



Social inheritance and the social mind: Introduction to the Synthese topical collection The Cultural Evolution of Human Social Cognition

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Abstract

In this introduction to the Synthese SI: The Cultural Evolution of Human Social Cognition, we introduce some basic theoretical terms that will help readers to navigate the volume. Subsequently we describe the papers that make up the volume and draw attention to points of agreement and disagreement between the authors. We also identify a number of outstanding issues for the field of cultural evolution research. The papers in the volume can be divided into three sections: (1) The Cultural Evolution of Mindreading, (2) The Cultural Evolution of Ethics and Aesthetics, and (3) Methodological Challenges.

Keywords Cultural evolution · Social cognition · Theory of mind · Human evolution · Methodological challenges · Aesthetics · Ethics

Questions about the origins of the human mind have a long philosophical history. Debates about whether human cognitive powers are innate or learned can be traced back to Plato's *Meno*, are present in disagreements between Locke and Leibniz, and were a central bone of contention in analytic philosophers' discussions of the representational mind in the second half of the 20th century. In more recent years, questions about whether features of the mind are innate have been supplemented with a further set of questions about the processes through which learned aspects of mental life develop during ontogeny, and about how culturally acquired traits arose in human history. Building on work by Dawkins (1976), Richerson and Boyd (1985, 2005), and

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Dennett (1995) among others, some have argued that the human mind is a product of both *cultural evolution* and *cultural inheritance* (e.g., Heyes, 2018).

Broadly speaking, culturally inherited traits are those that are learned from others. Cultural evolution is the process by which the socially learned beliefs, knowledge, and skills within a population persist, propagate, and change over time (Lewens, 2015). The gradual and cumulative way that cultures change has been likened to Darwinian evolution by natural selection. To illustrate with an example, tool manufacture and use is an ancient human cultural adaptation. Successive generations of humans have not only learned the cultural innovations of their ancestors, but also refined them, developing newer, more sophisticated versions of existing tools, and abandoning those that have been superseded. Though there are some obvious differences¹, this process is comparable to a biological process in which adaptively advantageous genetic mutations undergo selection and become established in a population, while less successful variants fail to be reproduced.

With the boom in cultural evolution research over the past decade, broader questions about the role of human culture in the evolution and development of human cognition have once again come to the fore.² Many have argued that cultural evolution has shaped more than just the material tools which ensured the survival of our ancestors (e.g., Tomasello, 1999; Heyes, 2018; Henrich, 2020). It has also shaped our *cognitive tools*.³ On this view, certain distinctively, and perhaps uniquely, human forms of cognition likely originated in cultural practices. If true, this has implications for the diversity of human societies. Culturally inherited traits, for example, would not have been possessed by all humans, and whether communities of individuals possessed these traits would depend (among other things) on when and where they lived in human history. Thus, our cultural artefacts—not just cars and computers, but also languages, concepts, counting systems, and social institutions—change over historical time in a cumulative and dynamic manner.

While it is uncontroversial that human artefacts are products of cultural evolution, the idea that our cognitive abilities could have culturally evolved is the subject of significant debate (see, e.g., Jacob & Scott-Phillips, 2021). In part, this is because the human mind has long been thought to be a product of biological evolution (e.g., Tooby & Cosmides, 1992), rather than cultural evolution; with social cognition hypothesised to be a central locus of natural selection in the hominin lineage (Herrmann et al., 2007, Tomasello 2008). Empirical studies identifying adult-like socio-cognitive abilities in infants (e.g., Onishi & Baillargeon, 2005; Kovács, Téglás & Endress 2010) are interpreted by many as offering compelling evidence that the human mind is substantially innate and thus that our social cognition is largely the product of our biological inheritance. Evidence for the cultural inheritance of social

¹ For example, the inheritance of tool manufacturing and tool use occurs both vertically from parent to offspring and horizontally from conspecific to conspecific. In contrast, genetic inheritance is only vertical in nature. Cultural selection too has the potential to be far more directed than selection in the strictly biological context is understood to be.

² These questions also have a long history. In the 20th century alone, important discussions of the cultural origins of human cognition can be found in Piaget (1926), Luria (1976), and Vygotsky (1978).

³ For a comparison of these authors' influential claims, see Heyes & Moore (in press).

cognition undermines this interpretation and offers a radically different picture of the evolution of culture itself.

The question of whether, and why, human cultures have become so complex and diverse when the cultures of other species remain rudimentary drives a great deal of research in cultural evolution. Many have argued that what enabled the historical explosion of human cultures was the prior emergence of uniquely human socio-cognitive abilities (e.g., Tomasello, 1999, 2008; Sterelny 2012). If, however, uniquely human forms of cognition are themselves products of cultural evolution, then it becomes harder to explain why human cultures became so dominant, while the cultures of other species did not. Furthermore, if we cannot explain the origins of human culture, then we also lose our capacity to explain the emergence of culturally dependent forms of cognition. Nonetheless, data testifying to the early emergence of adult-like socio-cognitive abilities in infants have increasingly been contested. Some argue that they have been systematically over-interpreted (e.g., Heyes, 2018). Concerns that key studies fail to replicate have added fuel to the fire (Poulin-Dubois et al., 2018). Ultimately, this has rekindled questions about the role of culture in the inheritance, development, and evolution of social cognition.

