological Sciences* 372(1727): 20160244.
Engh, A., Hoffmeier, R., Cheney, D., and Seyfarth, R. (2005). Who, me? Can baboons infer the target of vocalizations?" *Anim. Behav*. 71: 381–387.
Emery, N. Seed, A., von Bayern, M., and Clayton, N. (2007) "Cognitive adaptations of social bonding in birds," *Philos Trans R Soc Lond B Biol Sci.* 362(1480): 489–505.
Fischer, J. and Price, T. (2016). "Meaning, intention, and inference in primate vocal communication," *Neuroscience & Biobehavioral Reviews* 82: 22–31.
Field, H. (1986). "Stalnaker on intentionality: On Robert Stalnaker's inquiry"*Pacific Philosophical Quarterly* 67: 98–112.
Fogal, D., Harris, D., and Moss, M. (2018). *New Work on Speech Acts*, Oxford: Oxford University Press.
Godfrey-Smith, P. (1993). "Functions: Consensus without unity," *Pacific Philosophical Quarterly* 74(3): 196–208.
———. (2006). "The Strategy of Model-Based Science," *Biology and Philosophy* 21: 735–740.
———. (2014). "Signs and symbolic behavior" *Biological Theory* 9(1): 78–88.
———. (2017). "Senders, receivers, and symbolic artifacts," *Biological Theory* 12(4): 275–286.
Ginzburg, J. (1995). Resolving questions, Part I and Part II. *Linguistics and Philosophy* 18.5: 459–527.
———. (2012). *The Interactive Stance: Meaning for Conversation*, Oxford: Oxford University Press.
Glüer, K. and Pagin, P. (2003). "Meaning theory and autistic speakers" *Mind & Language* 18(1): 23–51.
Greco (2014). "Could KK be OK," *Journal of Philosophy* 111(4): 169–197.
Grice, H.P. (1957). "Meaning," *Philosophical Review* 66(3): 377–388; reprinted in Grice (1991).
———. (1991). *Studies in the Way of Words*, Cambridge, MA: Harvard University Press.
Hamblin, C. (1971). "Mathematical Models of Dialogue," *Theoria* 37: 130–155.
———. (1973). "Questions in Montague English," *Foundations of Language* 10(1): 41–53.

Harris, D., Fogal, D., and Moss M., (2018). "Speech Acts: The Contemporary Theoretical Landscape," in Fogal, Harris, and Moss (2018).
Hauser, M., Chomsky, N., and Fitch, T (2002). "The faculty of language: what is it, who has it, and how did it evolve?" *Science* 298(5598): 1569–79.
Hawthorne, J. and Magidor, O. (2010). "Assertion and Epistemic Opacity," *Mind* 119(476): 1087–1105.
Heim, I. (1982). *The Semantics of Definite and Indefinite Noun Phrases*. Ph.D. thesis, Linguistics Department, University of Massachusetts, Amherst, Massachusetts.
Hobbes, T. (1668/1994). Leviathan (Latin edition), in E. Curley (ed.), *Leviathan, with selected variants from the Latin edition of 1668*, Indianapolis: Hackett.
Hume, D. (1738/1975). A Treatise of Human Nature, edited by L.A. Selby-Bigge, 2nd ed. revised by P. H. Nidditch, Oxford: Clarendon Press.
Humphrey, N. (1976). "The Social Function of Intellect," in *Growing Points in Ethology*, ed. P.P.G. Bateson and R.A. Hinde, Cambridge: Cambridge University Press, pp. 303–317.
Hurley, S. (2001). "Animal Action in the Space of Reasons." *Mind and Language* 18: 231–256.
———. (2006). "*Making Sense of Animals." Rational Animals?* S. Hurley and M. Nudds, Eds. Oxford, Oxford University Press: 139–174.
Jablonka, E. and Lamb, M. (2014). *Evolution in Four Dimensions*, Cambridge, MA: MIT Press.
Jerison, H. (1973). *Evolution of the Brain and Intelligence*, Academic Press Inc.
Jolly, A. (1966). "Lemur Social Behavior and Primate Intelligence." *Science* 153: 501–506.
Kalan, A., & Boesch, C. (2015). "Audience effects in chimpanzee food calls and their potential for recruiting others," *Behavioral Ecology and Sociobiology* 69(10): 1701–1712.
Karttunen, L. (1974), "Presupposition and linguistic context," *Theoretical Linguistics* 1: 3–44.
Kamp, H. (1981). "A Theory of Truth and Semantic Representation", in *Formal Methods in the Study of Language, Jeroen Groenendijk*, Theo Janssen, and Martin Stokhof (eds.), Amsterdam: Mathematisch Centrum, 277–322.
