Group Creativity

BERYS GAUT

Abstract
Group creativity is vital in overcoming the numerous challenges that the world faces. Yet group creativity is deeply puzzling. It seems plausible that only agents can be creative, so group creativity requires group agency. But how could groups possess the mental states required to be agents, let alone the rich range of them required to be creative? It appears more reasonable to hold that group creativity is not a real phenomenon, but is merely the summed creativity of the individuals forming the group. There is also much empirical evidence that groups are no more creative than their members. In this paper I examine the conceptual and empirical challenges to group creativity, defend its existence, and offer an explanation of how it is possible.

We live in a challenging world. Recently we have faced a global pandemic, accelerating climate warming, increased pressure on biodiversity, and since 1945 have acquired the ability to annihilate our species by nuclear warfare. Challenges require solutions, and the most promising solutions are collective ones. The vaccines against Covid-19 were all developed in group laboratories, involving many specialists: the Oxford Vaccine Group, for instance, has more than 100 members. More generally, scientific outputs have increasingly shifted from individual to group-authored papers. Collective action in meeting the challenges also needs to be creative to have much chance of success, given our mixed results in dealing with them so far. So group creativity is vital to solve our problems. But there are reasons for denying that group creativity is even possible, and if it is, that it can surpass individual creativity. I argue here that scepticism about group creativity can be countered, and so provide some reason to think that our global challenges can be met. And in so far as creativity is a virtue (Gaut, 2014), we can also conclude that it is a virtue of groups, not only of individuals.

1. Two challenges to group creativity

It is widely agreed that creativity requires the production of new things, at least in the sense that they are new to the person or entity that produces them. It is also generally agreed, though not so

doi:10.1017/S1358246122000145

widely, that the creative product must be valuable (Boden, 2004, pp. 1-10). Agency theories, which include virtue theories, of creativity also hold that it is only agents that are creative, in the core sense of 'creative' (Gaut, 2018; Kieran, 2014; Paul and Stokes, 2018). So on agency accounts of creativity, group creativity requires group agency. But some philosophers deny that groups can be agents, since they hold that groups cannot possess those mental states such as intentions, and related beliefs and desires, that are required to be an agent.[1] The problem is particularly acute in trying to show that groups can be creative, since creativity standardly involves a rich range of mental powers, such as imagination, that go beyond the minimal conditions, such as the possession of intentions, that are required for agency in general. How could groups possess the mental states required for agency, particularly the rich range of them required for creative agency? Call this the philosophical or *richness challenge* to group creativity.[2]

If the richness challenge cannot be met and agency theories are correct, then groups cannot be creative: it is the *individuals* who compose groups who are creative. If so, group creativity is merely the sum of the creativity of the individuals in the group. The creativity of the whole is merely the sum of its parts.

This individualist, summative alternative to group creativity admittedly does not sit well with our common talk: we speak of scientific research teams, jazz groups, filmmaking groups, companies or company divisions (such as Google DeepMind and Pixar) and even of political states as being creative. And these kinds of locution seem well-supported, even for the largest of entities: for instance, Mariana Mazzucato (2015) argues that the U.S. state has played a leading role in technological innovation, and that many innovations often credited to companies have emerged from US government agencies, such as DARPA (the Defense Advanced Research Projects Agency). But maybe we are mistaken in our attributions of creativity to groups.

[1] The threat to group creativity applies if agency theories are correct. But not all theories of creativity are agency based. Notably, Darwinian theories (Simonton, 1999; 2014) hold that creativity requires a blind variation and selective retention (BVSR) process that occurs not only in agents, but also in other entities and processes, such as biological evolution. So these theories do not face the same challenge from group creativity.

[2] Scepticism about the possibility of group creativity in the political realm, drawing on these kinds of considerations, is expressed by Matthew Noah Smith (2018).

https://doi.org/10.1017/S1358246122000145 Published online by Cambridge University Press

The philosophical worry about groups also has empirical support, which forms the *empirical challenge* to group creativity. One of the most common techniques for enhancing creativity is brainstorming. The advertising executive Alex Osborn published the first book on the technique in 1948. He provided four rules for brainstorming: don't criticise the ideas generated (deferment of judgement: evaluation comes later); be freewheeling (the wilder the idea, the better); produce as many ideas as possible (quantity breeds quality); and build on ideas previously produced (Sawyer, 2012, p. 235). Osborn proposed brainstorming as a group technique.