The papers in this volume contribute to debates about the origins of social cognition in several ways. Papers in parts (1) and (2) of the volume address questions about whether and which features of human social cognition might have evolved culturally. Papers in part (3) focus, loosely, on methodological issues that have arisen in recent work on the cultural foundations of human cognition.

1 The cultural evolution of mindreading

The largest part of this volume is given over to the discussion and development of the idea that human ‘Theory of Mind’ (‘ToM’, also known as ‘mindreading’) is a product of cultural evolution. A Theory of Mind is the set of cognitive processes that are involved in an agent’s thinking about minds, whether our own or the minds of others. To claim that ToM has culturally evolved is to defend the idea that the ability to think about other minds is a cognitive technology that has increased in sophistication over generations. On this view, earlier human populations were likely less adept at mindreading than we are. Central features of human social cognition have developed over human history, perhaps because of the cultural evolution of language, and the evolution of other cultural practices that support the ability to think about mental states. As cultural practices have developed differently in different parts of the world, so might ToM skills have diverged across populations and periods of time. It is not surprising that this is a controversial idea.

As you read this volume it is important to be aware that there is no single agreed upon definition for the term ‘Theory of Mind’. It has perhaps most often been used in a narrow sense, to capture the ability of agents to think about others’ false beliefs. This ability has been taken to be paradigmatic of (if not always necessary and sufficient for) ToM possession. Often, possession of a ToM is also taken to presuppose the command of a developed, propositionally structured folk theory of the human mind, incorporating developed concepts central to mental life, including intention,

belief, and desire (Davidson, 2001; Burge, 2018). ‘Theory of Mind’ has been used in a broader sense too, with the most generous views incorporating any ability to think about or act in light of an understanding of others’ behaviour (Andrews, 2008). On such broad accounts, ToM is not limited to thinking about mental state concepts but taken to include an understanding of the behavioural proxies of mental states, and of emotional states and their behavioural expressions. In addition, while some (mostly critics) have conceived of ToM as presupposing a mastery of a theory-like body of knowledge (e.g., Gallagher, 2001), one need not be committed to this view. Some, for example, take ‘ToM’ to be whatever mechanism it is that enables us to track and reason in light of others’ mental states, whether this is theory-like or not (e.g., Spaulding, 2020). As a result, when thinking about rival accounts of the origins of ToM, we should be aware that different authors may not always be giving an account of quite the same thing. The target of their explanation may be more broadly or more narrowly conceived.

With this conceptual foundation made explicit, we now turn to consider the papers that make up the ToM part of this volume. While other papers in the collection set out to defend the hypothesis that human ToM emerged as a product of cultural evolution, Jacob and Scott-Phillips (Jacob & Scott-Phillips, 2021) present a series of arguments against Heyes’s account of the cultural evolution view (Heyes, 2018; Heyes & Frith, 2014). Heyes claims (i) that mindreading is learned in the same manner as print reading, and (ii) that children are taught to read minds by participating in communicative interactions with their teachers.

Jacob and Scott-Phillips challenge these claims, and in particular Heyes’s interpretation of some of the data on children’s ToM development that she uses to motivate her view. They argue that the failure of young children to pass explicit ToM tasks is not, as Heyes claims, evidence that young children cannot attribute mental states. Rather, they argue, it is evidence that children’s ability to engage in *conversations about minds* is learned and develops only later in ontogeny. They extend this point to evaluate evidence of different ToM learning trajectories across cultures, which is cited by Heyes as demonstrative of the role of culture in the development of ToM cognition. Instead, they argue, these data can also be explained by cultural variation development of ToM talk. Jacob and Scott-Phillips also question Heyes’s attempts to explain infants’ performance in implicit false belief paradigms by appeal to perceptual novelty. They argue that her perceptual novelty account of the development of mindreading cannot explain several studies that purport to show mindreading in younger infants, casting doubt on the evidence offered by Heyes for her view.

