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# Modest Propositional Contents in Non-Human Animals

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**Abstract:** Philosophers have understood propositional contents in many different ways, some of them imposing stricter demands on cognition than others. In this paper, I want to characterize a specific sub-type of propositional content that shares many core features with full-blown propositional contents while lacking others. I will call them *modest propositional contents*, and I will be especially interested in examining which behavioral patterns would justify their attribution to non-human animals. To accomplish these tasks, I will begin by contrasting modest propositional contents with primitive feature-placing contents: a kind of content that, according to some philosophers, can explain the behavior of non-human animals. I will examine which cognitive abilities are involved in having mental states with each of these contents and which sorts of behavioral patterns would provide evidence that an animal has one of them or another. Finally, I will present some empirical evidence which strongly suggests that some non-human animals have mental states with modest propositional contents.

**Keywords:** propositional contents; feature-placing contents; animal minds

## 1. Introduction

Nowadays, many philosophers consider that the sophisticated behavioral patterns displayed by various non-human animals give us good reasons to attribute mental states with intentional contents to them [1–6]. Despite this growing consensus, there are pending questions regarding the nature and structure of animal mental contents that stir further controversies and require a more thorough treatment. In this paper, I will focus on one of such questions: are there non-human animals capable of entertaining (some kind of) propositional content? As I will argue, there are different ways of understanding such contents, some imposing stricter demands on cognition than others. Thus, before answering our question, it is necessary to clarify how we will understand the notion. Here, I will distinguish between a cognitively demanding variety of propositional content and a maximally deflationary one. Then, I will introduce "modest propositional contents", a third subtype occupying a middle ground between the other two. Finally, I will examine which behavioral patterns would justify the attribution to non-human animals of modest propositional contents. Based on that work, I will also defend the claim that some non-human species' behavior strongly suggests that these animals have propositional contents.

In Section 2, I will discuss several notions of propositional contents and introduce modest propositional contents. As I will argue, these contents share several core features with full-blown propositional contents while lacking others. To understand better what is involved in their attribution, I will contrast them with another kind of content frequently ascribed to non-human animals: non-propositional, feature-placing content. In Sections 3–6, I will examine which cognitive abilities are involved in having mental states with modest propositional contents versus feature-placing contents and which behavioral patterns would provide evidence that a creature has one or the other. Finally, in Section 7, I will present some empirical evidence justifying the attribution of modest propositional contents to some animal species.

## 2. Kinds of Propositional Contents

Philosophers understand propositional contents in many different ways. According to a deflationary use of the term, a content is propositional if it represents things as being a certain way, and it can be evaluated as true or false or, more leniently, as correct or incorrect [7–11][1]. On the other end of the spectrum, there is a full-blown notion of propositional content. According to it, besides representing something as being a certain way, these contents also have a sentence-like structure. This is often associated with several other demanding requirements. Firstly, just as sentences have words as their constituents, full-blown propositional contents are composed of concepts (or conceptual abilities) [13,14]. Secondly, it must be possible for these concepts to be freely and spontaneously recombined in every significant manner to form new propositional contents. In other words, creatures capable of thinking propositional contents have to satisfy Evans' Generality Constraint (GC) [13,15,16]. This comes together with the idea that the subject which has these contents must be capable of detaching their constituent concepts and grasping their meaning independently of their application to any particular situation [17,18].

Moreover, it is frequently assumed that full-blown propositional thinking includes the capacity to form complex contents involving universal and existential quantifiers such as *There exists an x such that Px*, and *For all x, if Px then Qx*. Arguably, however, forming such contents is not easy. According to Burge [14], these are cases of "pure predication", in which the predication of properties is independent from the functions of referring to a particular entity and identifying it. Hank [19] affirms that thinking this kind of content requires identifying or expressing a property and decoupling it from the act of predicating it of a particular object. In this way, the expressed property becomes the target of a second-order act of predication[2]. Bermúdez defends the claim that to have thoughts with these contents, one must be capable of having second-order thoughts [2] (pp. 180−181). What transpires from the work of these philosophers is that thinking existentially or universally quantified contents requires particularly sophisticated cognitive talents (such as the abilities to think about properties in a decoupled way, master concepts of second-order properties, have second-order thoughts, etc.).

Finally, it is often claimed that it must be possible to combine full-blown propositional contents by employing all kinds of logical connectives (such as conjunction, disjunction, etc.) [2,14,20]. Yet, there are reasons to think that this also requires a high level of cognitive sophistication. First, the concepts of logical connectives appear to be deeply abstract and combinatorial notions that represent only the relationships between thought constituents and can be used to combine all sorts of contents in a domain-general way [21]. Some also argue that to think complex thoughts involving logical connectors, one must grasp how the truth value of the component propositions is related to the truth value of the whole. Furthermore, this requires some capacity to take one's intentional mental states as objects of further thoughts [2].

Full-blown propositional contents might be useful to account for some striking features of human cognition. The ability to spontaneously recombine our concepts in all admissible ways may help explain the fully-fledged productivity and flexibility of our thoughts and our capacity to represent what lies far beyond our current circumstances [22]. Our capacity to use logical connectors and quantifiers may be relevant to explain how we can entertain universal laws, make logical inferences, etc. [2,14,23]. In brief, it seems possible to draw multiple connections between full-blown propositional contents and our kinds of minds.

It is, on the contrary, highly controversial to attribute propositional contents involving all these fancy requirements to non-human animals. To begin with, we have good reasons to doubt whether there are non-human species capable of satisfying GC, at least in its strictest version [4,22,24]. Likewise, it is contentious whether there are animals capable of thinking thoughts involving logical connectors or quantifiers [2,23]. Thus, while some researchers are optimistic about the possibility of attributing logical concepts to some animals, others remain skeptical. Three difficulties beset these debates. Firstly, there is no consensus on what cognitive requirements an animal must satisfy to master logical

concepts. As stated above, those who understand propositional contents in full-blown terms usually defend that thinking with quantifiers and logical operators requires sophisticated cognitive abilities that are difficult (at best) to find outside the human realm. Conversely, researchers who favor attributing contents containing logical connectors and quantifiers to non-human animals tend to understand them, and their possession conditions, less demandingly[3]. Secondly, relevant empirical evidence on non-linguistic animals' mastery of logical operators is indirect, scarce, and inconclusive. Thirdly, both sides in this debate provide diverging interpretations of extant studies. Those willing to admit that animals have some grasp of logical concepts frequently lean on studies suggesting that some non-human species, such as great apes, perform inferences by exclusion. According to the most optimistic reading, these results indicate that the tested animals use disjunctive syllogisms involving the disjunction and negation operators [14]. However, those who deny that animals grasp logical concepts offer deflationary alternative readings of the same empirical data [2,26][4].

Given the current state of these debates, it seems sensible to be cautious and refrain, at least temporarily, from attributing full-blown propositional contents to non-human animals. But is it better to focus on whether some animals have deflationary propositional contents? The main problem with this alternative is that it is unclear what kind of cognitive requirements an animal must meet to have these contents. According to some philosophers, some creatures may have a deflationary propositional content, such as *a is F*, even if they lack the conceptual abilities required to think about *a* and *F* [8]. Others claim that deflationary propositional contents involve conceptual capacities, but only in a weak sense [10]. A third group remains silent on the matter[5]. In any case, many central questions are left unexplained. What kind of representations (if not concepts) must an animal have to think these contents? How do they differ from the representations involved in different types of non-propositional contents? Are these contents composed of smaller representational units (maybe non-conceptual ones) that can be detached and recombined? Or are these unstructured contents representing states of affairs in a holistic way that admits no decomposition? Since we lack clear answers to these interrogations, it is hard to know what cognitive abilities and behavioral patterns to focus on when trying to establish whether non-human animals have minimal propositional contents or not. In light of these difficulties, I think it is advisable to leave this minimalistic notion aside, at least for the moment.