From 1958 onwards (Taylor, Berry and Block, 1958), the method has been subject to intensive psychological study. Many of these studies compare group brainstorming with individual brainstorming: that is, with individuals using the same four rules on their own. A well-established finding is that group brainstorming, as standardly practised, produces only about half the number of good ideas as does individual brainstorming by the same number of individuals (see Sawyer, 2012, pp. 235–42 for a review). So asking people to be creative in groups, using the most influential creativity technique, is damaging to creative outcomes. Hypotheses to explain this include: free-riding on others' contributions (social loafing); evaluation apprehension (people are afraid of looking stupid in front of others); production matching (matching one's productivity to others', so there is convergence on the mean number of ideas produced); and production blocking (for instance, people cannot talk at the same time). These explanations suggest that creativity loss is deep-rooted in the nature of groups: tendencies to free ride, to be concerned with how others think of one, to converge on the average, and difficulties with people speaking at the same time are endemic to groups. Moreover, the larger the group, the worse the creativity loss is relative to the same number of individuals brainstorming. For instance, Thomas Bouchard and Melana Hare (1970) tested groups composed of five, seven and nine people: the larger the group, the fewer ideas were produced, relative to a nominal group of the same size (a nominal group is composed of a number of individuals who have no interaction with each other).

Adjusting the brainstorming technique can improve these results: for instance, 'electronic brainstorming' involves participants typing their ideas, which are then displayed on monitors to other participants without identifying who generated the ideas. But even electronic brainstorming, with a few exceptions, only produces at best the same number of ideas as does individual brainstorming. And since it works by paring down group interaction, preserving

https://doi.org/10.1017/S1358246122000145 Published online by Cambridge University Press

anonymity and removing face-to-face contact, these electronic groups are very unlike real-world groups. The less a test group is like a real group, it seems, the more likely it is to be creative.

This empirical evidence suggests that the summative account of group creativity is a best-case scenario. In practice, a group's creativity is likely to be *less* than the sum of the creativity of its members: the creative whole is likely to be less than the sum of its parts. So the evidence suggests that the creativity of a group is *no more than* the sum of the creativity of its members, were they operating independently. Call this the summative-minus hypothesis.

2. A method for meeting the challenges

What would be required to refute the summative-minus hypothesis?

One lesson from the brainstorming literature is that it is too simple to contrast the creativity of groups per se with individual creativity.[3] For the design of groups is crucial to determining their degree of creativity: electronic brainstorming groups can be up to twice as creative as traditional brainstorming ones. So the alternative hypothesis to summative-minus should hold only that some *kinds* of groups are more creative than are their members.

However, it may be that some kinds of groups are more creative than their members, but only because of contingent features of the groups. For instance, some groups may be better funded, in terms of the pay they offer and the research resources they provide, than their members would be, were they operating as solo researchers; and this extra funding explains groups' enhanced creativity. We need to rule out such possibilities. So the claim that needs to be demonstrated is this:

> (GC) The creativity of some kinds of groups is, because of the features that make them groups, greater than the summed creativity of their members, were those individuals acting separately.

So it is because of some of the features that make them groups – that *constitute* them as groups – that these groups are more creative than their members would be, were they working individually. If this can be shown, then the summative-minus hypothesis is false.

[3] From now on I will sometimes use 'individual creativity' and 'the creativity of members' as shorthand for 'the summed creativity of the members of the group'.

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Moreover, because the truth of this claim would show that the creativity of the group isn't the same as the summed creativity of its members, it would also follow that group creativity can't be reduced to individual creativity. Call this claim the group creativity (or non-summative) hypothesis.

3. Social groups

The group creativity hypothesis requires an account of what constitutes a group as a group. There is a plethora of competing philosophical proposals in social ontology and collective intentionality, and I do not propose to provide a definition of social groups and group agents, only an indication of some of the relevant factors.[4] A good start is Margaret Gilbert's (1990) famous example of walking together. What, she asks, is the difference between two people who are walking side by side, as it happens, and two people who are walking together, and so who constitute a (temporary) social group? The two people walking together are subject to some norms that those who walk side by side are not: for instance, if one of them walks too fast, the other walker is entitled to rebuke her and ask her to slow down; and the one walking too fast is obliged to slow down. In contrast, two people who are merely walking side by side are not thus entitled or obliged to alter their pace at the behest of the other. So when we do something together, when we form a social group, a framework of norms applies to our conduct that does not apply if we are acting individually. It is the norms about how its members ought to act towards each other that in part makes a collection of people a social group: that is, groups are partly constituted by interpersonal norms.