By itself this isn’t a positive reason to believe ToM is innate or early developing. To that end, Jacob and Scott-Phillips provide a further argument—namely, that the teaching and communicative interactions that Heyes thinks necessary for acquiring a ToM are themselves dependent upon mindreading. If this is right, then Heyes’s argument would conceal a circularity. Jacob and Scott-Phillips argue that to avoid circularity, Heyes must show that learning from teaching can be explained in a way that does not presuppose the mastery of a ToM. As part of this, they argue that Heyes would need to “explain away growing experimental evidence showing...that pre-verbal infants are sensitive to ostensive non-verbal communicative actions”, both when these are directed to them and when they are directed to others (Jacob & Scott-

Phillips, 2021, p. 11). Here a tacit premise of their argument should be elaborated: Jacob and Scott-Phillips hold that understanding ‘ostensive-inferential communication’—the term they use to describe communication that involves the production and comprehension of communicative intentions—requires the ability to attribute mental states (see Scott-Phillips, 2014 for an extended defence of this claim). Since teaching also requires understanding ostensive-inferential communication, then, in their view, learning from teaching also presupposes the ability to attribute mental states. If this is correct, it presents a challenge for Heyes’s view that mindreading can be learned through communicative interaction, because it makes mindreading a prerequisite of communicative interaction. This constitutes an argument for thinking that the ability to attribute mental states is an unlearned product of our biological inheritance.

While it is uncontroversial that infants can recognise communicative acts both when these are addressed to them and others, it is worth noting that others have disputed the claim on which Jacob and Scott-Phillips’s argument lies, namely that understanding ostensive-inferential communicative acts requires attributing sophisticated mental states (Moore, 2017a, Heyes, 2018). In a paper that covers some of the themes raised by Jacob and Scott-Phillips, (Moore, 2021) argues that we can, and should, think of uniquely human forms of mindreading as a product of cultural evolution. He directly addresses the question of whether ToM is a prerequisite of communicative interaction. According to Moore, while some forms of mindreading—including the attribution of intentions—are prerequisites of communicative interaction and language development, others are not. In particular, the ability to construct and attribute propositional attitudes is likely learned in ontogeny; and the propositional attitude constructions deployed in this process are themselves a product of cultural evolution. Moore argues that before the development of these linguistic tools, our ancestors likely could not, and did not, think about minds in the ways that we do now—just as, prior to the development of a natural number system for counting, they were unable to think precisely about the relationships between large quantities.

Moore argues that new formats for representing others’ behaviours came with the cultural evolution of natural language. In time, these facilitated the development of a set of linguistic tools for representing more abstract mental states, and these linguistic constructions enabled our ancestors to think about the mind in new ways. A range of new abilities likely became possible for those able to use a specific type of linguistic form, propositional attitude constructions. These linguistic constructions enabled us to contrast propositions and attitudes towards propositions. In turn, this facilitated new forms of belief reasoning, abilities for higher order metarepresentation, and the ability to represent how the same thing could look different to individuals occupying different perspectives. Moore also tries to show how the specific linguistic forms used to make propositional attitude reports might have emerged from linguistic devices used for reporting speech and perceptual states. This is done to sketch a route for the historical development of propositional attitude language that does not presuppose an understanding of mental states (in effect, offering a riposte to critiques of the gadgets hypothesis such as that offered by Jacob & Scott-Phillips (2021)).

In a similar vein to Moore’s paper (and with both Berio and Moore developing ideas proposed by van Cleave and Gauker (2010)), Berio (2021) argues that the interplay of linguistic structure and social interaction was central to the evolution of our

mindreading capacities and remains key to their development. As Berio points out, while some think there is an intuitive role for social interaction in generating linguistic structure (as outlined by Moore, 2021), not all theorists hold such an important causal role for social interaction in the evolution and development of the key features of language. Some hold what she calls ‘structure-oriented views’ which emphasise the role of linguistic structure in making ToM development and evolution possible. Prominent in this theoretical vein are those who claim that natural languages are heavily reliant on an unlearned logical form (Carruthers, 2002), or the Language of Thought (Fodor, 1975). In contrast, those like Berio (and Moore) hold what she calls ‘cultural/social-oriented views’, emphasising the role of social interaction in the evolution and development of ToM and downplaying the role of genetically inherited linguistic structures.

On Berio’s view, a large part of folk psychology consists in manipulating representations of agents and the states of affairs that those agents are themselves representing (or failing to represent). These metarepresentations can subsequently be used to produce, among other things, explanations of behaviour. What language contributes to social cognition is a common (meta)representational format which draws attention to socio-cognitively relevant features of agents and states of affairs, and the relationships between them. By becoming familiar with the use of these abstract representational schemas, which children learn through culture-specific narrative practices, agents learn how to attend to the relationships between agents and the states of affairs that they represent. Thus, schemata make children computationally efficient—because they help them to filter out spurious details while focusing on key explanatory and predictive relationships. In this way, according to Berio, the acquisition of natural language provides agents with a new representational formation that facilitates false belief reasoning, specifically because “linguistic structures provide a way for the child to form schemata relating agents and descriptions of state of affairs” (Berio, 2021, p. 298).

Whilst focusing on language, Berio emphasises that it is just one of the possible abstract schemata that facilitates the representations required for false-belief reasoning. While there may be differences in the ways that different cultures represent folk psychological properties, these differences need not be limited to linguistic formats. There could be non-verbal representational schema too. This is important for thinking about the incremental cultural evolution of ToM and how ToM develops across different cultural contexts.