Nevertheless, this does not mean we must entirely abandon the question of animal propositional contents. Here, on the contrary, I propose to distinguish another sub-type of propositional content that can be fruitfully employed to account for some of the behavioral and cognitive capacities of several non-human species: modest propositional content. Modest propositional contents represent things being some ways, and they have truth values. This is what they have in common with deflationary propositional contents. But, in addition, they satisfy two further requirements:

1. They have a building-block structure: they are composed of constituent representational units—or representational abilities—that may be re-combined and re-deployed in other contents[6];
2. They involve constitutive conceptual abilities of two different kinds: the ability to think about certain particulars and the ability to think about some properties attributed to them [15,18,22,28].

Since they satisfy 1, modest propositional contents are structured. The fact that they meet 2 guarantees that they have a specific kind of structure, which involves concepts with two different semantic functions: referring to a particular and attributing a property to it. These are central features that they share with full-blown propositional contents.

However, having modest propositional contents does not require being capable of freely recombining all their component conceptual abilities in every admissible way. Neither is it necessary to master the use of universal quantifiers, existential quantifiers, or logical

connectors. Hence, we can ask whether animals have modest propositional contents while leaving aside taxing philosophical debates on their capacity to master sophisticated logical concepts and satisfy the Generality Constraint in its full-blown sense. Besides, in this case, the cognitive requirements for having modest propositional contents are clear. Consequently, we know what capacities to focus on when discussing if non-human animals have these contents: we should examine whether they can deploy concepts of particulars and properties, recombining them to think about different particulars and attribute properties to them. For these reasons, we can expect the notion of modest propositional content to be a promising tool to begin our exploration of the structure of non-human animals' mental contents[7].

In what follows, then, I will focus on whether some non-human animals have modest propositional contents. More specifically, I will be interested in exploring two questions. First, do (at least some) animals have contents composed of re-deployable concepts which can be used (even if only to some extent) to form other thoughts? Second, can they use these concepts to think about particular entities as having different properties?

To answer these questions, however, I will take an indirect route. In the next section, I will compare modest propositional contents with an alternative kind of non-propositional content that many philosophers have considered a promising alternative to explain primitive minds: feature-placing content. Drawing on this comparison, later on, I will try to identify good behavioural indicators that a creature has one of these contents or the other. There are several reasons in favour of this strategy. In the first place, the contrast between these two kinds of contents will help us understand better what is at stake in positing modest propositional contents to explain the behaviour of non-human animals. Secondly, researchers on animal cognition frequently warn us to be cautious with our psychological attributions to non-human animals. Their advice is to refrain from crediting them with more sophisticated capacities, representations, etc., if we have cognitively less demanding explanatory alternatives. Following this advice, I will not merely identify behavioural patterns that can be plausibly explained by attributing modest propositional contents. I will also try to show that these behavioural patterns cannot be equally explained by a more deflationary candidate: feature-placing contents.

## 3. Feature-Placing Contents vs. Modest Propositional Contents

Several philosophers have distinguished propositional contents from a more primitive kind of content that involves neither reference to particulars nor the ascription of properties to them. These are contents composed of representations of features "placed" in a creature's surroundings [17,29–32]. Having such feature-placing contents requires the ability to discriminate the presence of features. However, it does not "require the ability to identify something as a countable (referable) item, nor the ability to re-identify it again" [17] (p. 665).

Some authors claim that these representations can help explain the abilities of non-human animals " . . . to navigate through space, as well as their ability to register states of affairs in a way that does not involve reference to objects or attributions of properties" [32] (p. 119). According to them, feature-placing representations are not only more primitive but also autonomous and independent from propositionally structured ones.

Feature-placing contents differ from modest propositional contents regarding requirement 2. Thus, while modest propositional contents refer to objects and attribute properties to them, feature-placing contents do not differentiate between particulars and properties; they merely represent the incidence of features in the creature's environment. But what about requirement 1? Are feature-placing contents composed of simpler representational units that can be decomposed and recombined in multiple ways? Leaving exegetical precision aside, it seems to me that there is conceptual space to understand feature-placing contents in two different ways. The first possibility is to think of them as unstructured contents that lack simpler components. Thus understood, each of these contents would constitute a holistic unit that admits no internal variation, transformation, or decomposition [18,22]. Here there are some possible examples:

(i)    *Threatening!*

Or:

(ii)   *Big-noisy-threatening!*

As these examples show, unstructured mental contents may represent the presence of one (i) or several features (ii) as incidental in the creatures' environment. But, when these contents represent several features, all of them must be 'amalgamated' into a unitary whole that admits no decomposition. Thus, unstructured contents are not composed of smaller units that can be freely redeployed in other contents. A creature C that thinks (ii) may be somehow registering and representing the presence of three features (*big*, *noisy*, and *threatening*) out there in her environment. But that content will not be composed of more basic abilities—such as the ability to represent the features *big* or *threatening*—that can be detached from it and recombined to form other thought contents. This does not necessarily preclude C from forming a new holistic representation of another conjunction of features such as (iii) *big-red-eatable* whenever she is in front of a big red apple. But the relevant point here is the following. Even if we have to use the same word "big" twice to describe contents such as (ii) and (iii), C will not be deploying the same basic representational ability to think about the feature *big* in these different situations. In each case, C will display an entirely new, holistic, and non-decomposable representational ability that will exclusively refer to the present bundle of features and have nothing in common with the other.

Nonetheless, one may doubt whether all feature-placing contents are unstructured and non-decomposable. Here is another possibility: there might exist complex feature-placing representations. These would be composed of more basic representational abilities, each positing a different feature in the environment that can be recombined and redeployed in other thoughts. In such a case, those creatures which can think contents such as *big, noisy, threatening* must be capable of redeploying their capacities to represent each of these features in other feature-placing contents such as *big, soft, warm* or *noisy, playful, friendly*, etc.

Hereafter, I will leave aside the exegetical issue of which of these ways of understanding feature-placing contents is favored by its advocates. It suffices for my purposes to highlight that it is possible to distinguish these two types of feature-placing contents (as subjectless unstructured and non-decomposable contents, or as subjectless but structured and decomposable ones). Besides, I will compare each of them with modest propositional contents to establish what type of behavior would provide good evidence that a creature has mental states with the latter type of content instead of the two former ones.

## 4. Structured versus Unstructured Contents and Their Behavioral Manifestations

In the previous sections, I claimed that modest propositional contents satisfy two different requirements: (1) they have a building-block structure, and (2) they involve two different conceptual abilities (to think about particulars and attribute properties to them). I also briefly compared modest propositional contents with structured and unstructured feature-placing contents. Unstructured feature-placing contents are the ones that most starkly differ from modest propositional contents since they neither satisfy requirement (1) nor requirement (2). Structured feature-placing contents, instead, have a building-block structure since they are composed of re-deployable and re-combinable representational units. Nevertheless, they still fail to satisfy requirement (2) because it is not possible to find, amongst their representational constituents, neither concepts of particulars nor concepts of properties. In the following two sections, I will examine what behavior would provide good empirical indicators of a creature having structured modest propositional contents instead of unstructured feature-placing mental contents or structured feature-placing contents.