We can add that social groups are also partly individuated – are partly distinguished as different kinds of groups – by the norms to which they are subject. For instance, two members of the army marching together might be indistinguishable in their physical movements from our two walkers, if the walkers aim to match each other's stride. But the army group would be marching together, whereas our civilians are merely walking together. This is because the norms applying to the army marchers are different to those applying to the civilians: accelerating ahead by one marcher might be a violation

[4] Leading accounts are by Michael Bratman (1999; 2014) Margaret Gilbert (1990; 2009), Christian List and Philip Pettit (2011), John Searle (2010) and Raimo Tuomela (2013).

https://doi.org/10.1017/S1358246122000145 Published online by Cambridge University Press

of an order, and so subject to military sanctions, rather than merely grounding a rebuke. And the coordination of the walking movements of the army duo might be required, rather than being merely optional as with our walkers. The relevant norms may be elaborate, structuring the group internally by specifying a set of roles, each constituted by its rights and obligations, or 'deontic powers', as John Searle (2010) calls them, such as different ranks and positions in the army with different authority and responsibilities. So the army group forms a different kind of group to that of our sociable walkers, partly because of the different norms to which they are subject.

The norms that constitute groups extend beyond those governing the entitlements and obligations members have vis-à-vis each other. As Amie Thomasson has noted, the norms that partly constitute groups also include how members are to behave, what they should believe, how they are to dress, etc. (think of Orthodox Jews, for instance). And groups may even be defined by the norms applied to them by those who are not members, such as being an immigrant (Thomasson, 2019).

So collections of people become social groups in part because they are subject to norms that apply to members of the collection. And norms that distinguish between one collection of people and another partly constitute these collections as groups and individuate them from each other.

This normative approach to groups has considerable intuitive appeal and philosophical support. It also has its critics: Michael Bratman (1999, chapter 7) has objected that two people may act together, and so form a group, without giving rise to rights and obligations. This might either be because they are engaged in an immoral activity, and so neither has a right to demand that the other continue in the shared activity, or because one of the participants has coerced the other, and so has no right for the action to be performed, nor has the coerced person an obligation to perform it. So though groups typically generate rights and obligations, these deontic features are not necessary to groups and so do not constitute them. But, as Gilbert (2009) has noted, the obligations and correlative rights involved need not be moral ones and, as we can put it, they are only *prima facie*, since they can be outweighed or undermined by facts about the immorality or coerced nature of the joint action. What makes the action a group one depends on the *prima facie* status of the obligations, not on their all-things-considered status. This point also applies to the more general view of groups as partly constituted by norms: there are many norms besides moral ones (dress codes for instance are not usually moral codes), and

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norms may be only *prima facie*, so can be outweighed or undermined by other norms.

There is also empirical evidence in support of the normative view. The cultural evolutionary theorist Michael Tomasello and collaborators ran an elegant series of experiments in which three-year-olds were introduced to Max, a glove puppet (Henrich, 2016, pp. 185–87). Max sometimes made mistakes, as the children were shown when he used the wrong end of a pencil to draw. While Max took a nap, the children saw an adult with an odd assortment of objects engaging in a procedure which was one of several ways to use the objects. The children were then offered the chance to play with the objects. Max then awoke and used the same objects in a way that was sensible but different from that employed by the adult. Most children protested against Max's way of using these objects, even though nothing had indicated that there was a correct way to use them. The lesson is that young children are inveterate norm-inferrers: give them a regularity and they will conclude that it is the correct way to do something. In a variant of the experiment, the children encountered another puppet, Henri, who spoke French-accented German, unlike Max who was a native German speaker (the experiments were run in Leipzig). The children protested far less against Henri, when he played the game differently from the adult, than they did against Max. So they were associating norms of how to act with different groups, French or German (Henrich, 2016, p. 204). And this is what the normative conception of groups predicts.

Evidently, more needs to be done to develop this account into a complete theory of group constitution and individuation, and Gilbert (1990; 2009) and Searle (2010) in particular have done much work in this direction, but the foregoing suffices for our purposes. However, not all social groups are group agents, that is, can engage in group action: for instance, gender, ethnic and class social groups are usually not group agents. I will discuss later what more is required for group agency. But even as our account stands, since it gives a condition on what constitutes a group, it allows us to fill out and evaluate the group creativity hypothesis.

4. Evidence for the group creativity claim

That hypothesis, recall, holds that:

> (GC) The creativity of some kinds of groups is, because of the features that make them groups, greater than the summed

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creativity of their members, were those individuals acting separately.

According to the normative account of groups, groups are partly constituted and individuated by the norms that distinguish them from other collections of people. So, if there are different norms, there are different kinds of groups, and if these norms play a role in explaining the greater creativity of the group, then that enhanced creativity is to be explained by group-constituting features, rather than by incidental features of groups, such as some groups' greater funding.