Rubio Fernandez (Rubio-Fernandez, 2021) also makes the case for a more expansive approach to ToM, in advocating for expanding the scope of ToM research beyond questions about when and why children pass explicit false belief tasks. Specifically, she highlights the importance of many non-verbal elements of communication that are frequently overlooked in syntax-based accounts of ToM development, such as the way interlocutors track one another’s perspectives in communicative interaction. She argues that, whilst empirically fruitful, the narrow focus of ToM research gives us little explanatory traction on important broader issues such as the nature of ToM and communicative capacities of young children who have yet to master complement clause syntax, and in language communities where such syntactic forms are not used.

Rubio Fernandez proposes a new account of perspective tracking in her paper. It focuses on the developmental relationship between ToM (in the expanded sense of perspective tracking) and two classes of pragmatics markers: demonstratives (e.g., ‘this’ vs. ‘that’) and articles (e.g., ‘the’ vs. ‘a’). She argues that the earliest linguistic forms to require some ToM, both historically and in child development, are demonstratives. These are pragmatic markers because, for example, what is *here* for one person is *there* for another; and because speakers must track their interlocutors’ relationship to their shared environments to use and understand these terms. Taking demonstratives as her starting point, she starts to sketch an account of the co-development of language and ToM by looking at the ways in which languages across cultures have differently created the intersubjective space in which interlocutors communicate. She defends three hypotheses:

- (i) Since demonstratives (e.g., ‘this’ and ‘that’) encode relational values that facilitate the tracking of perspectives across the immediate context of interaction, “their acquisition should help the development not only of early joint attention, but also of later perspective-taking skills” (ibid., p. 1130). Moreover, since there is cultural variation in the ways in which communicative space is articulated, there will be cultural variation in the development of perspective taking skills that she predicts are developmentally associated with it.
- (ii) Discourse demonstratives (e.g., ‘that’ and ‘the’) enable the tracking of conversational common ground outside the immediate context, for example by giving interlocutors ways to mark shared experiences that occurred in the past. As a result, the use of these terms should train “speakers in monitoring their interlocutor’s attention and in managing common ground” (ibid., p. 1131). Again, there is expected to be cultural variation here.
- (iii) The acquisition of the above-described pragmatic markers will not only correlate with the development of perspective-taking abilities in children. This ontogenetic development will correlate with a historical development of the same ToM abilities, corresponding to the cultural evolution of linguistic forms.

Rubio Fernandez draws together a large array of empirical data to motivate these hypotheses. In the process she sketches the theoretical foundations for a systematic study of the ways in which different communities have used language to create a shared conversational space, and the implications of this creative process for our ToM development. What she proposes will complement other accounts of the cultural evolution of mindreading by extending both our understanding of the nature of ToM and illustrating the ways in which the co-development of language and ToM are not limited to the effect of complement clause mastery on explicit false belief understanding.

In their paper, Woensdregt, Cummins and Smith (2021) present a computational model designed to “explore the hypothesis that the emergence and cultural evolution of language has led to better mindreading” (Woensdregt, Cummins & Smith, 2021, p. 1348). Their model assumes both that inferring speakers’ perspectives depends on

the mastery of a natural language, and that language learning depends on some form of perspective taking abilities—particularly the ability to track speakers’ referential intentions. It seeks to characterise the developmental relationship between perspective taking and the development of a lexicon on a cultural evolutionary timescale. The developmental assumption on which the model is based holds that a Bayesian agent’s success at inferring the meanings of a lexicon improves with the agent’s ability to grasp a speaker’s perspective, because knowledge of intended reference can be derived from knowledge of the speaker’s perspective (Woensdregt et al., 2016). In contrast to earlier models (Gong & Shuai, 2012), Woensdregt and colleagues do not assume that their agents possess biological adaptations for inferring others’ perspectives from their interlocutors’ non-linguistic cues. Lexicons are culturally transmitted from ‘parents’ to learners over generations, through iterated learning, and both lexicons and perspective taking abilities can culturally evolve. The lexicon is modelled in terms of associations between signals and referents.

In the model, agent learners must infer two unobservable variables from correlated observable ones. An agent’s lexicon must be inferred from her utterances, and her perspective from the context of her utterance. The speaker’s mental state is modelled probabilistically, in terms of her likely intended reference in the context of utterance (where some capacity to determine this is considered to be innate). This mental state is modelled as a referential intention, based on which a speaker’s utterance can be interpreted.

In simulations in which agents sought to provide informative utterances for others, and to learn from one another, Woensdregt and colleagues found that the cultural evolution of an informative lexicon gave rise to improved perspective taking over generations, because more informative lexicons give better insights into speakers’ perspectives than less informative ones. Moreover, it was found that selection for informative lexicons occurred under pressure for either successful communication, or improved perspective taking, but not in the absence of these pressures.

