

ORIGINAL ARTICLE

Collective practical Knowledge is a Fragmented Interrogative capacity

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Abstract

What does it take for a group of people to know how to do something? An account of collective practical knowledge ought to be compatible with the linguistic evidence about the semantics for collective knowledge—how ascriptions, be able to explain the practicality of collective knowledge, be able to explain both the connection between individual and collective know-how and the possibility of a group knowing how to do something none of its members know, and be applicable to a suitably wide range of groups. In this paper I develop a view which can meet all of these desiderata, which combines a Fragmented account of collective knowledge (Habgood-Coote, 2019a), with the view that practical knowledge is an Interrogative Capacity (Habgood-Coote, 2019b).

1 | INTRODUCTION

Britain's computing industry failed to compete with Silicon Valley because in the 1960s, it replaced a largely female and subclerical workforce with male managers, thereby losing the accumulated knowledge of its previously feminised workforce (Hicks, 2017).¹ Early plantation society in North America successfully fed itself because of the productivity of rice plantations in Georgia, South Carolina, and Florida, which relied on the skills and knowledge of enslaved people from West-African rice-growing cultures (Carney, 2002; Fields-Black, 2014). Post-2011 protest movements across the middle east failed—in part—because the affordances of social media platforms allowed

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for the co-ordination of large groups of people in protests, allowing movements to grow without developing the organisational know-how and capacities required to maintain a resistance movement (Tufekci, 2017). In the 1960s, a number of laboratories struggles to operate so-called TEA lasers, because they failed to employ workers with the knowledge which could only be gained through hands-on experience (Collins, 1974).

How should we understand the collective practical knowledge which underlies these explanations? In this essay, I will build an account of collective knowledge-how which is designed to bear the weight of these explanations. The explanations from the previous paragraph give us a sense of the shape this account needs to take. It needs to explain how a group can know how to do something none of its members do (which is important to all the examples), the role of individual practical knowledge in collective know-how (highlighted by Hicks and Collins), and the sense in which collective knowledge-how is a kind of *practical* knowledge, the presence or absence of which can explain success or failure in collective practical enterprises.

The plan of action is as follows.

Section 1 articulates a set of desiderata on an account of collective knowledge-how. Section 2 lays out two previous accounts of knowledge-how due to Jonathan Birch (2019), and Orestis Palermos and Deborah Tollefsen (2018). I argue that neither account is easily semantically implementable, and that both focus on an overly narrow set of cases involving small groups engaged in shared co-operative activity. In section 3 I develop a positive account—the Fragmented Interrogative Capacity view—that is motivated by the semantics for knowledge-wh ascriptions (3.1.), the semantics for *collective* knowledge-wh ascriptions, and consideration of the relation between collective knowledge-how and collective action (3.2.). According to this account, collective knowledge-how relating to a task is built up out of fragmented individual knowledge about the parts of the question of how to do this task, which come together to generate an ability to answer the question *how can we V?* Section 4 argues that the fragmented knowledge account does well on all of the desiderata from section 1.

2 | DESIDERATA ON AN ACCOUNT OF COLLECTIVE KNOWLEDGE-HOW

Collective knowledge-how sits at the intersection of two debates: the debate about the nature of collective knowledge (Bird, 2010; de Ridder, 2014; Habgood-Coote, 2019a; List, 2005; Palermos, 2020; Wray, 2007), and the debate about the nature of knowledge-how (Bengson & Moffett, 2011; Cath, 2019, forthcoming; Pavese, 2016a, 2016b). In lieu of a thorough overview of these debates, I will present five constraints they place on an account of collective knowledge-how.

The first two constraints come from the knowledge-how debate (see Glick, 2011; Habgood-Coote, 2019b):

SEMANTIC IMPLEMENTABILITY: An account of collective knowledge-how ought to be compatible with a linguistically acceptable semantics for sentences which ascribe collective knowledge-how.

Since Stanley and Williamson (2001), one strand of the knowledge-how debate has focused around whether knowledge-how is a kind of propositional knowledge, with *Intellectualists* using linguistic evidence to argue that it is (Glick, 2011; Stanley, 2011),² and *Anti-Intellectualists* denying the relevance of linguistic evidence to philosophical debates and maintaining that

knowledge-how is not a kind of propositional knowledge (Devitt, 2011; Noë, 2005). SEMANTIC IMPLEMENTABILITY states that linguistic evidence is relevant to inquiry into the nature of knowledge-how, but it does not assert that linguistic evidence is the only or most important consideration: we should assess accounts of the nature of knowledge-how by considering a full range of linguistic and philosophical evidence. SEMANTIC IMPLEMENTABILITY doesn't entail that the only acceptable semantics for knowledge-how ascriptions is propositional. There are several linguistically acceptable non-propositional semantics for knowledge-how ascriptions.³ We should think about this constraint as placing an explanatory burden on an account of collective knowledge-how: it is a point in its favour if it can give a linguistically plausible semantics, and a point against if it cannot.

PRACTICALITY: An account of collective knowledge-how ought to explain the relation between collective knowledge-how and collective action.