I will begin by examining some insightful suggestions made by Elisabeth Camp on the kinds of behavioral patterns that could justify the attribution of structured contents instead of unstructured ones. According to Camp:

If a creature invariably responds to a variety of situations with the very same behavior, then we should conclude that it is simply representing or respond-

ing to some particular feature, or class of features, that is common to all those situations—we wouldn't yet have uncovered enough behavioral complexity to justify postulating re-combinable representational abilities. However, if we find systematic patterns of constancy *within significant variation* in a creature's responses to different situations, then there is explanatory work for recurrent, interacting representational constituents to do [22] (p. 280).

Immediately after this quote, Camp invites us to consider the example of a dog, D, which encounters several other dogs, M, N, and O, on multiple occasions and treats each of them differently depending on their behavior. Thus, for example, if M behaves aggressively and O playfully on one occasion, D may treat M as a threat and O as a playmate. Yet, in a second situation, M might be the one behaving playfully and O the aggressive one. In this case, D will treat M as the playmate and N as the threat. Yet, D's behavior towards M and O might also show some differences, even when they both behave in a threatening or playful way. In such a case, Camp thinks that:

To explain *D*'s later behavior, it is not enough to attribute to *D* just an ability to represent *M*, because it treats *M* differently on different occasions. Nor is it enough to attribute to it just an ability to represent threats, because it treats *M* differently from *O* when it treats them both as threats. We could postulate entirely distinct, unstructured representations of *M-as-hunter*, *M-as-threat*, and *O-as-threat*; but then it would remain a mystery why we find the commonalities we do across *D*'s behavior, whenever it encounters *M*, for instance. A much more parsimonious explanation of the overall pattern of behavioral constancy within difference is that *D* has distinct abilities to represent *M*, *N*, and *O*, and to represent *hunter*, *playmate*, and *threat*, and that its later behavior toward M is the combined result of its representations of *M* and *threat* [22] (p. 281).

In these paragraphs, Camp reflects on what sort of behavioral complexity and versatility would justify attributing structured contents composed of re-combinable and re-deployable representational units to a creature. Her idea seems to be the following: we can legitimately attribute such contents when we find behavioral patterns that simultaneously show the relevant kind of constancies and variations.

Camp seems to be focusing on structured contents composed of re-combinable parts. Here, I am interested, instead, in modest propositional contents, and these are contents that are also composed of two kinds of re-combinable conceptual units with different semantic functions. But, then, which constancies and variations are relevant to justify the attribution of such contents?

Closely following Camp's example, imagine that we want to attribute to an animal $A_1$ two beliefs with structured modest propositional contents such as:

(a)   *M is a threat*;
(b)   *O is friendly.*

If (a) and (b) are structured contents composed of detachable and re-deployable basic concepts, then $A_1$ should also be capable of recombining them in some ways [33,34]. Consequently, she should be capable of forming some other thoughts, such as:

(c)   *O is a threat*;
(d)   *M is friendly.*

Now, what kind of behavioral patterns would justify attributing this whole spectrum of contents to $A_1$? To begin with, one may argue that, to attribute to her contents that include concepts such as *friendly* or *threat*, $A_1$ should show a disposition to react differently to friendly behavior than to threatening one. Thus, she should respond in a way $R_1$ to M or O when they are threatening and in a very different way $R_2$ when they are friendly. But, at the same time, at least in ideal circumstances, there should also be some relevant similarities in her responses, presumably, because she is representing the same individual twice. This would give us a good reason to attribute to $A_1$ pairs of contents such as (a) and

(d) or (b) and (c). Moreover, if we follow Camp's original suggestion, we should also find that $A_1$ tends to respond in a different way when O is friendly than when M is friendly. This difference justifies attributing to $A_1$ two concepts of particulars, *O* and *M*, each making its specific semantic contribution. Yet, $A_1$'s behavioral dispositions in these cases must not be completely alien. Some similarities must remain so that we are justified to attribute her contents involving the same general concept *friendly* in both situations. Mutatis mutandis, an analogous pattern of differences and similarities should be expected from $A_1$ for us to have good reasons to attribute her contents such as (a) and (c).

Now imagine the opposite situation: an animal $A_2$ systematically responds in the same way—for example, by running away—when she faces two threatening predators, $P_1$ and $P_2$, in two different situations. In such a case, we would not be justified in attributing to $A_2$ the capacity to distinguish these particular predators from their threatening behaviors. At best, we would be justified in attributing twice the same unstructured mental content to her: *threatening*. If this is right, when creatures systematically show rigid responses to the same features, regardless of the different particulars instantiating them, their behavior can be explained better in terms of unstructured representations.

So far, it seems that Camp has given us a plausible criterion to attribute contents with a building-block structure (i.e., contents composed of basic representational units that can be further recombined and redeployed). According to it, we should only attribute these contents to creatures that display flexible behavioral patterns in which it is possible to find relevant constancies and, at the same time, significant variations. However, one may doubt whether Camp's suggestion is also a good criterion for attributing modest propositional contents (i.e., contents composed of basic concepts with two different semantic roles: representing particulars and attributing properties to them).

As I pointed out in the previous section, it is possible to imagine some creatures capable of thinking structured feature-placing contents composed of several re-combinable units, each representing a different feature of their environments. If such creatures could represent features such as *small, big, friendly,* and *threatening*, they should, in principle, also be capable of using them in contents such as (i) *big, threatening*; (ii) *small, threatening*; (iii) *big, friendly*; and (iv) *small, friendly*.

Now, it seems to me that a creature capable of such representational re-combinations should display, at least if we observe her long enough and in a wide variety of circumstances, behavioral patterns showing the kind of constancies and variances that Camp requires[8]. The constancies would be caused by the fact that her mental contents in these different situations share some basic representations of features. Thus, when thinking (i) and (ii), she may react cautiously, prepare to escape, etc., because she is detecting the same feature—*threatening*—out there. The variances, in turn, will be due to the partial differences in her complex representations of environmental features. Then, for example, she may scream more, make more pronounced gestures of fear, etc., when her perceptual states have a content such as (i), because she is positing the feature *big* out there, than when she has a content such as (ii) in which the feature posited is *small*.

If this is correct, detecting differences and constancies in some animals' behavioral dispositions can be a good reason to attribute them structured (i.e., decomposable) contents. But it does not suffice to attribute to them the specific structure characteristic of modest propositional contents. The reason should be evident by now. Some animals' behavior may vary due to their thinking contents with some different representational constituents. They may also exhibit some constancies resulting from the fact that such contents share other representational components. However, these animals may still have only complex and structured but non-propositional, feature-placing contents. Consequently, something more is required to justify the attribution of modest propositional contents to them. We need evidence that they can think about a particular entity and attribute a general concept to it.

## 5. Concepts of Particulars, Concepts of Properties, and Modest Propositional Contents

In the previous section, I argued that to identify what behavioral patterns would justify the attribution of modest propositional contents to non-linguistic animals, we should examine what behavior would provide good evidence that these animals have contents composed of concepts of particulars and concepts of properties. To deal with this last issue, I will begin by delving a little deeper into what is involved in thinking a content composed of such conceptual abilities.