As the evidence from brainstorming groups shows, not all kinds of groups satisfy (GC). But are there some kinds of groups that do? The social psychologist, Charlan Nemeth, with collaborators examined the importance of dissent for group creativity. In one study they gave five-person groups of undergraduates the task of coming up with as many good ideas as they could in twenty minutes about how to reduce traffic congestion. The groups were given either no instructions about how to do so (the minimal condition), or brainstorming instructions with the standard 'don't criticise' requirement, or debate instructions: that 'you *should* debate and even criticize each other's ideas' (Nemeth et al, 2004, p. 369). The results were striking: including ideas generated immediately after the discussion was over, the no-instructions groups generated an average of 22.7 ideas, brainstorming groups 24.5 ideas, and debate groups 28.4 ideas. Thus the debate groups were substantially more creative than the brainstorming groups, and this was because of the difference in norms, either brainstorming or debate, that were specified in the instructions. Unfortunately, Nemeth and colleagues did not compare the performance of the groups with individuals, so the experiment provides no direct evidence for the group creativity hypothesis. They also framed their results in terms of Solomon Asch's paradigm of the surprising degree of conformity in groups and the role of dissent in breaking it down. However, the debate instructions specifically call for debate and criticism, i.e., for participants to come up with reasons for their own suggestions and against others' suggestions; and that suggests that the key to better creative performance lies in the role of reasoning in group activity.[5]

[5] A distinct research programme about collective wisdom has shown that more diverse groups are more accurate predictors of events than are homogeneous groups (Hong and Page, 2012). However, in its main form this is a statistical model, depending on the fact that individuals' judgements are independent and so their biases tend to cancel each other out; it does not require individuals to be members of social groups.

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Let us turn momentarily from the social psychological literature on creativity to research on reasoning. The Wason selection task, a canonical test of reasoning abilities, involves four cards, on the first of which a vowel is visible, on a second a consonant, on a third an even number, and on the fourth an odd number: for instance, E, K, 4 and 7. Participants are told that all the cards have a letter on one side and a number on the other. They are also given a rule: for instance, that if there is vowel on one side of the card, there is an even number on the other. What are the cards, and only the cards, that they need to turn over to test whether the rule applies to them? People are strikingly bad at this reasoning task: generally only about 10-15% produce the right answer, which is to turn over only the cards with E and 7 on their faces. David Moshman and Molly Geil (1998) tested participants individually on the Wason selection task, obtaining a score of 9.4% for individuals. But when they tested groups of 5 or 6 persons, an astonishing 70% of groups got the answer right. Groups are far better at reasoning than are individuals. Moreover, when they formed groups out of people who had previously taken the test individually, 80% of groups answered the problem correctly. Three of the groups who were successful were composed of individuals *none* of whom had answered correctly when tested individually. So these answers were not produced by one or more people in the group, who had discovered the answer individually, persuading the other members of its correctness. Rather, the groups discovered the answers collectively. As the transcripts show, group members did this by reasoning with each other; challenging each other's conclusions; adding new bits to an argument, part of which had been generated by their fellow members; extending each other's arguments; and so on. They were engaging in group reasoning.

Though Moshman and Geil don't remark on it, the participants who got the answer right were creative: they came up with something valuable (the correct solution to the Wason selection task), which was new to them (in Margaret Boden's, 2004, pp. 1-3 sense, they were psychologically creative, P-creative), and did so by intentional actions, involving discussion and debate. So in some cases people can be creative by employing reasoning. Since groups can, as these data show, reason much better than individuals, groups should be, other things equal, more creative than individuals when they employ norms of reasoning, rather than, for instance, brainstorming. And Moshman and Geil's findings directly compare groups to individuals, unlike Nemeth et al's (2004) experiment, which is the missing comparison we needed.

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It might be objected that not all creative processes involve reasoning: there are sudden illuminations – the famous 'aha' experience – which have nothing to do with reasoning; so the data are of limited interest. However, the argument I have advanced relies on the claim that not all creative processes involve reasoning: the contrast between the effectiveness in group contexts of brainstorming and reasoning depends on brainstorming not being a type of reasoning. Moreover, reasoning can sometimes produce an experience of sudden insight: in his classic account of his own creative process Henri Poincaré (1985) gives examples of when conscious reasoning led to illumination during the course of the reasoning, and also examples of when illumination happened some time after he had stopped reasoning. He stresses in the latter cases that illumination would not have occurred without extensive preparation, including conscious reasoning. And Andrew Wiles' sudden moment of illumination about how to prove Fermat's last theorem occurred during the course of reasoning (Singh, 2005, p. 297).