Almost everyone⁴ in the knowledge-how debate agrees that when we are talking about knowledge-how, we are not just interested in knowledge picked out by ascriptions involving 'knows' and a 'how' or 'how to' complement.⁵ 'Pico knows how coffee smells' does not ascribe knowledge-how. We are interested a kind of practical knowledge which some (but not all) 'knows how to' ascriptions pick out. There are several ideas about what makes knowledge-how practical:

DIRECTNESS: knowledge-how is primarily exercised in action, rather than in speech.⁶

NECESSITY: knowledge-how is necessary for intentional action,⁷

ABILITY: knowing how to V entails the ability to V.⁸

FLEXIBILITY: knowing how to do something involves an ability to react intelligently to a wide range of V-related situations.⁹

NORM: knowing how to V is a condition on appropriately intending to V.¹⁰

I won't try to adjudicate between these views here, but merely point out that an account of collective knowledge-how ought to predict similar connections between collective knowledge-how and collective action.

The remaining three constraints come from the debate about collective knowledge. The first two concern the relation between individual and collective knowledge:¹¹

DIVERGENCE: an account of collective knowledge-how ought to be able to explain how a group can know how to do something which none of its members know how to do.

CONNECTION: an account of collective knowledge-how ought to explain the importance of individual knowledge-how to collective knowledge.

We can motivate DIVERGENCE by considering cases. Consider the following case (based on a case from Bird (2010)):

NASA: NASA has formed a plan to build a space shuttle. This is a complicated process, involving a number of tasks which draw on specialised knowledge. In order to build the shuttle efficiently, the planning committee splits the task into various sub-tasks, and assigns specialists to each one. A programmer is assigned to design the software; a chemist to make up the fuel; an aeronautical engineer to design the fuselage, and so on. Each of the specialists has a good deal of knowledge about how to perform their task, but none of them has any knowledge about any of the other sub-tasks. Nonetheless, the team of specialists each does an excellent job, and the space shuttle gets made successfully.

In this case, we make the following judgements:

- 1) NASA knows how to make a space shuttle.
- 2) No-one in NASA knows how to make a space shuttle.¹²

These judgements are shared by the folk. Jenkins et al. (2014) presented 116 participants with an extremely similar case. On a 1 to 7 scale (1 low, 7 high), the agreement with 1 was $M = 6.48$, $SD = 1.24$, $p < .001$, and the agreement with ascriptions of knowledge how to *each member knows* was $M = 1.68$, $SD = 1.19$, $p < .001$ and to *any member knows* was $M = 3.10$, $SD = 2.07$ $p < .001$.¹³ At an intuitive level, what's going on in NASA is that the team has implemented a division of practical labour, with different individuals assigned to different subtasks, which comes along with a division of *epistemic* labour, whereby team-members' knowledge about how to do their different subtasks contributes to the group's knowing how to make a space shuttle.¹⁴ DIVERGENCE precludes a simple summativist account of collective knowledge-how, on which a group knows how to do something only if at least one of its members knows how to do that thing (Bird, 2010).¹⁵

CONNECTION states that individual knowledge is a crucial component of collective knowledge-how. This condition explains why the UK civil service lost know-how when it fired its female computer operators, why slave plantations in the gained know-how when they enslaved West Africans who knew how to grow rice, and why NASA would no longer know how to make a space shuttle if it fired its chemists. Another motivation for CONNECTION connects to PRACTICALITY. If collective knowledge entails collective ability (ABILITY), a collective can only V in virtue of some of its members performing actions ABC that contribute to V (see Lackey, 2014, p. 286), and knowledge-how is necessary for individual action (NECESSITY), then for a group to know how to V , its members must between them know how to A , how to B , and how to C .

The final constraint sets out the scope of an account of collective knowledge-how:

GENERALITY: An account of collective knowledge-how ought to be applicable to a suitably broad set of cases.

Although it seems simple, this condition requires a bit of unpacking. What kinds of collectives can possess knowledge-how?

PRACTICALITY means that we are interested in the kinds of groups which are capable of collective action. I won't try to resolve the question of exactly which kinds of groups are capable

of collective action (or what exactly collective action is), but I think it is a capacious category, including familiar examples like two people going for a walk, or painting a house, alongside more unwieldy examples like the UK civil service calculating PAYE tax returns, and NASA building a space shuttle.

In the background of GENERALITY is a tricky debate about what exactly the concept of knowledge-how is for. Some writers have suggested that the function of the concept of knowledge-how is to help us to pick up capacities from others (Craig, 1990, C17), or to allow us to talk about the capacities which underlie a special category of intelligent action (Ryle, 1949/2009). I will be assuming that the function of the concept of knowledge-how arises from our more everyday interests in predicting success and failure, and making decisions about who to rely on (see Habgood-Coote, 2019c), meaning that I will be happy to countenance individuals and groups who know how to do things which are not especially intelligent (typing in a key code, submitting tax returns) and which they are poorly positioned to teach others.

3 | EXISTING ACCOUNTS OF COLLECTIVE KNOWLEDGE-HOW

Nestled as it is between two complicated debates, there are multiple ways to approach the topic of collective knowledge-how. Birch approaches it by thinking about the kind of knowledge involved in shared co-operative activity, whereas Palermos and Tollefsen consider the way co-operation can give rise to responsible action. Although both accounts help us to understand phenomena of co-operation which are closely connected to knowledge-how, I will argue that they face problems of semantic implementation, and fail to be properly general.

