

# What Is It Like To Be An Ant Colony?

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## Composite Organisms and Composite Consciousness

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# Outline

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1. Mapping out some questions about consciousness in eusocial insect colonies
2. Arguing against 'anti-nesting' principles
3. Shared experiences and divergent structure

# Who is this talk about?

Eusocial insect colonies:

- Almost all ants
- All termites
- Many bees
- Some wasps



(Also, apparently, one weevil and some aphid and thrips species, who form colonies inside tree trunks and galls.)



(Eusocial non-insects include naked mole rats, and apparently some shrimp.)

(But I'll focus on ants, termites, bees, and wasps.)



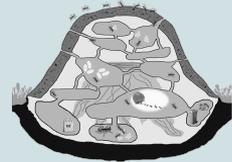
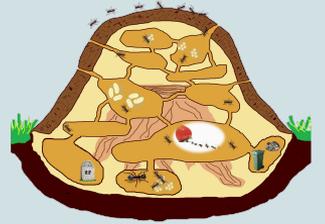
# Section 1: Mapping Out Questions

Title Question: *What is it like to be an ant colony?*

Preliminary Question: *Is there something it's like to be an ant colony?*

This in turn depends on three subsidiary questions:

1. *Are individual ants conscious?*  
(Individual-Qualification Question)
2. *Is the structure of an ant colony sufficient for consciousness?*  
(Group-Qualification Question)
3. *Does being made of ants stop the colony being conscious?*  
(Disqualification Question)



**DISQUALIFIED**

# Section 1: Mapping Out Questions

1. *Are individual ants conscious?*  
(Individual-Qualification Question)



This is partly a conceptual/metaphysical question:

- 1a. *What sort of capacities (cognitive, sensory, behavioural, etc.) does consciousness require?*



It's also partly an empirical question:

- 1b. *What sort of capacities (cognitive, sensory, behavioural, etc.) do ants have?*

Question 1a. probably can't be decisively answered at present  
(cf. Schwitzgebel, three weeks ago)

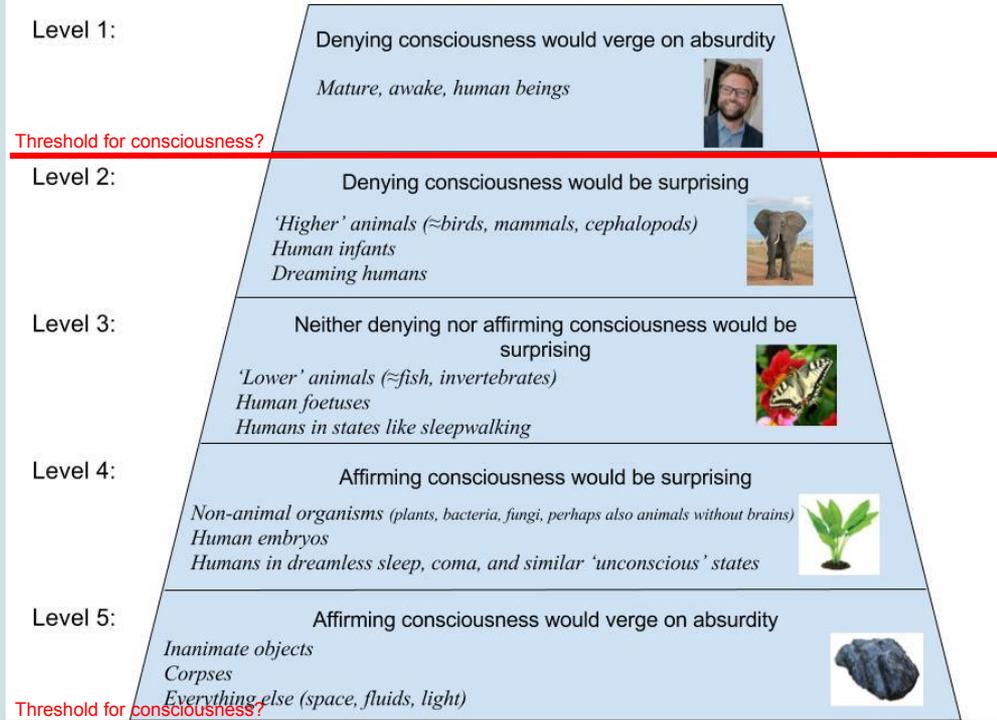


# Section 1: Mapping Out Questions

Intuition suggests a rough ranking of entities by their likelihood of being conscious.