There is also non-experimental evidence to show that groups can be more creative than individuals because of groups' superior deployment of reasoning abilities. Kevin Dunbar (1995; 1997) conducted a one-year study of how four world-renowned microbiology labs ran their research projects. All the labs held a weekly meeting which all members were required to attend, even those not working on the project under discussion, at which a presentation was given by one of the scientists working on the project. This was followed by extensive group discussion, and Dunbar notes that several insights were generated in the course of these discussions.

We can distinguish three reasons for why group members reasoning together enhance creativity. First, when they had experimental evidence confounding their hypotheses, individual scientists tended to explain this by assuming some fault in the experimental set-up. In contrast, other members of the group tended to explain the inconsistency by offering new hypotheses or getting the presenter to suggest new ones (Dunbar, 1995, p. 380). Mistakes in reasoning, such as confirmation bias, were countered because people can identify mistakes more easily in other people's thinking than in their own and are more motivated to find them.

Second, Dunbar shows that the labs used distributed reasoning, that is, reasoning where more than one member of the group contributed to providing the premises of an argument. Analysis of discussions in the HIV lab showed that 30% of the inductions or deductions generated involved premises supplied by more than one individual, and 12% of them premises supplied by more than two

individuals (Dunbar, 1997, p. 483). And some of these premises involved knowledge that only one lab member had, so that the members operating separately could not have come up with the argument. This was important in the creation of new analogies, since the analogies that were most useful in hypothesis formation were to other organisms (Dunbar, 1997, p. 473), which might not be known to other members of the group. The importance of cognitive diversity was therefore also demonstrated (see also Jefferson and Sifferd, 2022, on the importance of diversity for making good judgements).

Third, group reasoning processes are sometimes enhanced by the organisational structures of labs, which may be elaborate: one of the labs had a total of 32 members, comprising a senior scientist, 22 postdoctoral fellows, 5 postgraduates and 4 technicians (Dunbar, 1995, p. 373). Each person in the lab could call on its other members to help her: that was part of the point of the weekly lab meeting. So specialists in labs were expected to share their subject-specific information with others. Participants in psychological experiments, in contrast, have a tendency not to share with other members of their group information that is unique to them (Stasser and Titus, 2003). The entitlements and obligations of group membership, to extend Gilbert's point, can be invoked in the service of creative reasoning.

It is worth noting that group creativity is not unique to science. Many art forms, such as cinema, are highly collaborative (Gaut, 2010, chapter 3) and similar group mechanisms are to be found there. For instance, Pixar is an enormously creative company, the maker of the first computer-animated feature film. Ed Catmull (2008), its co-founder and president, describes the group's creative process in the years to 2008. While acknowledging the importance of a few key people to the success of each film, Catmull also emphasises the role of group creativity. Daily meetings were held, in which draft film material was shown to all members of the animation crew, and everyone was encouraged to comment on it. There was also a 'creative brain trust', composed of John Lasseter and eight directors, who could be asked by a filmmaker to comment on her material. The constant feedback as described by Catmull was an intensified version of the back-and-forth of argument that is present in the microbiology labs: in Pixar's case the meetings were daily, not weekly. The similarity to an academic milieu is not entirely coincidental: as David Price (2009, pp. 24-25) has noted, Catmull recreated in an early incarnation of Pixar the atmosphere of the University of Utah Computer Science department, in which he had obtained his PhD. Even Pixar's Emeryville studio with its large atrium was designed, with

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considerable input from Steve Jobs, to get employees to mix with each other, and so to foster group discussions (Price, 2009, pp. 198–199).

So there is both experimental and real-life evidence that groups reason better than individuals thinking in isolation, and that reasoning can produce creative outputs. Hence there is evidence that groups, when operating according to norms of reasoning, as opposed to for instance norms of brainstorming, can be more creative than their members, and their creative superiority is to be explained in part by the norms which partly constitute their identity as groups. And that is what the group-creativity hypothesis holds.