3.1 | Birch on joint knowledge-how

Birch (2019) defends what he calls the *active mutual enablement* account of the relation between individual and collective knowledge-how. Following Bratman's account of shared co-operative activity (Bratman, 1992, 2014), Birch starts with the two-person case, asking what epistemic conditions are required for two people to successfully bring off a shared activity involving interlocking and meshing intentions. Two people merely knowing how to do their parts of a joint activity will not suffice, because two people could do their parts in ways that mutually interfere. Hence, the respective parts of a shared activity also need to be co-ordinated. Drawing on Bratman's idea that mutual responsiveness in action is the mark of shared co-operative activity, Birch suggests that each participant in a joint activity needs to know *how to co-ordinate* their activity, making failure-averting adjustments on the basis of on-the-fly prediction and monitoring. Co-ordination is not merely a matter of prediction; it involves acting in such a way as to enable coordination. For example, two pianists who are duetting might coordination-enable by raising their head at the beginning of phrases, and a rower at the back of a coxless pair might coordination-enable by rowing at a constant speed (Birch, 2019, p. 3337).

Mirroring the structure of Bratman's account of shared co-operative activity, Birch proposes the following account of collective knowledge-how (where J is the task known, and J1 and J2 are its parts):

The Active Mutual Enablement account :

S1 and S2 jointly know how to do J if and only if:

- (1a) S1 knows how (in conditions C1)¹⁶ to perform J1 in a way that is actively coordination-enabling for S2.
- (1b) S1 knows how to predict, monitor and make failure-averting adjustments in response to S2's performance of J2, provided S2 performs J2 in a way that is actively coordination-enabling for S1.
- (2a) S2 knows how (in conditions C2) to perform J2 in a way that is actively coordination-enabling for S2.
- (2b) S2 knows how to predict, monitor and make failure-averting adjustments in response to S1's performance of J1, provided S1 performs J1 in a way that is actively coordination-enabling for S1.
- (3) C1 and C2 are mutually compatible.

Just as Bratman accounts for shared intentions by giving an account of interlocking individual plans, Birch proposes to account for joint knowledge-how by giving an account of interlocking individual practical knowledge. This account is formulated for the two-person case, but it is easy to see how one could scale it up, perhaps allowing that not every participant need coordinate with every other. This account predicts both DIVERGENCE—because each member only needs to know how to do their part—and CONNECTION—because the collective's knowledge depends on individual knowledge.

Bratman recognises that not every case of shared activity involves mutual adjustment, and he draws a distinction between *shared cooperative activity*, and *prepackaged cooperation*. Examples of prepackaged cooperation include two people painting a room by taping down the middle and each painting half, and two people singing a duet by reading the sheet music without listening to their partner (Bratman, 1992, pp. 338–9, 2014, pp. 78–84). Birch takes the lack of 'mutual responsiveness' in these cases of prepackaged cooperation to be evidence that these are not cases of joint knowledge-how, but rather the exercise of individual knowledge-how in close proximity (Birch, 2019, pp. 3334–5, 3340–1).

Birch offers us a *structural* account of joint knowledge-how, in the sense that it doesn't make any commitments about what individual knowledge-how (to do a task, or to coordination-enable) is like. Birch explores the possibilities of an intellectualist implementation of this view, although this account ends up having to appeal to practical modes of presentation to make sense of cases in which a pair of people know how to do something using a method which they individually believe will not work (Birch, 2019, §9).

3.2 | Palermos and Tollefsen on collective responsibility

Whereas Birch started with the analysis of joint action, Palermos and Tollefsen (henceforth P&T) start with a Ryle-inspired account of knowledge how. Although Ryle is widely believed to have identified knowing how to do something with the ability to do it, in several passages he explicitly rejects this view:

Knowing how, then, is a disposition, but not a single-track disposition like a reflex or a habit. Its exercises are observances of rules or canons or the applications of criteria, but they are not tandem operations of theoretically avowing maxims and then putting them into practice. (Ryle, 1949/2009, p. 30; see also Palermos & Tollefsen, 2018, p. 114)

There are various ways to spin off an account of knowledge-how from Ryle's remarks.¹⁷ P&T follow a similar line to Elzinga, Kremer, and Löwenstein, stressing the importance of self-regulation, applying rules of conduct, and responsibility for the exercises of knowledge-how, whilst giving an anti-intellectualist spin on these ideas. They suggest that in general, knowledge-how is an adverbial ability to act *responsibly*, where this is a matter of self-regulation.

P&T argue for the application of the responsibilist view by developing objections to other views. They point out that a reductionist view that identified collective knowledge-how with a mass of individual knowledge would make collective knowledge-how modally fragile—in the sense that any change in membership would change a group's know-how—and would struggle to account for the importance of interaction between people. An intellectualist view that identified collective knowledge-how with collective knowledge of a way-proposition would struggle to identify a suitable way of acting which the group was collectively acquainted with before the outset of collective action.

By exclusion, P&T argue the Rylean responsibility view is the best bet. Just as an individual's knowledge-how is her ability to regulate her behaviour by acting responsibly, a group's knowledge-how is its ability to regulate its collective activities by acting responsibly. Drawing on work in cognitive science, P&T argue that collective responsibility is generated from continuous mutual interactions between a group of people acting in a non-linear way. They argue that such a group constitutes a distributed cognitive system, which acts in a way that cannot be decomposed into competent activities. This suggests they accept something like the following account of collective knowledge-how:

The Group Responsibility account:

A group *G* knows how to *V* if and only if

- (1) *G* is able to responsibly *V* by reliably applying the constitutive standards of *V*-ing.
- (2) *G* is able to fulfil (1) in virtue of its members forming a distributed cognitive system.

Whereas Birch focuses on individual adjustment and tracking in collective activity, P&T claim that it is the group qua collective entity which generates responsible activity. On their view, it is important that collective knowledge-how is a nonreducible property of a dynamic system. As with other anti-intellectualist accounts (Hornsby, 2011; Wiggins, 2012), P&T suggest that propositional knowledge may play some role in knowledge-how. In particular they focus on the role of propositional commitments in creating a barrier to individuals defecting from a collective plan.