Woensdregt and colleagues take their simulation to be evidence for several existing hypotheses in the ToM literature. It supports Paul Harris’ suggestion that conversation supports the development of mindreading abilities, by giving interlocutors experiences of one another’s perspectives on the world (Harris, 2005). Although it does not support any specific predictions about the ways in which specific linguistic forms might support particular ToM abilities, it does provide a general proof of principle that the cultural evolution of language leads to improved perspective taking abilities. Thus, the model developed by Woensdregt et al. is consistent with claims made in several papers in this volume (Berio, 2021; Moore, 2021; Rubio-Fernandez, 2021).

In a final paper on the cultural evolution of Theory of Mind, Fenici & Zawidzki (2021) defend what they call a ‘radical socio-cultural constructivist’ approach to the explanation of mindreading. Their view makes two distinctive claims. One is that the attribution of mental states serves both interpretive and regulative functions. Whereas mindreading is the practice of attributing mental states in order to interpret the behaviour of agents, on a mindshaping view, the attribution of propositional attitudes is made to regulate agents’ behaviour. Additionally, mindshaping includes the formulation of cultural norms with which to promote conformity within a community. Fenici

and Zawidzki argue that a primary function of mental state attribution is to “make explicit practical commitments” (ibid. p. 8368) undertaken by agents in the context of collaborative activities. Moreover, they argue, mindreading and mindshaping are codependent: they emerge together in human development.

The second and perhaps more radical claim made by Fenici and Zawidzki is that the mental states attributed in the practices of mindreading and mindshaping do not exist independently of these practices. That is, they defend an anti-realist conception of mental states, according to which “the domain of mindreading is not independent of and does not pre-exist the practice of mindreading” (ibid. p. 8368). In their words, “there is little evidence that mental states, as the folk conceive of them, will constitute integral parts of an empirically adequate, scientific psychology; hence, there is little reason to think that they exist except as constituted by our mindreading practices” (ibid. p. 8371). Further evidence for this view comes, they say, from the cross-cultural variation in the classification of mental states. Given that such states are typically classified on the basis of behaviours, and that the behaviours taken to be evidence of underlying states vary greatly, the authors argue that the relationship between behaviours and the states they are taken to indicate is much more arbitrary than a realist account of mental states should predict. Cross-cultural variation constitutes evidence of this arbitrariness.

Fenici and Zawidzki’s argument constitutes a point of disagreement with other authors in this volume. For example, Moore defends an instrumental realist view of the nature of mental states. According to this view, while some elements of our mental state characterisation may be driven primarily by explanatory concerns, nonetheless there exist “first personal states that correspond broadly to elements in our folk psychology” (Moore, 2021, footnote 2). While Fenici and Zawidzki need not deny the existence of first personal states that correspond to our mental state classifications, they would deny that they are a constitutive feature of the classification of these states. Whereas both Jacob and Scott-Phillips (2021) and Moore (e.g., 2017a, 2017b) would hold that the existence of mental states plays a central role in justifying the rationalising explanations of agents’ behaviour, Fenici and Zawidzki deny this. Rather, they hold that the rationality of mentalising ascriptions is derived from deontic scorekeeping practices like those described by Brandom (1994), and the sorts of practical syllogisms that we entertain when simulating what it would be rational for ourselves and others to do (Gordon, 1986). In their view, the rationality of propositional attitude ascriptions is grounded not in the existence of internal psychological states, but in language users’ participation in communities who hold themselves and others accountable for making good on their verbal commitments. As a result, they say, “the verbal practice of ascribing mental states does not say much about the alleged internal psychological reality of an agent” (Fenici & Zawidzki, 2021, p. 8374).

In response to the claim that ascribing mental states is made possible only by participation in certain forms of linguistic practice, Jacob and Scott-Phillips might again raise the circularity concern addressed in their paper. If traditional accounts of communication presuppose the existence of developed mindreading, this would threaten the view that mindreading and mindshaping could be codependent. Rather, if mindshaping depends on discursive communicative practices, and communication

depends on mindreading, mindreading must be developmentally foundational with respect to the linguistic practices needed for ascribing mental states. However, Fenici and Zawidzki reject this view. Like Heyes (2018) and Moore (2017a; 2021), they point to the existence of accounts that deny that human communication depends on developed forms of mentalising. Such views open the possibility that mindreading and mindshaping could emerge together in human development.

2 The cultural evolution of ethics and aesthetics

Whilst most of the articles in the first half of this volume are focused on mindreading, there are a number which look beyond Theory of Mind to cultural evolution and social cognition more broadly. Two articles, by Heyes and by Currie and Zhu, identify other features of human cognition where questions about cultural origins might also be posed.

In their contribution, Currie & Zhu (2021) assess the biological and cultural origins of human aesthetic practices. They argue that aesthetic sensitivity—“delight in the appearances of artefacts which display, through their appearances, the personal qualities that contributed to their having those very appearance” (Currie & Zhu, 2021, p. 6570)—is a very old human capacity, having played an important role in the social transmission of Acheulean stone tool culture.