There is also a plausible explanation of why group members when reasoning together are superior to individuals reasoning on their own. Hugo Mercier and Dan Sperber have argued that reasoning is a social competence: its function is to produce arguments to convince others and to justify one's own actions; and also to evaluate others' attempts to persuade oneself and to justify themselves (Mercier and Sperber, 2017, especially Introduction and Conclusion; Sperber and Mercier, 2012). This interactionist or argumentative theory of reasoning is distinct from the traditional 'intellectualist' theory that holds that the function of reason is to advance the individual reasoner's cognition. The theory explains the biased nature of reasoning and its laziness when people are defending their own views, whereas the intellectualist theory is left with the puzzle of why reason is so bad in these cases. The interactionist view also explains why people are so much better at evaluating other people's arguments and justifications than their own, since evaluating others' claims is a form of 'epistemic vigilance' (Sperber and Mercier, 2012) that pays off because so many of our beliefs are grounded in claims made by other people. Since others' arguments may be directed to showing that one's own views are badly grounded, individuals will more likely change their minds when reasoning with others than when engaged in solo reasoning, so group reasoning is, other things equal, superior to solo reasoning.

If this explanation of the superiority of group over individual reasoning is correct, and we add the premise that reasoning may lead to creative results, then we can explain why groups, when they follow reasoning norms, are more creative than their members would be when engaged in solo thinking.[6] Recall that the individual scientists

[6] Mercier and Sperber (2017, chapter 18) also make the link between reasoning and creativity in science, and adduce some of the evidence employed in the present paper (I was alerted to the existence of the

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in Dunbar's studies were loathe to accept experimental disconfirmation of their pet hypotheses, yet the other scientists had no problems in coming up with alternative and undermining hypotheses, which usually persuaded the presenting scientists to modify their views.

5. Group agency and creativity

So far I have argued that the empirical evidence that groups are less creative than their members applies only to some types of group, including brainstorming ones, and that other types of group, using for instance reasoning norms, can be more creative than their members; moreover, this is because of what in part makes them groups, their constitutive norms, rather than their incidental features, such as their financing.

This argument, however, is not yet sufficient to establish the group creativity claim. For it is consistent with groups not being agents or creative at all: rather, groups might be part of the background, causal conditions that merely make *individuals* in the groups more creative. Consider an analogy. There is evidence that having the colour blue in one's environment promotes creative outputs relative to the colour red, which fosters greater attention to detail, or a neutral colour, such as white (Mehta and Zhu, 2009). So blue-coloured environments enhance creativity, but it makes no sense to say that the colour blue *is* creative: it only has creative *effects* on people; colours cannot be creative since colours aren't agents. In the same way, someone might hold that individuals are more creative when they are members of groups, but that it makes no more sense to speak of groups as being creative than it does to talk of colours as being creative. So we need to show that groups can be agents and that they can have a sufficiently rich mental life to sustain creativity.[7]

Moshman and Geil paper by their discussion). Their main aim, however, is to show that apparently solitary geniuses are really participants in social networks and thus are not counterexamples to their interactionist view. This is true in many cases, but it does not fit all of them: Andrew Wiles for instance, up to the point when he submitted his proof for publication, carried on his work on Fermat's theorem in complete secrecy (Singh, 2005). A better response to such cases is to acknowledge the existence of individual, as well as group, creativity.

[7] Even without establishing this further result we have, however, shown something about group creativity. For there is a weak sense of group creativity, in which it is sufficient to establish it that the creativity

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Hence we need to return to our unfinished business of discussing what makes a social group a group *agent*: as noted earlier, not all social groups are group agents. Again, given the complexity and disputed nature of the terrain, I will only provide a sketch of the relevant factors (see Astola, 2022, for further discussion of some group-level properties).

Group agents come in many kinds. Some are corporate groups, such as charities, political parties, and companies; these have formal organisational structures, specified by often elaborate rulebooks of procedures (see List and Pettit, 2011, for discussion). But there are also informal, smaller scale groups, that lack these elaborate procedures, such as a group of people walking together, to return to Gilbert's iconic example. It is these more informal groups on which I focus here. Ordinary language licenses talk of them as group agents: we may talk of a group going for a walk, or equivalently of the individuals who comprise the group going for a walk together. In general, we can say that a group F's if and only if the individuals comprising it F together. For instance, a jazz group plays a song if and only if the members of the group play that song together. Let us employ a common philosophical parlance and call the action of doing something together a joint action.

There are two conditions that plausibly suffice for this modest kind of group agency. First, the individuals who comprise the group must have a common aim or purpose: for instance, speaking from their perspective, that we go walking, or that we play a particular song. The content has to include reference to the collection of individuals: the 'we' in the 'we go walking'. The aim is not merely that a walk happens, or a song is played, which could be satisfied by other people doing these things: the aim is that *we* walk or play a song.