3.3 | Assessment

The Active Mutual Enablement, and Group Responsibility accounts are engaged in importantly different projects. The first is a structural account which doesn't commit to an account of practical knowledge, whereas the second is a full account of what it is for a group to know how. They have substantive points of difference: Birch appeals to individuals keeping things on track, whereas P&T appeal to the properties of distributed cognitive system. With that said, there are two points of agreement which create shared problems.

The first point of agreement is that we should calibrate our account of collective knowledge-how for small-scale groups with no hierarchy, and a tight pattern of mutual engagement. Birch

makes this point explicitly by deploying Bratman's distinction between shared co-operative activity and pre-packaged co-operation. He states that the Active Mutual Enablement account will not deal with cases like Apple knowing how to make large profits (Birch, 2019, p. 3350). P&T get to the same place via the idea that collective responsibility is the product of the kind of mutual interdependence which develops through ongoing interactions. The practical knowledge of small-scale groups is a very real phenomenon to be explained, but it is only a part of the topic of collective practical knowledge. We might think that collective action—and, via PRACTICALITY, collective knowledge-how—runs the gamut of cases from small-scale, highly-integrated groups characterised by a flat hierarchy and common knowledge, to large-scale groups involving a developed division of labour, hierarchy, the separation of roles, and limited common knowledge. Although there is a tendency among theorists of collective action to work out the theory of collective action with application to small-scale cases¹⁸, we should want our philosophical theories to be able to expand upward to deal with larger-scale cases. This is particularly important if we want our account of group knowledge-how to be able to explain the kinds of cases which social scientists appeal to—knowing how to operate computers, knowing how to grow rice, or knowing how to organise a social movement—which often involve large and diffuse groups. If we think that our account of collective knowledge-how ought to apply to large groups both Birch and P&T fail the GENERALITY constraint.¹⁹

The second point of agreement is the prioritisation of philosophical over linguistic evidence. Birch appeals to considerations about the epistemic conditions on shared cooperative activity, and P&T appeal to philosophical problems for reductive and intellectualist views. Neither offers us an account of the semantics for collective knowledge-how ascriptions which is compatible with their metaphysical commitments. While this isn't a reason to reject these views out of hand, it means that neither account discharges the burden of LINGUISTIC IMPLEMENTABILITY. Further, there are no off-the-shelf semantics which would allow them to implement their views. Birch needs an account of how a sentence like 'John and Barney know how to row a coxless pair' entails that John knows how to row in a coordination-enabling way, and how to predict, monitor, and make adjustments on the basis of Barney's performance, and ditto for Barney. P&T need a general account of knowledge ascriptions which had them coming out as a relation to an activity. There are ways to develop both semantics, but it would take a considerable amount of working out.²⁰

While these are not knock-down arguments, they give some motivation to take a different methodological tack, that starts with the semantics of collective knowledge-how ascriptions, and bearing in mind the importance of large-scale collective practical knowledge.

4 | FRAGMENTED INTERROGATIVE CAPACITIES

I presented SEMANTIC IMPLEMENTABILITY as a defeasible explanatory requirement on an account of collective knowledge-how. Without committing to the controversial linguistics-first methodology, in this section I want to employ linguistics as a probative tool, showing that the semantics of collective knowledge-how attributions points towards an account of collective practical knowledge which is independently plausible: the Fragmented Knowledge account. I will pursue this idea in three steps: i) presenting the standard semantics for individual knowledge-how ascriptions, ii) suggesting that collective knowledge-how ascriptions involve cumulative predication, and iii) putting this structural account together with an account of knowledge-how which is able to explain the practicality of knowledge-how.

4.1 | Semantics for knowledge-how

Let's start off by considering what some fairly standard views in syntax and semantics tells us about the meaning of knowledge-how ascriptions (Stanley, 2011; Stanley & Williamson, 2001).

Consider an ordinary practical knowledge ascribing sentence:

3) Hannah knows how to swim.

Syntax splits this sentence into three parts: a subject, a verb, and an interrogative clause which is its object, leaving us with:

4) Hannah [knows [how PRO to swim]]

PRO is an unpronounced pronoun, which can either refer to the subject of the verb, or function generically, meaning 'one'. This syntactic treatment suggests that the thing that Hannah knows is going to be closely related to the meaning of the interrogative clause 'how PRO to swim'. There are a few different views about the meaning of interrogatives, but a popular view is that interrogatives denote *questions*, which consist in sets of possible answers. Although some verbs relate to the whole of a question (consider 'wonders', 'asked', 'inquires'), plausibly to stand in the knowledge relation to a question is to know an answer to that question (ignoring for the moment issues about the mention-some and mention-all readings). Assuming that how-questions are answered by way-propositions gives us:

5) Hannah knows [that w is a way for PRO to swim]

We then need to unpack the referent of PRO, and the modality of the infinitival phrase. The standard moves here are to po that sentences which ascribe distinctively practical knowledge involve a controlled PRO that refers to the subject of the verb, and a can-type modal that requires counterfactual success in normal worlds (call this 'can*') (Hawley, 2003), giving us:

6) Hannah knows [that w is a way in which Hannah can* swim]

This gives us what we might think of as the standard semantics for knowledge-how ascriptions. A couple of points about intellectualism, and the role of PRO.