Currie and Zhu’s approach relies on a broader conception of the aesthetic than has typically been assumed by philosophers. They distinguish between two forms of aesthetic culture: the ‘basic’ capacity for aesthetic culture (captured by the idea of aesthetic sensibility above), and what we might more traditionally construe as aesthetic culture, which they denote as ‘artistic culture’. Artistic cultures, say Currie and Zhu, exhibit both basic aesthetic sensibility *and* the sorts of hyper-refined artistic standards we now associate with art (and presumably artistic expression), but they are not the only type of aesthetic culture possible.

More simple aesthetic cultures would have pre-dated these more familiar notions of the aesthetic and aesthetic culture. Furthermore, thinking about the value of these simpler aesthetic norms, beliefs and associated cognition in ancient hominin evolution is illuminating. Specifically, Currie and Zhu argue that the simpler form of aesthetic culture they describe, aesthetic sensibility, would have made the social transmission of stone tool forms more robust by bolstering the normative thinking required to reliably produce stone tools across generations. This way of thinking about stone tool cognition and aesthetic culture is novel and highlights the value of the cultural inheritance perspective to both debates in cultural and cognitive evolution but also to broader philosophical discourse.

Cecilia Heyes (2021) extends the work in her book, *Cognitive Gadgets* (2018) (an inspiration for this Synthese SI), to explore whether morality could also be a cognitive gadget. She begins by distinguishing between three different types of contribution to development; ‘nature’, ‘nurture’ and ‘culture’, where ‘nature’ refers to genetic contributions, ‘nurture’ to the contribution of interactions between the developing system and the world in which it is developing, and ‘culture’ refers to the contribution of socially inherited information through cultural learning, which Heyes takes to be

specific to cognitive gadgets like mindreading, imitation, and language. This division may seem artificial to those sympathetic to broader accounts of cultural inheritance. For example, many include non-imitative social learning such as stimulus enhancement (Hoppitt & Laland 2013), and the construction of the environment via processes such as downstream epistemic niche construction (Sterelny, 2003, Stotz, 2010) as forms of cultural inheritance. Heyes motivates a special role for mindreading, language, and imitation ('cultural learning') by distinguishing between *learning from* other agents and *learning about* other agents. She says "viewed in this way, cultural learning contrasts with learning about other agents or the inanimate world in a way that does not involve transfer of information from other agents. The alternative to cultural learning, which is part of nurture's contributions to development, is sometimes characterised as 'trial-and-error' learning or, as in the preceding paragraph, as learning by 'direct interaction' with the social or asocial environment"(Heyes, 2021). Whether or not this distinction really holds up to scrutiny is unclear (see Dennett, 2021, Jacob & Scott-Phillips, 2021) but it is sure to stir up debate either way.

With this distinction made, Heyes surveys the existing approaches and literature on the development of morality for evidence that it is inherited via cultural learning (i.e., that it is a cognitive gadget). She concludes that nativist bias and a failure to distinguish nurture from culture is so pervasive in this literature as to make answering the question of whether morality is a cognitive gadget impossible at least for the moment. Looking forward, Heyes then makes several suggestions for the extra empirical work required to decide the matter (including the need to "test nativist hypotheses with an eye on both nurture and culture" (Heyes, 2021, p. 4409).

Those unsympathetic to the cognitive gadgets hypothesis may view Heyes' failure to respond in the affirmative to her guiding question (is morality a gadget?) in this article as extra reason to be skeptical, but this would be to underestimate the value of her contribution. Although no unequivocal defence of her view, Heyes' article offers compelling evidence of the prevalence of nativist bias in this research domain and lucidly makes the case for this leading to there being limited evidence in favour of morality being a gadget. A self-proclaimed 'armchair psychologist' (but a very experienced empirical psychologist in her own right) Heyes leverages her unique position to offer the sort of empirical suggestions required to mitigate this bias, and thus answer her motivating question. This should drive a fruitful new direction of research, making this a very important contribution to the literature.

3 Methodological challenges

Two further articles, by Brown and by Turner and Walmsley, offer critical assessments of Heyes' Cognitive Gadgets Hypothesis.

Turner and Walmsley's critique (Turner & Walmsley, 2021) focuses on the adequacy of a core strategy of Heyes's approach relating to the poverty or wealth of a stimulus. Heyes uses evidence of a cognitive capacity being sensitive to learning to conclude that the capacity in question is a cognitive gadget (a domain-general cognitive process that is largely the product of a suite of culturally inherited developmental resources), rather than a cognitive instinct (a domain-specific cognitive process that

is largely the product of a suite of genetically inherited developmental resources). Turner and Walmsley argue convincingly that this approach is overly simplistic. The same evidence of sensitivity to learning is, they argue, also consistent with an alternative 'middle-of-the-road' option they dub 'moderate nativism'.