Second, the individuals should coordinate their individual actions with each other so as to achieve this common aim. Without action the common purpose remains a mere aspiration, and without *coordinated* action, there are merely several individuals who act individually to bring about the same goal, and perhaps know this, but who do not act as a group. As argued earlier, the appropriate coordination

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of individuals is enhanced by their group membership. Showing this might be the main aim of a psychological study, which is not concerned with whether it is the group or individuals to whom the enhanced creativity is correctly attributable, but only whether creativity is increased; or it might be the chief interest of an advertising executive who wants to know whether he should have his staff work in groups or individually to be more creative.

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involves norms, specifying entitlements and corresponding obligations of group members to each other. Two people walking together are entitled to call on the other to slow down if one draws ahead, and they are obliged to make their excuses should they decide to drop out of the group.

How exactly to specify these common purpose and coordination conditions is, of course, a contentious matter. But for our purposes we need not take a stand on these more fine-grained issues. What matters is that these two conditions, or something similar to them, suffice for a group to be a group agent, in the modest sense of the term.

The creative groups mentioned are, by this test, group agents. Moshman and Geil show that their participants are engaged in collaborative reasoning, which they define as 'cases in which two or more individuals deliberately coordinate their thinking for the shared purpose of achieving justifiable results' (Moshman and Geil, 1998, p. 231), a definition that closely mirrors our two conditions for group agency. These participants are reasoning together, just as Gilbert's walkers are walking together; and in the course of reasoning together and as a result of doing so, they are creative together. Likewise, the research scientists are reasoning together, with a common purpose (that they solve the problem set by the research project) and coordinate their individual actions by supporting, or challenging, or extending each other's arguments, and so are creative together. They also exhibit distributed reasoning, and follow more stringent norms for helping their fellow reasoners than the more ad hoc groups of the Wason case. The Pixar filmmakers are also reasoning and being creative together.

So the people reasoning together constitute group agents, that is, they act as groups. It might be objected that, even so, this does not show that they are creative as groups, for the features that make them group agents are not the features that make them creative. But the objection is untenable: in the examples presented the group's creative activity is inextricably bound up with its members' actions of thinking together: it is because they are reasoning together that they are group agents and also why they are creative as groups.

Fully meeting the richness challenge requires us to show not only that groups can meet the general conditions for agency but also that they can possess the mental powers, such as imagination, that are standardly exercised in creative acts.

As we saw, when individuals have a common purpose and coordinate their individual actions to achieve it, acknowledging entitlements and obligations relative to each other, this suffices for group agency.

https://doi.org/10.1017/S1358246122000145 Published online by Cambridge University Press

Complex intentional states can also be ascribed to groups on this account. For instance, several people might decide on a project of imagining in detail a particular state of affairs, perhaps a hypothesis or a story; they have a common aim, each may contribute something to the scenario, and they coordinate their imaginings so as to produce a coherent outcome, typically using external props, such as written texts and storyboards of film sequences. The participants have jointly imagined the story and we can thereby ascribe to the group the content of that imagining. The act of joint imagining (imagining together) may be richer than individuals could accomplish on their own, since each may contribute only a part of the whole, as we saw in the case of distributed reasoning.

Moreover, not all of the mental states required for creativity need be attributed to the group, even when the group has been creative. For instance, if an individual comes up with an analogy that leads to a creative idea and she tells the group about the idea but not the analogy, the analogy is not attributable to the group. Nevertheless, the group's creativity depends on the analogy, because it depends on the creative idea generated by it. Since group actions depend on the common goals and coordination of individuals' actions, individual agency is always present when there is group agency, so there is plenty of scope to attribute creative states to individuals that are not states of the group. So some of the mental richness required for group creativity is plausibly ascribable to the individual members, rather than to the group. Nevertheless, some of it is correctly ascribed to the group.

6. Implications and reflections

I have argued for the group creativity claim:

> (GC) The creativity of some kinds of groups is, because of the features that make them groups, greater than the summed creativity of their members, were those individuals acting separately.

Social groups, as we saw, are constituted as groups partly by virtue of the norms applying to them. The argument ran that the empirical data that seem to contradict the group creativity claim, chiefly the ineffectiveness of brainstorming norms as standardly practised, merely show that the claim is true of only some kinds of groups; and groups employing reasoning norms were shown to be ones where the hypothesis is well supported. The objection that this evidence is compatible

https://doi.org/10.1017/S1358246122000145 Published online by Cambridge University Press

with only individuals being creative, boosted by the background condition of group membership, was met by arguing that group agency is a genuine phenomenon, and that a group's being creative is one way in which group agency can be exercised. And an array of mental states can be attributed to groups by, for instance, individuals imagining together, which may be richer in content than those possessed by individuals. Groups can be creative and are often more creative than their individual members.