The truth-conditions in 6) do not entail the strong variety of intellectualism proposed by Stanley and Williamson. We can distinguish between two flavours of intellectualism (Glick, 2011):

Strong Intellectualism: knowledge-how is a theoretical knowledge relation to a proposition

Weak Intellectualism: knowledge-how is a relation to a proposition.

Because it is an analysis of the complement of 'knows' in sentence 3), this analysis in 6) only offers an account of the relata of knowledge-how, leaving open the nature of the knowledge-how relation. It is possible to think that knowledge-how involves a dispositional (Cath, 2020),

or abilitative (Habgood-Coote, 2019b) relation to the propositions which answer the embedded interrogative phrase. This is important, because these views of are best placed to explain the practicality of knowledge-how, whilst remaining easily semantically implementable. In Habgood-Coote (2019b), I proposed the following analysis of individual knowledge-how (bracketing context-sensitivity):

The Interrogative Capacity view:

A subject knows how to V iff S has the ability to activate knowledge of a fine-grained answer to the question how to V? on the fly in the process of V-ing.

Activating an answer to a question can mean either generating new knowledge or employing existing knowledge. In some situations, knowing how is a matter of being able to employ standing propositional knowledge—knowing how to open a padlock is a matter of knowing that the code is 1234—and in other cases it is a matter of being able to generate new knowledge for the situation—knowing how to walk on rough ground in high winds requires the ability to work out how to do the task as you go along. Following Ryle (1949/2009, p. 30, 1971, 1976), on this view the exercise of knowledge-how is very often a process of self-teaching, or what calls *thinking what one is doing*.

The Interrogative Capacity view is well-positioned to explain the practical features of knowledge-how. On this view, knowledge-how is exercised in activity (DIRECTNESS), often involves an open-ended ability to answer a complete question (FLEXIBILITY), is at the same time an interrogative ability, and an ability to do an activity (ABILITY), and involves a capacity which secures success in intentional action (NORM and DIRECTNESS)

Although PRO is often sidelined in discussions of knowledge-how, it plays an important role in collective ascriptions. If we apply the standard syntax and semantics to the collective ascription in 1), we get:

7) NASA knows [that w is a way in which PRO can make a space shuttle].

As in the individual case, PRO can either have a generic meaning, or refer to the subject of the verb. On the controlled reading, we get:

8) NASA knows [that w is a way in which NASA can make a space shuttle].

This articulates the intuitive point that collective knowledge-how is knowledge about how a *group* can do something: its content is first-person plural.²¹ When we are thinking about the relation between individual and collective practical knowledge, we need to be really careful about the objects of individual and collective knowledge.²² It is possible for a group to know how to do something, for that knowledge to be completely reducible to individual knowledge, and for no-one in the group to know how to do that thing. Consider the following:

9) The department knows how to surround Edgecliffe.

10) Every member of the department knows that w is a way for the department for surround Edgecliffe.

11) No member of the department knows of a way w that is a way for her to surround Edgecliffe.

Surrounding a building is something which only a collective agent (or a person with very long arms) can do, so it is impossible for any individual to know how to surround a building (hence 11). Nonetheless, the knowledge ascribed by 9) might be reducible to individual knowledge about how the department can do something (as in 10). Activities which can only be engaged in by groups are the simplest case of this divergence: there might be different ways for a group and individuals to do something, a way might be reliable in the individual but not the collective case, or people might know that a way is reliable in the individual but not the collective case.

Dragos's (2019) argument for the irreducibility of collective knowledge-how falls afoul of the shiftiness of PRO. He argues that because there is no way for an individual to ride a tandem,²³ perform a symphony, or run a high-energy physics experiment, collective know-how in each of these cases must be an irreducible property of a group (Dragos, 2019, p. 270–1). This argument targets knowledge about the wrong kind of agent. If John and Betty's knowledge how to ride a tandem reduces to individual knowledge, it reduces to each of them knowing that some way is a way for [John and Betty] to ride a tandem, not to each of them knowing how to ride a tandem alone. The kind of simple summativist view fails for other reasons (as we'll see below), but it can easily account for the fact that there are some things only groups can do.

4.2 | Semantics for collective knowledge

The syntax and semantics of interrogative complements gives us an account of the property of knowing how, our next task is to understand how this property functions in the case of collective agents.

There are three ways that predicates can function when applied to groups. Consider the following sentence from Scha (1981):

12) Six linguists wrote three books

On the *distributive* reading, 12) says that each linguist falls under the property *wrote three books*, meaning eighteen books were written overall. On the *collective* reading, it says that the six linguists *together* fall under the property *wrote three books*, meaning that they co-wrote three books. On the *cumulative* reading it says that *between them* the linguists fulfil the property of having wrote three books, leaving open the manner in which this property is realised. This reading is true if one linguist wrote two books, and the other five wrote one book together. Intuitively, the cumulative reading says that a property is realised by the different members of a group contributing different parts of the property, such that between them they secure the full property.

Philosophers overwhelmingly focus on the collective and distributive readings of collective predicates, but the kind of collective practical knowledge in our target examples seems to involve the cumulative reading (Habgood-Coote, 2019a).²⁴ Consider sentence 1) as a description of the NASA case:

1) NASA knows how to make a space shuttle

This sentence is false on the distributive reading, if we ignore contexts that set the standards for knowing how to make a space shuttle very low. P&T presumably think that the true reading of the sentence is the collective one and see Group Responsibility as spelling out what it is for a collective to know how. Although this is an option, the structure of the case suggests that the cumulative

reading is the one we are after. Although no-one in NASA knows how to make a space shuttle (recall DIVERGENCE) NASA's practical knowledge depends on its members knowing how to do various things (recall CONNECTION). Put in the idiom of the cumulative reading, what matters is that *between them* NASA employees (and perhaps contractors) know how to do enough stuff to be in a position to make a shuttle.