Let us begin by examining the conceptual ability to think about a particular entity. Different philosophers have claimed that thinking about a particular involves the capacity to focus on it, identifying it, and re-identifying it, over time and through space, in our different encounters with it [18,28,35,36][9].

Now, arguably, identifying and re-identifying a particular entity is a complex task involving the ability to single it out and keep track of it, at least in two different ways. Firstly, it seems necessary to be able to distinguish the entity in question from others. Secondly, one must have some ability to distinguish this particular from its properties[10]. However, it does not seem that identifying and re-identifying particulars necessarily requires any fancy capacity to explicitly think about how they might be related to their properties in different situations. What seems crucial is having a practical ability to differentiate these particulars from their changing properties. This includes having some implicit sensitivity to the fact that, on other occasions, a particular may lack some of the properties that it shows at present, that it may have additional properties that one cannot currently perceive, and that some of its properties can change without it necessarily ceasing to be that particular[11].

I want to suggest that this practical and implicit sensitivity to the differences between particular entities and their properties is present, at least in a rudimentary sense, in creatures that have:

I.　the capacity to track some of the changes that a particular suffers through time, without ceasing to recognize it as the same particular [35,36];

II.　the capacity to learn new things about a particular and integrate the different information acquired in our various encounters with it [35,36].

Creatures which satisfy I and II can do more than discriminate a particular entity from other objects in the vicinity. They can also cognitively differentiate this particular from the bunch of properties that it currently manifests, treating it in practice as something that has these properties but is not equal to them (since it may lose some of these properties, acquire new ones, have other properties that go beyond what is perceptually available, etc., without ceasing to be that particular).

But how could it be empirically established whether a creature has abilities such as I and II? In the case of I, things are pretty straightforward. We should find that our creature treats some particulars as the same entities despite manifest changes in some of their properties [36]. Thus, imagine that C is a young infant who runs to greet her uncle when he visits her. One day, the uncle appears, boasting a new beard. If the child recognizes him as her uncle, her basic reaction towards him should not change. She may touch the beard or laugh at it—thus indicating that she is sensitive to the change that he has suffered—but she will keep effusively greeting her uncle instead of running away from him as she would if he were a completely new individual. A way in which C may manifest her ability to learn new things about a particular and to integrate what she has learnt with previous information about it is when her behavior flexibly changes in virtue not only of the properties that this particular shows at present but also of the properties it has manifested in previous encounters with C. Let us consider an example of such a capacity: imagine that child A is usually friendly with C, but, one day, A bites C aggressively. The next time they meet, A behaves amicably toward C, but C reacts more cautiously to A. It seems natural to claim that C's behavior is guided by what she has learnt about A's aggressiveness, even if this trait is not presently manifest.

We can turn now to what is involved in thinking about a property and attributing it to a particular entity. Philosophical tradition tells us that concepts of properties are general in the following sense: they can be attributed to any number of different particulars [18,37]. More modestly, one can defend that having a property concept involves some capacity to extend its attribution to new particulars (even if not the full-blown ability to attribute it to every particular that one can think about). In fact, as argued above, if there are creatures that can ascribe the same property concept to more than one particular, this suffices to conclude that they have a separate representation of the property in question [34].

It has also been claimed that possessing a property concept *F*—unlike having only a capacity to discriminate features in one's environment—requires some understanding of what it is to be an F [34]. Now, what does such an understanding involve? Very roughly, having a property concept requires having some knowledge of its application conditions. Arguably, the latter could be explicit knowledge of the requirements that an entity has to satisfy to fall under it. Alternatively, it may consist in a practical capacity to detect when an entity meets those conditions. In this last case, to credit a creature C with a property concept *F*, we need to find evidence that C attributes *F* to some entities because she detects that they satisfy some characteristic conditions.

What would give us good evidence that non-human animals have this practical capacity? Since these are non-linguistic animals, we cannot directly ask them what conditions an entity must fulfil to be an *F*. But, their lack of language need not imply an insurmountable difficulty. One may also consider things such as: which information is available, or even salient, to them when they classify a particular in some specific way and which can be absent without altering their classificatory responses, how they have interacted in the past with that particular, whether they manipulate it in ways that give them access to specific aspects of it, etc. Presumably, all this should lead us to plausible conjectures about the conditions that a particular must satisfy for these animals to classify it *as an F*.

To see this more clearly, consider a simple (artificial) example. Imagine that an animal has learnt to fetch and eat red tomatoes and that, in the past, she once tried a green tomato, ate it, and got sick. After this unfortunate encounter, she systematically grabs red tomatoes and eats them but leaves green tomatoes untouched. Alternatively, she does not try to eat red plastic toys. In such a situation, we seem to be justified in thinking that when she tries to fetch a new red tomato, she does so because she believes that *it is edible*. Besides, we can conclude that she thinks that tomatoes are edible when she detects that they are red and eating red tomatoes has not made her nauseous or sick in the past. On the contrary, when the animal avoids green tomatoes, this is because she finds them *inedible,* and she categorizes tomatoes in this way because she detects that they are of a specific color and has previously experienced that after eating them, she got sick[12]. If this is the case, we can conclude that this animal is not merely discriminating red tomatoes from green ones. She is attributing to them a property—*being edible*—based on previously acquired information about them[13]. Given that her responses to different particulars are adequately and flexibly sensible to this information, we can ascribe the relevant property concepts to her[14].

## 6. Behavioral Indicators of Modest Propositional Contents

Let me review the ground covered so far. In Section 4, I presented Camp's [22] ideas on the kind of behavioral dispositions that could justify the attribution of structured contents. I also examined whether such dispositions might constitute an adequate indicator that a creature has modest propositional contents. I concluded that the behavioral patterns highlighted by Camp were, indeed, relevant to justify the attribution of contents that satisfied one of the requisites of modest propositional contents: its building-block structure. Nevertheless, they failed to establish that these contents met the second requirement: possessing the double semantic functions of referring to particulars and characterizing them as having some properties. Her criterion does not seem sufficient, then, if what we are interested in is disentangling whether we can attribute modest propositionally structured contents to some non-human animals.

In Section 5, I distinguished two kinds of conceptual abilities that constitute modest propositional contents. In what follows, I would like to take one step further and single out a distinctive kind of non-linguistic behavioral pattern that can justify the attribution of these contents, composed of the aforementioned conceptual abilities, to non-human animals.

To begin with, when a creature $C_1$ thinks thoughts such as *a is F* in situation $S_1$, and *b is F* in $S_2$, one may expect her behavioral dispositions to have some common elements resulting from the fact that she is attributing the same general concept twice. Thus, if she thinks that *a is dangerous* in $S_1$ and that *b is dangerous* in $S_2$, she may be alert and disposed to fight or flee in both circumstances. So far, the situation is not so different from the one in which another creature, $C_2$, has structured feature-placing contents such as *a-shaped, dangerous* in $S_1$ and *b-shaped, dangerous* in $S_2$.