Turner and Walmsley draw on recent empirical and theoretical work on the evolution of learning preparedness to argue that genetically inherited biased learning or 'preparedness' can (and perhaps, should be expected to) evolve within a culturally inherited cognitive capacity under selective pressure. Such a domain-specific genetically inherited adaptation within our learning system would make some associations or responses more easily learned and less able to be overcome by contrary experience. Most significantly, as Turner and Walmsley point out, because of the possibility of modest nativism, evidence demonstrating that a cognitive capacity is sensitive to learning during construction is insufficient to conclude that a cognitive gadget alone is responsible for that capacity. Not only is modest nativism a theoretical possibility that Heyes ignores; it is, they contend, at least for imitation, well supported by the psychological evidence.

Turner and Walmsley raise several important issues for Heyes' cognitive gadgets hypothesis and cultural inheritance accounts of cognition more broadly. First, their contribution highlights the value to cognitive science of engaging deeply with the details of evolutionary biology (and even more particularly evolutionary developmental biology). Evolutionary approaches to cognition, from Sociobiology to the Evolutionary Psychology of the Santa Barbara School and beyond, have long been dogged by their reliance on an overly simplistic picture of the mechanisms and dynamics of evolution. As Turner and Walmsley show, this is to the detriment of the field. A more nuanced appreciation of the limits and power of evolution, particularly the interplay between genes, environments, social learning and other forms of plasticity, is central to filling in the space between 'culture' and 'genes' and 'nature' and 'nurture'. This is key to making cultural evolution accounts of social cognition evolutionarily plausible.

This leads us nicely to a second issue their article highlights—the importance of nuance and shades of grey in this area of theorising. Although no contemporary theories or theorists claim that social cognition is entirely genetically inherited, and equally no-one contends that it is entirely culturally inherited, the middle ground is poorly enunciated. The focus is all too often on 'pure' and 'clean' cases. This, again, will not help us to fill out the space between 'nature' and 'nurture'. As Walmsley and Turner's article demonstrates, we must avoid the rhetorical allure of simple theories and simple evolutionary stories if we are to make progress here.

Brown's contribution (Brown, 2021) also serves to highlight the importance of nuanced evolutionary thinking (particularly from the perspective offered by evolutionary developmental biology) in cognitive science. Her article focuses on the degree to which we should expect the cultural evolution of cognition to be similar to cultural evolution more broadly. Specifically, Brown interrogates the applicability of the common assumption that cultural evolution is faster and more nimble than biological evolution to the cultural evolution of social cognition.

In arguing that the assumption cannot be straightforwardly extended to the cultural evolution of social cognition, Brown explores the features of cultural evolution that

typically drive the ‘faster and nimbler’ moniker, such as the role played by functional transparency in increasing the likelihood that cultural innovations will be adaptive. It is, she argues, the structure and nature of typical cultural adaptations as external to the body and readily manipulable by agents, rather than cultural inheritance, which makes them able to adaptively evolve at speed. She then shows that, although culturally inherited, culturally evolved cognitive systems (such as Heyes’s cognitive gadgets) would be highly unlikely to be able to undergo rapid evolution. This is in virtue of them lacking the type of properties which makes them readily manipulable by agents and thus able to undergo rapid adaptive evolution.

Like Rouse and Turner’s contribution, Brown’s article highlights the ways in which a nuanced understanding of the limits and power of evolution can inform and constrain our thinking about cognitive evolution and development. The devil is so often in the details here, and whilst particular evolutionary outcomes or trajectories can seem intuitively plausible, they are not always feasible when we move from the big picture to a more fine-grained one.

Two articles by Sterelny and Chellappoo take a different tack again from the majority in the rest of the volume, focusing on the drivers of the complex cumulative cultural evolution so characteristic of the hominid lineage. In the context of the broader dialectic of the volume their importance lies in characterising the basic conditions for cultural evolution of social cognition to get off the ground in the first place.

In his article, Sterelny (2021) defends the ‘demographic hypothesis’ of human cultural complexity: the claim that changes in social scale, rather than changes in social cognition, drove at least some of the biggest leaps in cultural complexity observed in the fossil record of the human lineage. The demographic hypothesis rests on the idea that the redundancy of labour which comes with larger social groups facilitates innovation, tinkering and cultural specialisation and ultimately allows cultural complexity to flourish. Furthermore, it is hypothesised that complex cultural elements would be less likely to be altered or go extinct in large social groups because they are buffered from drift events such as accident and illness simply in virtue of “being in more heads” (Henrich, 2004; Powell et al., 2009; Shennan, 2001). Whilst intuitively appealing, and supported by theory, Sterelny’s examination of the archaeological record and anthropological data for the demographic hypothesis makes clear that it is far from cut-and-dried what role demographic factors played in hominin cultural complexity. It is hard to get unambiguous data about past human social scales from the evidence we have available to us, making it difficult to tie transitions in cultural complexity to transitions in social scale. There are also multiple factors, aside from social scale, that have been shown to influence cultural complexity, for example, social connectivity. On this basis, Sterelny argues that, whilst social scale can facilitate cultural complexity, it is not necessary for it. Other factors, such as social connectivity, can make complexity possible even in small groups.