In Habgood-Coote (2019a), I defended what I called the *Fragmented Knowledge* account of collective knowledge, which provides an account of the epistemic structure underlying the cumulative reading of knowledge-wh ascriptions. Drawing on ideas from Lahiri (2002), this view understands the parts of a piece of knowledge-wh in terms of knowledge about the parts of the embedded question.²⁵ For a group of people to know the answer to a question, they must individually have knowledge of the answers to *parts* of that question (sometimes called its subquestions) such that adding up the partial answers yields a complete answer to the original question. In the case of knowledge-how, we want to get a combination of pieces of knowledge-how which would provide us with one complete way for the group to do the activity in question. This might involve each member of a group knowing how to do different things, or every member knowing how to do the same thing, and how to co-ordinate those activities.

Applied to the case of knowledge-how, this yields:

The Simple Fragmented Knowledge view :

G knows how to V iff

- (1) Some members of G know the answers to subquestions of *what is a way in which G can V?*;
- (2) Between them, the members of G know answers that add up to a resolving answer to *what is a way in which G can V?*.

One might worry that this account predicts that the members of a group simply need to know how to play their roles, without needing to know how to coordinate.²⁶ Recall that the question at issue in group knowledge-how ascriptions is the first-person plural *how can we V?*. I want to suggest that co-ordination questions are a part of collective how-to questions. Just as *which order should one carry out the steps?* is a part of *how to make a cake?*, questions like *how should we design the fuselage given what fuels we're using?* are part of *how to make a space shuttle?*. Because co-ordination questions are part of collective how-to questions, the simple Fragmented Knowledge view predicts that collective practical knowledge requires capacities to engage in co-ordination enablement. As with practical questions, co-ordination questions can be answered either by standing propositional knowledge, or by on-the-fly dispositions to work out answers together. In a commercial kitchen, coordination questions might be answered by a pre-developed plan, and the assignment of cooks to work stations, whereas two experienced cooks making a new tasting menu will work out how they will coordinate as they go along, dealing with issues as and when they emerge.²⁷

The Simple theory is what we get if we simply read off the semantics for the cumulative reading of a knowledge-how ascription. Although it has some good features, it fails to deal with the following kind of case (which I owe to Jessica Brown):

QUARTET: The members of a string quartet are learning to play Mozart's Quartet no14 by memory for an upcoming concert. The viola player and cellist have learnt their parts, and the first violinist has learnt both her part and the second violin part

in order to understand how their parts fit together. However, the second violinist has not learnt their part. The first and second violin parts are too complicated to play both at the same time by double stopping.

The members of the quartet appear to have all the knowledge needed for a complete answer to *how can we play Quartet no14?*. Between them they know how to play all of the parts, they each know that they can play the piece together by each playing their assigned parts, and they all know generally how to play together. What goes wrong is that their practical knowledge is distributed in a way which means it cannot be exercised in collective activity: too much of the quartet's knowledge is in the first violinist's head.

We can explain the importance of the availability of individual knowledge to collective action by appealing to the idea that knowledge-how is a capacity to generate answers to a practical question on the fly.²⁸ Applied to the collective case, this view predicts that collective practical knowledge is a collective ability for a group to generate a fine-grained answer to a question about how they together can do something, in the course of collectively doing that very thing. In QUARTET the members of the group cannot exercise their Fragmented practical knowledge together to generate new answers to the question *how can we play Quartet no14?* together because the second violinist doesn't have the knowledge she needs. Although they have the required chunks of knowledge, the way these chunks are arranged means that they cannot have collective practical knowledge. Although the QUARTET case at first sight looks to appeal to distinctive features of the collective case, this diagnosis is really deploying general ideas about knowledge-how which we discussed under PRACTICALITY: that knowing how is the kind of state which is exercised directly in action, and which puts the agent in a position to do the relevant activity.

Considering the QUARTET case and the connection between practical knowledge and action puts us in a position to combine the simple theory (motivated by the cumulative reading), with the Interrogative Capacity view of knowledge-how (motivated by the need to explain the practicality of knowledge-how). This view fills out an account of what it is for members of a group to know-how (condition 1) in the simple theory), adding the further condition that they are able to exercise their capacities together in the course of collective action, thereby explaining why the quartet does not have knowledge-how.

The Fragmented Interrogative Capacity view :

G knows how to V iff

- (1) Some members of G are able to generate answers to subquestions of what is a way in which G can V? on the fly;
- (2) Between them, the members of G are able to generate answers that add up to a resolving answer to what is a way in which G can V?;
- (3) The interrogative capacities of the different members of the group can be exercised together to generate resolving answers to the question how can we V? in the course of V-ing together.

This view predicts that if one member of a group knows how the group can do something, and her knowledge can be exercised as part of a collective plan, the group inherits her knowledge. In the case of small groups, where there is little difference between the questions *how can I V?* and *how can we V?*, a group may inherit much of its members' knowledge. The case the account is designed to deal with is one in which many different members of the group contribute interroga-

tive capacities concerning parts of a collective practical question, which can be exercised together to reach complete answers to the collective practical question. In the case of large groups, where the differences between *how can I V?* and *how can we V?* are considerable, and meshing interrogative abilities is non-trivial, the majority of a group's knowledge may diverge from its members' knowledge.