However, even if they are composed of different detachable and re-deployable units, the feature-placing contents entertained by $C_2$ involve no internal relation between their components. On the contrary, when $C_1$ entertains thoughts with modest propositional contents, she does not merely detect the presence of a feature in her environment. She attributes a general property to different particulars, and she does so, presumably, because they both satisfy the relevant conditions. In the contents of her thoughts, some representational elements hold an asymmetrical relation: property concepts are attributed to particulars and not the other way around. The question now is: what kind of behavior could give us good evidence that all this is the case?

Let me begin by pointing out one key behavioral difference between creatures that possess modest propositional contents and those that merely have feature-placing contents. By hypothesis, if $C_2$ only has feature-placing contents, she should respond in the same way in the two situations in which she represents the same bunch of features in her environment, no matter how these features are related. Imagine, for example, that in situations $S_3$ and $S_4$, $C_2$ faces two conspecifics: A and B. In $S_3$, A is smiling, and B is frowning threateningly. Instead, in $S_4$, A frowns while B smiles in a friendly way. In these two situations, $C_2$ will token the same bunch of representations and have the same feature-placing contents. After all, the two environments are identical as far as features go. The only difference between these two situations lies in which individual is frowning and smiling in each case. But, since $C_2$ cannot think about specific individuals as frowning or smiling, she will not be able to represent the relevant divergence between these situations. $C_1$, on the contrary, will be able to represent which property is attributed to which individual in each case.

Moreover, $C_1$ will be able to identify these individuals, track their property changes, learn about their properties from previous encounters, and apply in her future interactions what she has previously learnt. All this should have clear behavioral consequences. Undoubtedly, at least in ideal conditions, if in $S_3$ $C_1$ thinks that *B is frowning* and, in $S_4$, $C_1$ thinks that *A is frowning*, her behavior in these situations should display some commonalities resulting from the fact that she has attributed the same general concept twice. But, at the same time, her behavior should also be guided by things such as: which specific individual she is attributing this concept to, her previous history of interactions with that individual, what she has learnt about it in the past, etc. Thus, even if $C_1$ gives the same response in both situations (because she has attributed the same property concept twice), she should also show some behavioral variances because she has attributed this property to different individuals.

A creature's behavior may vary in several ways when she attributes an identical property to different individuals. Thus, $C_1$ may give the same general response to frowning A and B, showing signs of worry in both cases. However, she may also behave more cautiously towards A, which has been aggressive to her in the past, than towards B, which has always been friendly. Another way a creature's behavior can vary is when she gives the same initial response in both situations but then adds different new behavior in each case, guided by her recognition of the individuals involved. To offer a basic example, $C_1$ may initially react in the same worried way to frowning A and frowning B but, later on,

direct a specific gesture towards B that, as she has learned from the past, always wins her heart (while refraining from issuing the same gesture towards A).

It is crucial to notice that all these variances in $C_1$'s behavior should be explainable in terms of her history of previous experiences with these particular individuals and what she has learnt about them in the past. Thus, if we are looking for evidence justifying the attribution of modest propositional contents to a creature such as $C_1$, we need to pay attention to more than her present behavioral responses to A and B. We also need to examine her previous interactions with these particulars to establish how her behavior changes in specific ways as a result of them. It is in these larger diachronic behavioral patterns that we may find our main evidence that $C_1$ is not only responding to bunches of features but, instead, to individuals that she has been tracking for some time.

Let us now suppose that $C_1$ thinks two thoughts about the same particular in two different situations. If one directly extrapolates Camp's ideas to this case, one might conclude that we need to find that $C_1$'s behavior shows some constancies caused by the fact that she is detecting the same particular twice. However, as seen above, without any other qualifications, this would not allow us to distinguish, on many occasions, a creature having feature-placing contents from another one that has modest propositional contents.

Imagine, for example, these two situations: in $S_5$, $C_2$ is in front of a predator that is awake and watching her, whereas, in $S_6$, $C_2$ is in front of the same predator, but the animal is sleeping. Now, suppose that $C_2$ gives the same general response in both situations (e.g., she moves cautiously). However, she also shows some behavioral variances (such as flying away abruptly in the first case while inspecting the place a bit further and walking away slowly in the second). At least in principle, all these variances and invariances could be explained by attributing to $C_2$ two different structured feature-placing contents. These contents would share some common elements (the representations of those perceptual features that usually accompany the presence of that predator). But they would also show some differences in other representational components. In particular, they will include different representations of perceptual features associated with the predator being awake rather than asleep.

There will be two relevant differences between these responses and the behavioral patterns of creatures with modest propositional contents. Here is the first one: since $C_2$ has only mental states with feature-placing contents, she may react twice in the same way in the presence of the same particular in $S_5$ and $S_6$, but not because she represents the same particular. She will respond in the same way because these two situations share several features that she is detecting and representing. But, if some of these features change, $C_2$ responses will probably change, too. On the contrary, since $C_1$ can entertain modest propositional contents, she has the conceptual abilities to single out, identify, and re-identify the relevant particular. Thus, she will be capable of tokening the same mental representations of it, even if some of its properties change from one situation to another. Consequently, one may expect her behavioral patterns to keep sharing some common elements in a very stable way, even when the observable properties of the particular predator that she is re-identifying suffer more or less extreme variations.

But this is not all. Let us consider now the case of an infant who thinks *mom is sad* on one occasion, while she thinks *mom is happy* on another. Moreover, let us assume that she is tokening each of these thoughts because she has acquired relevant information that leads her to attribute to her mother these different properties. Presumably, these attributions will influence her behavior, causing her to respond differently to her mother in each situation. Yet, she is also deploying the same particular concept *mom* twice. Should we find some common aspects or elements in her behavioral patterns resulting from this? We should give a nuanced answer to this question. On the one hand, as long as the infant keeps identifying her mother as the same particular, one may expect to find some very general and stable behavioral indicators of that fact. She may, for example, call her by the same name, show signs of recognition, etc. However, since having the ability to re-identify the same individual involves the capacity to learn new things about it, one may also expect

that the infant's responses to her mother will flexibly change through time due to such learning. Thus, if she has learnt that her mother is becoming older and more fragile, she may not treat her the same way she did in the past. But, if she is re-identifying her mother in all these situations, her behavioral changes should not be random or arbitrary. They should be explainable, at least to a substantial extent, in virtue of her past interactions with her mother and what she has learnt from them.

If what I have said so far is correct, whenever we want to attribute modest propositional contents to a creature, we must not limit ourselves to tracking her isolated responses to particular entities in different situations. We must also track her interactions with those particulars through time, looking for evidence that:

(1)    Sometimes, her behavior shows common elements which can be explained by the fact that she is deploying the same property concepts in different situations.

(2)    Other times, her behavior shows variations from one situation to another which are explainable by the fact that she is attributing different properties to each of them.

(3)    Both in (1) and (2), there are other aspects of the creature's behavior that depend on whether she is attributing the relevant properties to the same or different particulars.

However, we should not expect exactly the same behavioral responses whenever the creature thinks about a particular. One should find something more complex and subtler: that it is possible to explain some aspects of these situations in terms of her past and present interactions with these particulars and what she has learnt about them.

But are there animal behavioral patterns that fulfill requisites (1)–(3)? In the next section, I will examine several empirical examples that, to my mind, satisfy these requirements, strongly suggesting that some non-human animals have mental states with modest propositional contents.