Sterelny’s article plays two important roles in this volume. First, it gives a valuable appraisal of the role of factors other than social cognition in human cumulative cultural change. This context is important for thinking about the adaptive value of social cognition and its evolutionary history. Second, it demonstrates very clearly the challenges of gaining empirical support for such claims. Whilst there are numerous lines of evidence available to us for understanding the causal relationships underlying

human cultural evolution, the actual evidence typically fits multiple alternative interpretations. This is partly due to the patchiness of the archaeological record but also a consequence of the complexity of the causal relationships we are interested in. Any attempt to find one big driver of complex human culture is unlikely to be successful. We are almost guaranteed to be looking at a set of complex interrelated causes all of which played some causal role in human culture, and not always the same role in different human groups. This lesson is an important one for thinking about the role of culture in the evolution of social cognition. Just as there is unlikely to have been a single driver of human cultural evolution, so too, the cultural drivers of cognitive evolution are very likely to be complex and resist overly simplistic theorising.

Like Sterelny, Chellappoo (2021) focuses on a purported driver of human cumulative cultural evolution in prestige bias (a bias towards copying the behaviours of high-status individuals over low-status individuals). Specifically, she questions the crucial role such a bias is claimed to play in facilitating cumulative cultural evolution by Henrich and Gil-White (2001) and others (e.g., Richerson & Boyd, 2005). She does this by presenting evidence which undermines both its purported existence and prevalence.

Chellappoo points to two key issues. The first concerns the nature of prestige bias. Chellappoo argues that there are two definitions of prestige operating in the literature: one being used in anthropological and ethnographic studies which is associated with the social markers of prestige, and another, used in lab-based studies, which focuses on the number of individuals observing a model. Chellappoo notes that neither of these align with an intuitive, folk definition of ‘prestige’, and that assessments of prestige on the two definitions can, and do, conflict. The lack of a clean definition understandably makes identifying cases of prestige bias difficult.

A second issue Chellappoo highlights concerns the extent to which one commonly adopted characterisation of prestige bias as an unconscious and implicit social learning rule is empirically tenable. Chellappoo argues that prestige-biased learning is flexible and context-sensitive in ways which run contrary to what we would expect if this characterisation were accurate. While a more empirically plausible characterisation is possible, she argues, it renders prestige bias much less explanatorily powerful. There are other candidate explanations for the behaviours observed, particularly goal-directed cognition, which are not in dispute, and thus should be preferred.

As with Sterelny, Chellappoo offers a novel contribution to the literature by drawing on empirical evidence to undermine the intuitive appeal of one purported driver of cumulative cultural evolution, in prestige bias. As Chellappoo shows, the challenge here is typically not that we lack a way of explaining a particular evolutionary trajectory or pattern, but that we have too many candidate explanations. In such a situation, careful assessment of the empirical evidence is key.

Acknowledgements We’d like to finish this introduction with a round of thanks. This volume has a long history. We first discussed the possibility of organising such a collection with Richard Menary, at the Inaugural Cultural Evolution Society Conference in Jena, Germany in 2017. Menary subsequently pulled out of the volume, because of other commitments, but we’d like to acknowledge his early contributions. The idea for the volume subsequently crystallised at the ANU’s Interdisciplinary Conference on Social Cognition, held in April 2018, and the Author Meets Critics event on Heyes’s *Cognitive Gadgets* also at the ANU in August of the same year, both organised by Rachael Brown with the support of Carl Brusse.

We'd like to thank the participants and discussants of those workshops for the extraordinarily fruitful exchange of ideas that took place. After those conferences, the volume stalled for a long time, because of illness (RM) and maternity leave (RB). Around a year later, one of us (RM) mentioned to Celia Heyes that the project was currently on the backburner. In response, Celia offered to come on board as an editor to help push the volume proposal along. The effect was immediate. Ultimately Celia asked not to be listed as an editor of this SI, because she thought she had not done enough work to merit credit (in part because her arrival coincided with our being able to take on more work). However, her presence gave the project an invaluable shot in the arm, and we owe her a huge debt of gratitude. We would also like to acknowledge Pierre Jacob and Cameron Turner for their detailed and helpful comments on earlier drafts of this introduction. Finally, we owe thanks to Daniel Dennett. The papers in this volume inspired Dennett to offer a brief set of responses to them, and to situate the papers in the historical context of discussions about the cultural evolution of human cognition. While these comments were originally planned for inclusion in the volume, the very personal nature of Dennett's foreword (Dennett, 2021) made it unsuitable for a round of anonymous peer review. As a result, he preferred to host his response on his own university website. It can be found here: <https://ase.tufts.edu/cogstud/dennett/recent.html>. We'd like to commend his valuable set of comments to our readers' attention.

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