Let's take stock. If we want to implement a view of knowledge-how using the standard interrogative semantics for knowledge-wh ascriptions, we need to commit to the weak intellectualist view that knowledge-how is a relation to propositions. If we want a semantics for collective knowledge-how ascriptions that predicts both DIVERGENCE and CONNECTION, one built on the cumulative reading of these sentences is a strong candidate. Combining these two ideas gets us the Simple Theory. If we want to explain the Quartet case, and the practicality of collective knowledge-how, we need to supplement the simple theory with account of the nature of knowledge-how which can explain PRACTICALITY. I've suggested that the best bet to do this is with the Interrogative Capacity view. Putting everything together gets us to the view that collective practical knowledge consists in a fragmented ability to answer a question in the course of collective action, whereby individuals contribute abilities to answer the subquestions of a question about how the group can do something, either drawing on their standing propositional knowledge, or from their abilities to work out how to do things together.²⁹

5 | ASSESSMENT

In section 1., I proposed five desiderata for an account of collective practical knowledge: SEMANTIC IMPLEMENTABILITY, PRACTICALITY, DIVERGENCE, CONNECTION, and GENERALITY. We can now see how the Fragmented Interrogative Capacity view can discharge these conditions.

The Fragmented Interrogative Capacity view is semantically implementable given very mainstream assumptions about syntax, the semantics of interrogative complements, and collective predicates. It treats collective knowledge-how as a fragmented relation of practical knowledge to a question about how a group can do something. Although I haven't worked through a semantic treatment for sentences like 1) on the cumulative, this would be relatively straightforward (see Lahiri, 2002).

One interesting question is whether alternative accounts of knowledge-how might also be semantically implementable using similar tools. Stanley (2011) and Pavese (2015) style intellectualism would be, as would Cath's (2020) practical attitude intellectualism. Other accounts are less clear. The account of the cumulative reading of knowledge-wh ascriptions developed by Lahiri appeals to the part-whole structure of a question, and the notion of knowing in part how to do something, and the only account of partial knowledge-how ascriptions requires weak intellectualism (see Pavese, 2017).

Unlike strong Intellectualist views, the Interrogative Capacity view is well-positioned to explain the sense in which knowledge-how is a kind of practical knowledge. This is true both in the individual case (an argument made in Habgood-Coote, 2019b), and in the collective case. We saw in the response to QUARTET that the idea that knowledge-how is an interrogative capacity means that collective practical knowledge will be a collective process of figuring out how to do something. Whereas Birch and P&T simply posit that knowing how to co-ordinate, and being able to adjust collective action on the fly are important features of collective knowledge-how, we can explain

both features in terms of the idea that collective knowledge-how is a certain kind of ability to answer a practical question.

Whereas Birch and P&T opt for metaphysical explanations for DIVERGENCE and CONNECTION that appeal to features of knowledge-how, the fragmented view of knowledge-how can appeal to ideas that are already established in linguistics to make sense of these facts (see Habgood-Coote, 2019a). DIVERGENCE and CONNECTION are not special features of collective practical knowledge; they are a consequence of the way cumulative predication works.

One of the important points on which the Fragmented Interrogative Capacity view improves on Birch and P&T's views is its ability to handle a wide range of cases (discharging GENERALITY). The examples of collective practical knowledge that we started with involve large and complex groups (the British computing workforce, the protest movements in the Arab spring), who pursue goals by drawing on large and heterogeneous bodies of knowledge, partly by means of collaboration, but also partly by means of parallel activity, and the division of labour. Because the Fragmented Interrogative Capacity view identifies collective knowledge-how with the ability to answer a question about how we can do something in the course of doing that thing together, it is open to different realisations of collective practical knowledge, corresponding to the different ways in which we can answer practical questions.

In the case of small groups, we typically answer practical questions together, depending on joint deliberation and our abilities to co-ordination-enable and monitor what our collaborators are up to. In the case larger structured groups, the institutional structure of a group may embody a particular answer to a question, preventing co-ordination questions from arising. Think about the way that job roles in a company, or the physical structure of a production line mandates a particular form of collaboration. Here, questions about how to collaborate have been answered by the designers of the company, enabling workers to go about their tasks without having needing fine-grained knowledge of what their colleagues are up to. In the case of larger unstructured groups, the ability to answer a practical question will be just as distributed as the group's activity. If a climate movement knows how to prevent the construction of a new oil field, its ability to answer the question of how to do so will be distributed between people who organise street protests, mobilise letter-writing, meet with policy-makers, raise awareness on social media, and so on. As these groups answer their different sub-questions, they may need to answer co-ordination questions with other sub-groups, but there need not be any central clearing-house for decisions. There is much more to be said about the way each kind of group realises collective practical knowledge, but I hope that this sketch shows that the fragmented interrogative capacity view provides the tools to think about each of them.³⁰

6 | CONCLUSION

Our initial goal was to build an account of collective practical knowledge which was applicable to the range of cases in which social scientists make explanatory appeals to it, which include large unstructured groups. I've argued that Birch's and P&T's accounts of group know-how are insufficiently general, applying only to small cases with a high degree of collaboration. Using formal semantics as a guide, we have seen a way to develop a more general account, which is nonetheless able to build on the good features of these accounts. Putting this account—the Fragmented Knowledge view—together with a first-order view of knowledge-how—the Interrogative Capacity view—we have been able to formulate a more general view of collective practical knowledge—

the Fragmented Interrogative Capacity view—which is able to meet all of the desiderata set out in section 1. Although this account is fairly conservative in its resources it is able to explain a wide swathe of cases of group knowledge-how, and to make good on appeals to practical knowledge in social science.