Korta, K. and Perry, J. (2011). *Critical Pragmatics. An Inquiry into Reference and Communication*, Cambridge: Cambridge University Press.
Krupenye, C., Kano, F., Hirata, S., Josep Call., J. and Tomasello, M. (2016). "Great apes anticipate that other individuals will act according to false beliefs," *Science* 354(6308): 110–114.
Kutsukake, N. and Castles, D. (2004). "Reconciliation and post-conflict third-party affiliation among wild chimpanzees in the Mahale Mountains, Tanzania" *Primates* 45(3): 157–65.
Lederman, H. (2017). "Uncommon Knowledge," *Mind*, 127. 508: 1069–1105,
———. (2018a). "Two Paradoxes of Common Knowledge: Coordinated Attack and Electronic Mail," *Nous*, 52. 4: 921–945.
———. (2018b). "*Common Knowledge*" *in The Routledge Handbook of Collective Intentionality*, ed. M. Jankovic and K. Ludwig, Routledge Press.
Lepore, E. and Stone, M. (2015). *Imagination and Convention: Distinguishing Grammar and Inference in Language*, Oxford: Oxford University Press.
Leslie, A. (1994). "ToMM, ToBy, and Agency: Core architecture and domain specificity," In L. A. Hirschfeld & S. A. Gelman (Eds.), *Mapping the mind: Domain specificity in cognition and culture* (pp. 119–148). New York, NY, US: Cambridge University Press.
Lewis, D. (1969). *Convention*, Cambridge, MA: Harvard University Press.
———. (1979). "Scorekeeping in a Language Game," *Journal of Philosophical Logic* 8: 339–359.
Liebal, K., Waller, B., Burrows, A., and Slocombe, K. (2013). *Primate Communication: A multimodal approach*, Cambridge: Cambridge University Press.
Logan, C. et al (2018). "Beyond brain size: Uncovering the neural correlates of behavioral and cognitive specialization," in Comparative Cognition & Behavior Reviews 13: 55–89.
Lurz, R. (2011). *Mind Reading Animals: The Debate over What Animals Know about Other Minds*. Cambridge, Mass.: MIT Press.
Maynard Smith, J. and Harper, D. (2003). *Animal Signals*, Oxford: Oxford University Press.

Millikan, R. (1984). *Language, Thought and Other Biological Objects*, Cambridge, Mass.: MIT Press.
———. (1995) "Pushmi-pullyu representations," *Philosophical Perspectives* 9: 185–200.
———. (1998). "Language Conventions Made Simple." *Journal of Philosophy* 95.4: 161–80.
———. (2004). *Varieties of Meaning: the 2002 Jean-Nicod Lectures*, Cambridge, Mass.: MIT Press.
Moore, R (2017). "Gricean communication and cognitive development," *Philosophical Quarterly* 67(267): 303–326.
Murray, S. (2014). "Varieties of Update", *Semantics and Pragmatics* 7: 1–53. https://doi.org/10.3765/sp.7.2
Murray, S. and Starr, W. (2018). "*Force and Conversational States*," in Fogal, D., Harris, D., and Moss, M. (2018).
Neale, S. (1992). "Paul Grice and the philosophy of language", *Linguistics and Philosophy* 15: 509–559.
Owren, M., Rendell, D., and Ryan, M. (2010). "Redefining animal signaling: influence versus information in communication," *Biology and Philosophy* 25.5: 755–780.
Parr, L. A., Winslow, J. T., Hopkins, W. D., & Waal, F. d. (2000). "Recognizing Facial Cues: Individual Recognition in Chimpanzees and Rhesus Monkeys." *Journal of Comparative Psychology* 114: 47–60.
Penn, D., and Povinelli, D., (2007). "On the lack of evidence that non-human animals possess anything remotely resembling a 'theory of mind." *Philos Trans R Soc Lond B Biol Sci*., 362(1480): 731–744.
Portner, P. (2004). "The Semantics of Imperatives within a Theory of Clause Types," In RB Young (ed.), *Proceedings from Semantics and Linguistic Theory* 14, 235–252. Ithaca, NY: CLC Publications.
———. (2018). "*Commitment to Priorities*," in Fogal, D., Harris, D., and Moss, M. (2018).
Pollick, A., Gouzoules, H., and de Wall, F. (2005). "Audience effects on food calls in captive brown capuchin monkeys, Cebus paella" *Animal Behaviour* 70(6): 1273–1281.
Roberts, C. (1996/2012). "Information Structure in Discourse: Towards an Integrated Formal. Theory of Pragmatics," In JH Yoon & A Kathol (eds.), OSU Working Papers in Linguistics,vol. 49. Columbus, Ohio: Ohio State University Press. Reprinted in Semantics and Pragmatics 5(6): 69.