## 7. Empirical Evidence of Modest Propositional Contents in Non-Human Animals

Throughout this paper, I have tried to delimit which behavioral patterns would justify the attribution of modest propositional contents and which ones can, instead, be explained in terms of feature-placing contents. In this section, I want to take one step further and examine some empirical examples that cannot be easily explained by positing feature-placing contents but seem to be guided by contents with a modest propositional structure. Anyhow, I do not expect to provide conclusive reasons for the existence of modest propositional contents in non-human animals. My aim is less ambitious: to show that one can posit such contents to offer a plausible account for some animal behavioral patterns.

We may then turn to our first example: the behavior of dogs towards their owners and strangers. In a series of studies, researchers applied a modified version of the Strange Situation Test (SST) to domestic dogs[15]. In this version, the dogs are repeatedly separated from their owners and then reunited with them. In parallel, they have various encounters with a stranger. The researchers' analysis revealed that, in general, the dogs displayed attachment behaviors towards their owners but not towards strangers. Thus, they looked for their owners in their absence, rapidly made enduring contact with them after their return, preferred to play with them, and decreased their play behavior in their absence. They also greeted their owners more enthusiastically and stayed longer by the door when separated from them [43,44].

Interestingly, there is also evidence indicating that sheltered dogs can rapidly change their behavior towards an unfamiliar human after a short period of interaction. Researchers offered sheltered dogs 10 min of walking and playing with an unfamiliar experimenter—"the handler"—for three consecutive days. The observations of the dogs' behavior in the STT test afterwards showed a clear difference between their responses to the handlers and strangers [45]. For example, they approached the handlers more, preferred to spend time with them, etc. According to Miklósi [46], these changes show that sheltered dogs are willing to rapidly initiate a novel relationship after brief contact with an unfamiliar human.

One can also read this evidence as supporting the claim that dogs can have some modest propositional thoughts. First of all, the studies show dogs give common

responses (to some extent) in two different situations: one in which a stranger interacts with them in a friendly way and another in which their owner (or a handler) behaves similarly. They show in both cases some disposition to approach these amiable humans and keep playing in their presence.

So far, two there are two alternative explanations of the data. One is to claim that the dogs can register the same properties in the behavior of different individuals and attribute the same property concept—*friendly*—to them. The other is to argue that these animals are not attributing property concepts to these individuals. They are merely detecting and responding to the same feature—*friendly!*—in the behavior of the owner and the stranger.

However, there are subtler differences in the dog's responses to these two situations that are not easy to explain by invoking feature-placing representations. Even when both the strangers and their owners (or the familiar handlers) behave in friendly, playful, and non-aggressive ways, the dogs play more in the presence of the latter, approach them more, prefer to spend time with them, etc. Yet, these behavioral differences do not seem to be systematically influenced by any variation in the perceivable features of these two situations. What seems to matter here are the dogs' previous histories of interactions with their owners (or with the handlers) and their capacity to re-identify those individuals and distinguish them from strangers. Thus, for example, the dogs respond in $T_1$ in one way to the unfamiliar handlers who behave in a friendly way but respond differently to the same handlers in $T_2$ after a short period of previous interactions with them. Now, it is not easy to account for this change in the dogs' behavior by invoking variations in the relevant perceivable features. After all, in both situations, the handler looks alike and behaves in a friendly way. It seems that what explains the behavioral changes is what the dog has learnt about the handlers through their previous interactions. But, if this is so, it also appears that the dogs are conceptually tracking, or re-identifying, particular humans. Moreover, the variances and invariances of their behavior suggest that they can attribute the same properties to these different humans and form thoughts with modest propositional contents such as *my owner is friendly, the handler is friendly,* or *this stranger is friendly*.

Another interesting corpus of empirical evidence comes from studies of social relationships amongst non-human primates. Numerous primatologists claim that non-human primates establish and maintain well-developed and differentiated social relationships with individual members of their groups [47]. Some benefits of such relationships include selective tolerance around resources, cooperative interactions, mating privileges, agonistic support, protection against external threats, etc. [48,49]. Interestingly, many of these behavioral tendencies are affected by previous interactions between the individuals involved. A clear example of this is reciprocal cooperation. Several studies of apes in captivity indicate that, on some occasions, primate A's willingness to cooperate with B depends on whether B has recently cooperated with A. Thus, Koyama et al. [50] found that chimpanzees were more likely to provide agonistic support to individuals which had recently groomed them. Also, Frans de Waal's studies indicate that captive chimpanzees are more disposed to share food with individuals which have groomed them within the past 90 min [51].

These examples already give the impression that modest propositional contents might be guiding reciprocal cooperation in primates. To further argue in favor of this claim, let us examine one experiment run by Cheney et al. [52]. The study aimed to test whether female baboons' willingness to respond to the call for help of another female is affected by their recent interactions with that individual. The researchers waited until a female baboon groomed another higher-ranked female. Ten minutes afterwards, they made the latter hear the threat grunts of the former (by playing them on hidden loudspeakers). In natural contexts, female baboons usually give threatening grunts to threaten lower-ranking individuals as well as to recruit allies. So, the playback mimicked a situation in which a previous grooming partner solicited the aid of the subject in an agonistic interaction. The experiment had two control conditions. In one of them, the experimenter did not play any threat grunts after the grooming interaction between the female baboons. They just observed the higher-ranked baboons' subsequent behavior to check whether a recent

grooming interaction might motivate them to approach the groomers again, even in the absence of any call for support. In the second control, they played the grunt of the lower-ranked female to the same higher-ranked female, but 10 min after the former had threatened the latter. In this case, the control was designed to test whether any interaction, even an agonistic one, motivated the subjects to respond to another individual's call for help. Researchers found that female baboons respond more to the recruitment calls of another lower-ranked female if the latter has recently groomed them.

According to Cheney et al. [52] these results suggest that female baboons' motivation to support a recent partner is mediated, at least partially, by the nature of a specific recent interaction. In light of our previous discussion, I think that we can also read these results as providing evidence that these animals satisfy the requirements to credit them with modest propositional contents.

To begin with, these baboons do approach other females which have previously groomed them, irrespective of whether they have given a threat grunt or not. Their willingness to approach these females increases only after hearing their threat grunt (that functions as a recruitment call). At the same time, they sometimes respond to threat grunts issued by other conspecifics that have threatened them recently. These two facts suggest that they have a separate capacity to detect threat grunts and treat them as requests for help (even when they are produced by individuals which have interacted with them in different ways).

If the baboons only responded to the threat grunts, one could explain their behavior by positing feature-placing contents. Roughly, one could claim that these primates merely detected and represented a perceivable feature (the sound of the threat grunt) in their immediate environment. But, here, another factor seems to be affecting the baboons' responses: whether, in the recent past, the baboon emitting the grunt has groomed them. Yet, this is not an observable feature in the baboons' immediate environment. Consequently, it is not the kind of factor that advocates of feature-placing representations can naturally incorporate in an account of the baboons' behavior. What seems to be crucially affecting the baboons' responses is information about the grunting baboons that they must have experienced and collected in the past. In other words, somehow, the subjects of the experiment appear to recognize that this baboon which asks for help is the same one which has recently groomed them (or the same one which has been aggressive with them).

If all this is correct, it seems that female baboons can attribute the same property (i.e., *giving a threat grunt*) once and again in different circumstances. But, also, they can differentiate which individual is grunting and how this individual has behaved in the past. Thus, they seem to have some concepts of particulars, some concepts of properties, and the capacity to combine them in thoughts such as *a is grunting*, *b is grunting*, etc.