This defence of the group creativity claim removes a serious challenge to agency theories of creativity. If group creativity is real, but incompatible with agency theories, we should abandon those theories. But far from that being so, we have shown that the philosophical literature on group agency can provide a plausible account of how group creativity is possible. Agency theories have sometimes been associated with 'genius' accounts of creativity, according to which the sole locus of human creativity lies in a small number of people possessed of exceptional gifts. But nothing within the agency claim requires the genius view. Creative agency is not to be equated with individual creativity, let alone with the creativity of a few outstanding individuals. Nor is the agency claim confined to humans: non-human animals and extra-terrestrial beings may be agents too.

The group creativity claim also locates creativity in a wider social and cultural context. This is partly because the groups in question are social entities, and also because of the central role played by social norms in group agency. According to cultural evolutionary theory, cultures evolve and cultural entities include social norms. Michael Tomasello (2009; 2014) has argued that core human achievements, particularly the cumulative evolution of knowledge, tools and practices, depend on the development of larger scale groups, themselves dependent on joint and collective intentionality, which in turn depend on shared cultural norms, particularly norms of fairness. As norms become more elaborate and more explicit (aided by the development of writing more than 5,000 years ago), groups can become larger, cooperation increases, and more creative achievements are rendered possible.

It might be thought that the group creativity claim leaves no room for competition and conflict as spurs to creativity, particularly given views such as Tomasello's that emphasise the role of cooperation. Whilst it is true that groups require a minimal degree of cooperation to exist, since they require common purposes and coordination to achieve them, they also permit and sometimes even require competition and conflict. There can be competition between groups, and in the case of competitive team sports and commercial firms,

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competition is standardly a requirement; and competition may incentivise creativity, producing innovations in sports techniques and commercial products. There can also be a degree of competition and conflict within groups which may similarly promote creativity, as with creative differences within rock bands and filmmaking groups (Gaut, 2010, pp. 130-32). Moreover, it is no part of the group creativity claim that only groups are creative (though some sociocultural theorists, such as Keith Sawyer, 2007, have advanced that view); the creativity of individuals is important too, as earlier noted. Individual creativity leaves room for more extreme forms of conflict and competition, which may enhance creativity, than does group creativity, since individual action does not require the minimal cooperative framework required by group action.

The existence of group creativity also renders intelligible the fact that groups have become more prominent in many creative areas. This is particularly important in science, as we noted earlier. Wuchty, Jones and Uzzi (2007), using a database of 19.9 million papers and 2.1 million patents, showed that between 1955 and 2000 the average number of co-authors of a scientific paper increased from 1.9 to 3.5, and the citations of team-authored scientific papers relative to citations to solo papers increased from 1.7 to 2.1 times. This is in part because as the knowledge frontier – the amount of knowledge individuals require to have a chance of improving on existing forms – advances in science, individuals have to specialise more, so teams of authors have a greater chance of making creative discoveries than do individuals operating on their own (Henrich, 2016, p. 325). In other cultural domains group creativity is also becoming increasingly important. As Wuchty, Jones and Uzzi (2007) also report, even in the arts and humanities more papers were group-authored at the end of the period they studied than at the start, which is partly because the knowledge frontier has advanced in these areas too. And many arts are now heavily dependent on science-based technology, which requires increasingly specialised knowledge: for instance, the digital revolution in filmmaking has caused substantial increases in the size of filmmaking teams, and some films are now made by thousands of people. So not only is group creativity real, but it is also increasingly pervasive in modern societies.

This is just as well. As I remarked at the start of this paper, the challenges we face are ones that call for group, and not merely individual, creativity. Our central example was the four world-leading microbiology labs studied by Dunbar: three of them were working on pathogens, either bacteria or viruses, including the

https://doi.org/10.1017/S1358246122000145 Published online by Cambridge University Press

HIV virus. Group creativity was essential to getting their results, and the problems of eradicating pathogens are still very much with us. We also require creativity in solving collective action problems, finding ways to reduce the temptations of free riding on proposed policies. Fortunately, we are uniquely good as a species at cooperating on a huge scale with unrelated conspecifics (Raihani, 2021), and so scope for group creativity opens up here as well. There are reasons, then, to be hopeful in looking forwards, and a major reason for optimism is the existence of group creativity.[8]

University of St Andrews
bng@st-andrews.ac.uk

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[8] For helpful comments on this paper or its precursors I would like to thank the editors of this volume, participants in the Creativity in Art, Science and Mind Conference in Cambridge in 2018, and attendees at the Values and Virtues in a Changing World Workshop in Cardiff in 2021.

https://doi.org/10.1017/S1358246122000145 Published online by Cambridge University Press

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