———. (2004). "Context in Dynamic Interpretation," in eds. L. Horn and G. Ward, *The Handbook of Pragmatics*, Blackwell Publishers.
———. (2018). "*Speech Acts in Discourse Context*," in Fogal, D., Harris, D., and Moss, M. (2018).
Rosati, A., Hare, B.A., & Santos, L. R. (2009). "Primate social cognition: Thirty years after Premack and Woodruff," In M. Platt & A. A. Ghazanfar (Eds.) *Primate Neuroethology*. Cambridge, MA: MIT Press. 117–143.
Rendall, D., Rodman, P., and Emond, R. (1996), "Vocal recognition of individuals and kin in free-ranging rhesus monkeys," *Animal Behaviour* 51. 5: 1007–1015.
Reader, S., Hager, Y., and Laland, K. (2011). "The evolution of primate general and cultural intelligence," *Philos Trans R Soc Lond B Biol Sci.* 366(1567): 1017–1027.
Scarantino, A. (2013). "Animal communication as information-mediated influence,' in ed. U. Stegman *Animal communication theory: Information and influence*, Cambridge: Cambridge University Press.
Schiffer, S., (1972). *Meaning*, Oxford: Oxford University Press.
Schlenker, P., Chemla, E., Arnold, K., Lemasson, A., Ouattara, K., Keenan, S., Stephan, C., Ryder, R., and Zuberbühler, K. (2014). Monkey Semantics: Two 'Dialects' of Campbell's Monkey Alarm Calls. *Linguistics & Philosophy* 37(6): 439–501.
Schlenker, P., Chemla, E., Arnold, K., & Zuberbuehler, K. (2016a). Pyow-Hack Revisited: Two Analyses of Putty-nosed Monkey Alarm Calls. *Lingua* 171(2016): 1–23.

Schlenker, P., Chemla, E., & Zuberbuehler, K (2016b). "What Do Monkey Calls Mean?" *Trends*.
Schino, G. and Aureli, F. (2009). "Reciprocal Altruism in Primates: Partner Choice, Cognition, and Emotions," *Advances in the Study of Behavior* 39, 45–69.
———. (2017). "Reciprocity in group-living animals: partner control versus partner choice," *Biological Reviews* 92.2: 665–672.
Scott-Phillips, T. (2014). *Speaking Our Minds: Why Human Communication is Different, and how Language Evolved to Make it Special*, Palgrave Macmillan.
Searle J. (1965). "What is a speech act?" in M. Black (ed.), *Philosophy in America*, Ithaca: Cornell University Press.
———. (1969). *Speech Acts*, Cambridge: Cambridge University Press.
Sellars, W. (1969). "Language as Thought and Communication," *Philosophy and Phenomenological Research* 29: 506–27.
Seyfarth R.M. & Cheney, D.L. (2015). "The evolution of concepts about agents: Or what do animals recognize when they recognize an agent?" In *The Conceptual Mind: New Directions in the Study of Concepts*. (Margolis, E., Laurence, S., Eds.): 57–76., Cambridge, MA: MIT Pres.
———. (2018a). "Pragmatic flexibility in primate vocal production," *Current Opinion in Behavioral Sciences* 21: 56–61.
———. (2018b). "Flexible usage and social function in primate vocalizations., *PNAS* 115: 1974–1979.
Seyfarth, R., Cheney D. and Marler, P. (1980). "Vervet monkey alarm calls: Semantic communication in a free-ranging primate." *Animal Behavior* 28: 1070–1094.
Seyfarth, R., Cheney D., Bergman T., Fischer J., Zuberbuhler K., and Hammerschmidt K. (2010). "The central importance of information in studies of animal communication," *Animal Behaviour* 80: 3–8.
Shultz, S. and Dunbar, R. (2007). "The evolution of the social brain: anthropoid primates contrast with other vertebrates," *Proceedings of the Royal Society B: Biological Sciences* 274, http://doi.org/10.1098/rspb.2007.0693.
———. (2010a). "Encephalization is not a universal macroevolutionary phenomenon in mammals but is associated with sociality," *PNAS* 107(50): 21582–21586.
———. (2010b). "Social bonds in birds are associated with brain size and contingent on the correlated evolution of life-history and increased parental investment," *Biological Journal of the Linnean Society* 100(1): 111–123.
Silk, J. (2002). "Grunts, girneys, and good intentions: the origins of strategic commitment in nonhuman primates," In: *Commitment: Evolutionary Perspectives* (ed. by R. Nesse), Russell Sage Press, pp. 138–157.
———. (2002b). "The form and function of reconciliation in primates," *Annual Review of Anthropology* 31: 21–44.