So far, I have provided only a couple of empirical examples suggesting that, at least in some contexts, several non-human primates and dogs might be using modest propositional contents. However, I think it is likely that a more thorough analysis of empirical evidence will show that we can attribute these contents to many other species. As we have seen above, animals having modest propositional contents must be capable of carving the world into objects that they can track and re-identify in multiple contexts, learning new things about them. They also must be capable of singling out and attributing different properties to these particular objects in different situations. Arguably, these capacities can be of high adaptative value for many non-human species helping them track relevant entities (such as nutritious items of foods, good places to rest, and potential tools) and to collect information about their properties that they can put to use later on, even when those properties are not observable anymore [36]. With these ideas in mind, we can now turn to some additional evidence suggesting that these abilities might be fairly extended in the animal kingdom, including many primates, non-primate mammals, and birds.

In the realm of physical cognition, great apes (bonobos, chimpanzees, and gorillas) [53,54], some other primates (rhesus macaques, capuchin monkeys) [55–58], domestic dogs [54], and chicks [59] not only track the spatio-temporal trajectory of objects but also

use remembered information about their specific properties to individuate them. Hence, in a typical experiment, they look longer or search more often when the object they find at the bottom of a box is not the same one they observed going in. Some studies also suggest that great apes [60,61], capuchin monkeys [62], kea parrots, and New Caledonian crows [63] can learn through active exploration and manipulation about relevant properties of objects and put that information to use, later on, to solve different problems. These data suggest that all these species may have the conceptual capacities required to form (modest) propositional contents: they can re-identify the same particulars once and again and attribute, in different situations, different properties to them.

We can also find evidence of notable abilities to identify and re-identify other conspecifics and to gather and accumulate information about them in various social animals. Several mammal species show complex skills, similar to those of non-human primates, to deal with individual members of their group and keep track of their changing properties. Let us roughly consider two notorious examples: elephants and spotted hyenas [64,65]. Similarly to primates, elephants and spotted hyenas live in complex societies and form close and cooperative relationships with other group members. Both species spend a high amount of time with their kin and frequently direct affiliative behaviors towards them. Both are also highly cooperative. Elephants cooperate with other family members for group defense, resource acquisition, and offspring care. Elephant families can also gather in larger aggregations, such as clans, for purposes such as antipredation, social benefits, and improved mating opportunities. Spotted hyenas frequently cooperate with other group members to defend the clan's territory or their infants against outsider hyenas or lions. They also use help from clan mates while hunting ungulate prey. Both species appear to recognize and remember the identities of the other group members for years. As happens with many primate species, spotted hyena's clans are organized into linear dominance hierarchies, and they seem capable of recognizing and remembering the ranks of other group members. All these impressive similarities suggest that we may also find that these non-primate mammals, similarly to many primates, can form modest propositional contents about different individual members of their groups and their social properties (such as their rank, cooperativeness, etc.).

But this may not be all. Many birds also show impressive social skills. Moreover, some species engage in long-term relationships with a partner interacting cooperatively to raise and protect their offspring. Rooks, for instance, form long-term pairs through reciprocal acts of food-sharing, bill twinning, and allopreening that function to consolidate and strengthen their bond[16]. Once a pair is established, the members behave in distinctive ways, aiding each other in fights, sharing food, offering assistance during agonistic encounters, etc. They also coordinate their behavior, synchronizing their movements, vocalizations, and social displays [67]. These brief remarks suggest that rooks may have some capacity to identify their partners, discriminate them from other birds in their group, accumulate information about their characteristics, and gradually change their behavior towards them because of what they have learnt about them in the past. Presumably, this allows each partner to accurately read the social signs of the other, responding appropriately and maintaining, in this way, a strong partnership with mutual benefits [67] (p. 502). But, then, rooks (and probably other birds that engage in long-term partnerships) may also turn out to be good candidates to possess the kind of conceptual capacities involved in modest propositional thinking[17].

Even though brief and rough, this analysis of empirical evidence gives us reasons to think that some non-human animals' behavioral patterns satisfy the requirements to attribute mental states with modest propositional contents to them. Then, at last, it is possible to give a provisory answer to the question raised at the beginning of this paper. There is, indeed, evidence suggesting that some animals have mental states with (at least) modest propositional contents. Of course, we may also find that some non-human species' behaviors do not satisfy the requirements to attribute such contents to them. In such cases, attributing structured or unstructured feature-placing contents to these animals might be

the better strategy. Mental contents may come in different varieties in the animal kingdom. If this is a promising hypothesis, the remaining task is to keep polishing our theoretical tools and our analysis of empirical examples to understand better this potential diversity.

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## Notes

1  According to Mendelovici [12], there are two ways of understanding the distinction between propositional and non-propositional contents. One option is to take it as a distinction regarding the deep metaphysical nature of these contents. Thus, while propositional contents may consist of sets of possible worlds, structured propositions, etc., non-propositional contents might be composed of other kinds of entities, like objects, sets of features, etc. Alternatively, it can be considered as a distinction about the superficial features of such contents. In this case, a content is propositional if it represents things as being a certain way, whereas, for example, feature-placing contents merely represent some environmental features. Mendelovici recommends understanding the propositional/non-propositional dichotomy in this superficial sense. Following this suggestion, I will focus on the superficial characteristics distinguishing full-blown propositional contents, modest propositional contents, and feature-placing contents.

2  Thus, for example, when thinking a content such as *For all x*: *if Px then Qx*, one is claiming that the property of being $Q$ has a second-order property (i.e., the property of being instantiated by everything that is P). Cf. Hank [19] (p. 87).

3  To give one example, Armstrong [25] (p. 5) proposes to take general beliefs as "habits of inference" or dispositions to move from a belief about a particular matter of fact to another one.

4  Another general difficulty arises when evaluating whether we can legitimately attribute propositional contents to non-human animals. Full-blown (and modest) propositional contents are composed of concepts, so to attribute the former, we need to attribute the latter. However, a long psychological tradition that studies human concepts has usually tied them, theoretically and methodologically, to natural languages [27]. In general, for example, these studies assume that the concepts to be studied correspond to the stock of predicates of our natural languages and frequently test concept possession by leaning on language involving tasks in which subjects are told to categorize objects using linguistic labels, are evaluated on their understanding of sentences, etc. Consequently, these studies are not easy to extrapolate to animal cognition research. Studies on animal concepts still need, to a large extent, the further development of good theoretical frameworks and experimental paradigms to investigate non-linguistic conceptual abilities.

5  Morgan [11] explores the consequences of adopting a deflationary view of propositional contents and points out that those contents can be considered non-conceptual. However, he does not defend the deflationary view. Grzankowski [9] and Searle [7] do not deal with what kind of (conceptual or non-conceptual) constituents can be found in propositional contents.

6  Following Evans [15] and Camp [22], I want to understand concepts in terms of abilities and remain neutral on the relation between these abilities and their representational vehicles. Consequently, throughout this paper, I will use "concepts" and "conceptual abilities" interchangeably to refer to abilities to think about certain things and their properties.