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ENDNOTES

- ¹For similar cases of uninvention, see (Mackenzie & Spinardi, 1995; Steingart, 2012)
- ²These arguments by no means start with Stanley and Williamson. See (Brown, 1970; Hintikka, 1999; Moore, 1997).
- ³Craige Roberts develops an imperatival semantics for infinitival wh-interrogatives and applies it to knowledge-how ascriptions (Roberts, 2009), Bengson and Moffett suggest treating how-to interrogatives as free relatives (Bengson & Moffett, 2011, but see Habgood-Coote, 2018a), and Santorio offers an expressivist plan-based semantics for knowledge-how ascriptions (Santorio, 2016). It would also be possible to develop non-propositional semantics for non-English knowledge-how ascriptions (Rumfitt, 2003).
- ⁴Except Braun (2011).
- ⁵(Brown, 1970, p. 216; Glick, 2011, p. 427; Hintikka, 1999, p. 14; Hornsby, 1980, p. 84; Moore, 1997, p. 168; Sgaravatti & Zardini, 2008, fn. 4; Snowdon, 2004, p. 7)
- ⁶(Ryle, 1949/2009, pp. 17–20; Stanley 2011, pp. 1–35).
- ⁷(Hornsby, 2016, pp. 8–10; Setiya, 2008, 2012; Stanley, 2011, pp. 188–90; Stanley & Williamson, 2001, pp. 415–6, 432–3).
- ⁸(Fantl, 2008; Glick, 2012; Lihoreau, 2008; Noë, 2005; Rosefeldt, 2004).
- ⁹(Fridland, 2013; Hornsby, 2011, p. 89–95; Ryle, 1976; Stanley, 2011, pp. 181–5; Wiggins, 2012, pp. 97–106).
- ¹⁰(Habgood-Coote, 2018b)
- ¹¹These are generalisations of Birch's Distribution and Tether principles (2019, p. 3333).
- ¹²To make this divergence case work, we need to assume that this latter sentence means 'no-one in NASA knows how NASA can make a space shuttle', see 3.2. below.
- ¹³Thanks to James Andow for running post-hoc analysis on the data from this paper.
- ¹⁴Note that there is a reading on which 2) is false. Lots of people in NASA will have generic propositional knowledge about how shuttles are made. This kind of knowledge does not have the practical features associated with knowledge-how. If the engineer formed an intention to build a shuttle by herself, her intention would be criticisable.
- ¹⁵DIVERGENCE is a popular movie trope. A string of 90s and 00s disaster movies (the Abyss, Armageddon, Sphere, Core, the Day the Earth Stood still) featured unlikely teams of experts whose combined practical knowledge made them earth's sole saviours. Plausibly this trope owes something to earlier heist moves (think: the Italian Job) where collective practical knowledge is dramatised by the smooth operation of the heist, and something to Japanese sentai series, like Power Rangers (originally Super Sentai), where the collective knowledge of the group is embodied by the Mecha.
- ¹⁶It is not clear to me whether in Birch's conditions are functioning like a modal base, or a task restriction, see (Hawley, 2003).
- ¹⁷See (Brandt, 2021; Elzinga, 2019; Habgood-Coote, 2019b; Hickman, 2019; Jackson, 2020; Kremer, 2017; Lowenstein, 2017; Turman, 2021)
- ¹⁸This temptation is especially salient in Bratman's work (Kutz, 2000; Shapiro, 2014).
- ¹⁹P&T and Birch might agree that we should want to make sense of these large-scale cases, but offer a bifurcated account which distinguishes collective practical knowledge in small-scale and large-scale groups. On grounds of

explanatory simplicity and to avoid committing to a line between small and large-scale groups, I think we should prefer a unified account.

- ²⁰ Briefly, here's how these views might work. Birch might take 'knows how to row a coxless pair' to function as a collective predicate and derive individual knowledge from the account of the collective property ascribed. Palermos and Tollefsen might appeal to the infinitival semantics for non-English knowledge ascriptions (such as the French 'John sait nager') and argue that English ascriptions must take the same analysis.
- ²¹ This is connected to Bratman's idea that the content of shared intentions is that we will do something (Bratman, 2014).
- ²² See Cath (2017) for similar discussion of problems around the transmission of know-how between people.
- ²³ This example is poorly chosen: to ride a tandem by yourself you just sit on the front seat and cycle normally. It's easy, if a little lonely.
- ²⁴ This is not to say that the other readings are unavailable. 'The musicians know how to play the instruments' has all three readings.
- ²⁵ This notion of partial knowledge is picked out by locutions like 'Joelle knows *in part* how to solve the puzzle' (Pavese, 2017).
- ²⁶ This makes the simple Fragmented view close to Birch's simple account (Birch, 2019, p. 3335)
- ²⁷ On the differences between these two kinds of collective practical knowledge, see Habgood-Coote (MS).
- ²⁸ In Habgood-Coote (2019a) I motivated a general version of the availability condition in a slightly different way, appealing to general knowledge-action links.
- ²⁹ These abilities need not be exercised—a group might know how to do something before it does it for the first time. This raises the knotty issue of how to distinguish knowing how to do something from knowing how to learn to do it (see Habgood-Coote, 2018b).
- ³⁰ See Habgood-Coote (MS).

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