———. (2007). "The adaptive value of sociality in mammalian groups," *Philosophical Transactions of the Royal Society* 362: 539–559.
Silk, J., Cheney, D., & Seyfarth, R. (1996). "The form and function of post-conflict interactions among female baboons," *Animal Behaviour* 52: 259–268.
Silk, J., Kaldor E., and Boyd, R. (2000). "Cheap talk when interests conflict," *Animal behaviour* 59(2): 423–432.
Silk, J., Beehner, J., Berman, T., Crockford, C., Engh, A., Moscovice, L., Wittig, R., Seyfarth, R., & Cheney, D. (2009). "The benefits of social capital: close social bonds among female baboons enhance offspring survival," *Proceedings of the Royal Society London, Series B*. 276: 3099–3014.
Silwa, J. and Freiwald, W. (2017). "A dedicated network for social interaction processing in the primate brain," *Science*, Vol. 356, Issue 6339, pp. 745–749.
Stalnaker, R. (1978). "Assertion." *Syntax and Semantics* 9(1978): 315–332.
———. (1984). *Inquiry*, Cambridge, MA: MIT Press.

———. (2002). "Common Ground," *Linguistics and Philosophy* 25(2002): 701–721.
———. (2014). *Context*, Oxford: Oxford University Press.
———. (2018). "*Dynamic Pragmatics, Static Semantics*," in Fogal, D., Harris, D., and Moss, M. (2018).
Sterelny, K. (2003). **Thought in a Hostile World*, Oxford: Blackwell.
Striedter, G. (2005). *Principles of Brain Evolution*, Oxford: Oxford University Press.
Skyrms, B. (1995). *Evolution of the Social Contract*. Cambridge: Cambridge University Press.
———. (2003). *The Stag Hunt and the Evolution of Social Structure*. Cambridge: Cambridge University Press.
Strawson, P. (1964). "Intention and convention in speech acts," *The Philosophical Review* 73: 439–460.
Sperber, D. (1995). "How do we communicate?" In J. Brockman & K. Matson (eds.), *How things are: A science toolkit for the mind*, Morrow, 191–199.
Sperber, D. and Wilson, D. (1986). *Relevance: Communication and Cognition*. Cambridge: Harvard University Press.
Starr, W.B. (2016). 'Dynamic Expressivism about Deontic Modality.' In N. Charlow &
Schel, A., Townsend, S., Machanda, Z., Zuberbühler, K., and Slocombe, K. (2013). "Chimpanzee Alarm Call Production Meets Key Criteria for Intentionality," *PLoS ONE* 8(10): e76674. https://doi.org/10.1371/journal.pone.0076674
Townsend, S. et al (2016). "Exorcising Grice's ghost: an empirical approach to studying intentional communication in animals," *Biological Reviews* 92.3: pp. 1427–1433.
Tomasello, M. and Call, J. (1997). *Primate Cognition*, Oxford: Oxford University Press.
Trivers, R. (1971). "The Evolution of Reciprocal Altruism," *Quarterly Review of Biology* 46(1): 35–57.
van Schaik, C., Isler, L., and Burkart, J. (2011). "Explaining brain size variation: from social to cultural brain." *Trends Cogn Sci.* (5): 277–84.
Weisberg, M. (2007). "Who is a Modeler," *British Journal of the Philosophy of Science* 58: 207–233.
———. (2013). *Simulation and Similarity: Using Models to Understand the World*, Oxford: Oxford University Press.
Whiten, A. and Byrne, R. (1997). *Machiavellian Intelligence II: Extensions and Evaluations*, Cambridge: Cambridge University Press.
Wich, S. and de Vries, H. (2006). "Male monkeys remember which group members have given alarm calls," *Proc Biol Sci*. 273(1587): 735–740.
Wittig, R.M., Crockford, C., Wikberg, E., Seyfarth, R.M. & Cheney, D.L. (2007). "Kin-mediated reconciliation substitutes for direct reconciliation in female baboons." *Proceedings of the Royal Society B: Biological Sciences* 274: 1109–1115.
Wittig, R. and Boesch, C. (2010). "Receiving Post-Conflict Affiliation from the Enemy's Friend Reconciles Former Opponents," *PLoS ONE* 5(11): e13995. https://doi.org/10.1371/journal.pone.0013995
Wright, L. (1973). "Functions," *Philosophical Review* 82(2): 139–168.
Yalcin, S. (2018). "*Expressivism by Force*," in Fogal, D., Harris, D., and Moss, M. (2018).
Zuberbühler, K. (2009). "Survivor signals: the biology and psychology of animal alarm calling," *Advances in the Study of Behavior* 40: 277–322.