7  Yet, there is another issue to consider. Even if we find compelling evidence that some animals have the relevant conceptual capacities to attribute them modest propositional contents, this will not suffice to establish that they lack full-blown propositional thoughts. For all we know, some animals that satisfy requirements 1 and 2 may also possess some mastery of logical connectors, quantifiers, etc. If new empirical evidence and philosophical arguments indicate that this is the case, we should accept that conclusion. Nevertheless, it still seems to me that we can benefit from focusing first on the more cautious hypothesis that capacities for modest propositional thinking might be fairly extended in the animal kingdom and decide later how to go on from there.

8  Just a caveat: in some situations, some animals' responses might diverge from Camp's general pattern of variances and invariances for different reasons, even if they have structured contents. In particular, in some cases, their behavior may show a rigidity similar to the one found in responses guided by unstructured representational contents. If, for example, C is extremely scared of detecting predator $P_1$ in situation $S_1$ and predator $P_2$ in situation $S_2$, she may respond identically to both of them—running away—even though she can distinguish them. In other words, she may respond in the same way as an animal tokening the same unstructured content—e.g., threatening—in both situations. Based on the argument given above, if we only examine such punctual responses, we would not have reasons to attribute structured contents to creatures similar to C, even though, by hypothesis, she does have them. This does not mean that it is impossible to justify our attributions of structured contents in the case of animals similar to C. Yet, it seems to me that, to find the evidence to do so, we need to examine a larger sample of behavioral patterns. In C's case, we should, for example, observe her responses to scary particulars for longer and in a more comprehensive set of contexts. Ultimately, this strategy should allow us to find the relevant variances in her responses, indicating her capacity to differentiate

between these particulars. Thus, in many complex and messy real-world situations, it will be necessary to attend to these richer, broader and more informative sets of behavioral patterns to find the kind of evidence needed to establish whether an animal has structured contents or not.

9   Some of these authors merely mention the link between concepts of particulars and abilities to re-identify such entities. Others, such as Millikan and Strawson, develop quite elaborate conceptions of re-identification. I will not deal with the differences between these conceptions. Instead, I will focus, leaning heavily on Millikan's work, on delimiting some central and rather undemanding sub-capacities involved in re-identification that can be extended, at least in principle, to non-linguistic animals.

10   The ability to identify and re-identify particulars can come in grades [36]. Thus, some animals may be only capable of tracking a particular, registering its changes, and integrating different information about it as long as they perceive it. However, once it is out of sight, they may be incapable of re-identifying it as the same one anymore. Others may display, in different contexts, weaker or stronger abilities to identify particulars. Human adults, for example, can usually re-identify things over long periods but sometimes, they limit themselves to tracking some objects only while they perceive them. This is what happens when we keep re-identifying the glass that we are drinking from at a party but stop tracking it after the party is over.

11   Here, I am loosely following Millikan's warning against overintellectualizing the capacities to identify and re-identify particulars [36].

12   Although I must use English terms to refer to the animal's concepts, I am not attributing to her exactly our concepts of *edible/inedible*. I am choosing these terms to point out some rough similitudes that I suspect to exist between our concepts of *edible/inedible* and the ones that she uses when fetching/avoiding tomatoes. The same point applies to other attributions of concepts and contents to non-human animals throughout the paper.

13   At this point, some may highlight that a long experimental tradition studying the capacity to categorize objects and events in different non-human animals may provide further evidence of animal concepts. Categorization can be defined as the capacity to group entities into different categories and respond to these categories in the same way [38]. In a typical experimental paradigm, animals are trained to select pictures of objects belonging to a specific category. If, after a training period with a group of pictures, they can sort them appropriately and generalize this sorting response to new stimuli, the researchers conclude that they have acquired the category under study. Adopting a broad notion of concepts, many of these researchers consider these categorization processes to be equivalent to processes of conceptualization [39] and claim that non-human animals can form different kinds of concepts (such as perceptual, functional, and even abstract relational concepts) [38,39]. Now, this broad notion of concept is not the one that can be found in philosophical debates on propositional contents. Consequently, it is not clear that the results from categorization studies are relevant to attribute concepts, understood as the constituents of propositional contents, to animals. It seems to me, for example, that in many perceptual categorization studies, animals might be just responding to bunches of category-relevant features instead of attributing property concepts to particular objects. If this is the case, their behavior may be explained by invoking feature-placing concepts instead of propositional ones. Arguably, things are different in the case of experiments showing that some animals can form more abstract (functional or relational) categories. Since these categories transcend the specific properties of the perceptual stimuli, it seems more difficult to explain the responses of animals merely by positing feature-placing contents. Much more suggestively, the Grey parrot Alex has been trained to respond to queries regarding the shape, color or material of some objects using linguistic labels such as "blue", "red", "wood", "cork", etc. These studies show that Alex can attribute the same properties to different objects and different properties to the same object [34,40]. Thus, Alex seems to have the core abilities required to form modest propositional contents.

14   We can also consider an empirical example based on some ethologists' observations of nut-cracking chimpanzees. Boesch–Achermann and Boesch [41] have extensively observed the nut-cracking behavior of Tai Forest chimpanzees. As they report, chimpanzees open two species of nuts: *Coula edulis*, a soft nut, and *Panda oleosa*, a hard one. To do so, they have to assemble an anvil, a hammer and nuts, and they can use two types of objects as hammers: rocks or tree branches. When searching for the appropriate tool, they choose stones to open harder nuts but settle for branches when they want to open softer ones. Besides, when searching for a stone, they choose among a group of candidates of a given range of weight, the one closest to the tree where they will crack the nuts. All this suggests that, during the whole process, chimpanzees are looking for an object that has the property of being a good tool (to open a specific kind of nut). Also, they seem to flexibly sort appropriate from non-appropriate tools, taking into account their material, weight, distance from the tree, etc. Thus, chimpanzees seem capable of detecting whether stones and branches around them have the features that turn them into good tools. If this is so, they satisfy the requirements proposed here to count as creatures that can attribute a property—such as being a good tool (to open a specific kind of nut)—to some particular pieces of material.

15   Developed by Ainsworth and Wittig [42], this procedure consists of controlled observations of how the subject responds to being placed in an unfamiliar room, introduced to a stranger, and subjected to several short episodes of separation from their owners. The test has been used to study affectional bonds and attachment in human children and other species.

16   Similar findings on jackdaws are reported by von Bayern et al. [66].

17   So far, I have focused on animal species that live in relatively fluid and complex social groups, interacting cooperatively with others, and whose survival depends to a great extent on their social relationships. On many occasions, to behave adaptively, such animals will need to take into account the plastic behavior of their conspecifics in different contexts [68]. Thus, it makes adaptive sense for these animals to have strong capacities to identify other members of their group in a wide range of circumstances and

to deploy previously acquired information about their rank, fighting abilities, social traits, previous behavior, etc. But these capacities to identify individuals and attribute properties to them may vary from species to species, depending on the adaptive problems that they face, the environments they live in, etc. Some species may, for example, be capable of attributing only a few properties to other conspecifics, while others might have richer conceptual repertoires. Some may be capable of identifying other members of their groups but only in specific contexts, for short periods, etc. Some animals may even be capable of successfully discriminating other members of their groups merely by responding rigidly to some specific observable cues. In this last kind of case, I tend to think that we do not need to credit these animals with modest propositional contents. However, since I favor a gradualist view of conceptual capacities, I am inclined to think that we may still be justified in attributing modest propositional contents to many other animals with more limited social abilities than the ones discussed so far

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