But plausible views of consciousness put the threshold in wildly different places.

Not clear how we decide between them without begging the question.



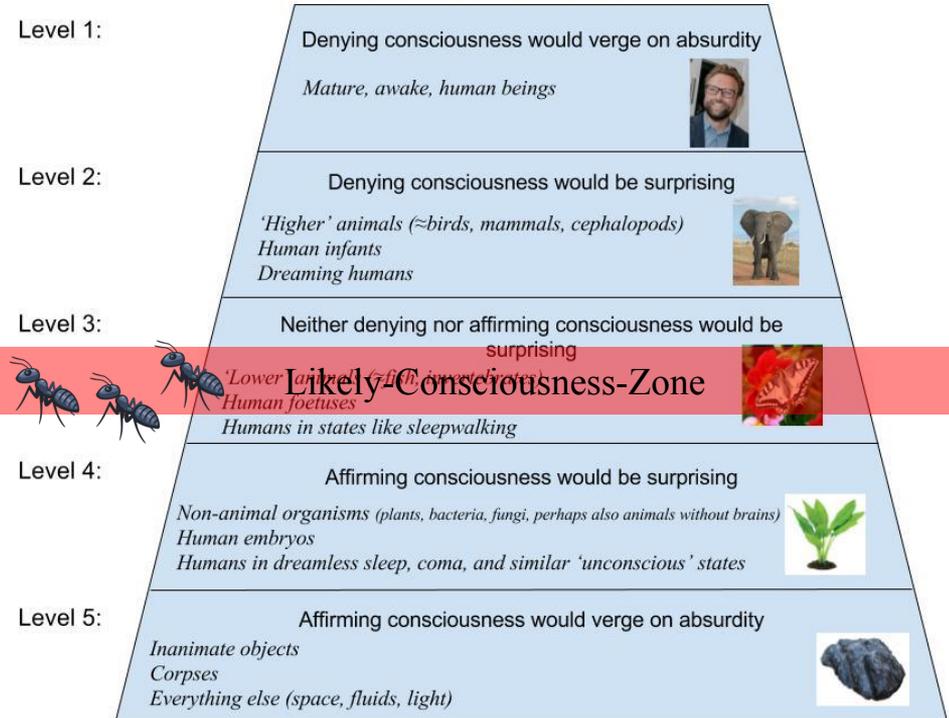
# Section 1: Mapping Out Questions

But ant consciousness does not seem unlikely.

The most plausible thresholds tend to be somewhere in level 3.

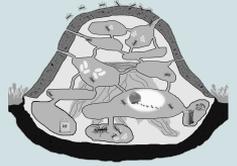
Here's a position that affirms insect consciousness (Klein and Barron 2016, Merker 2005, 2007):

Mobility and Integration: Mobile organisms that integrate sensory and interoceptive information into a single spatial model that can guide action selection are conscious.



# Section 1: Mapping Out Questions

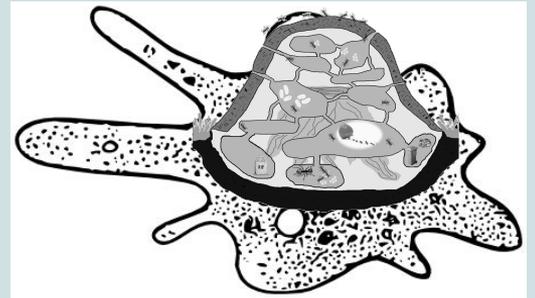
2. *Is the structure of an ant colony sufficient for consciousness?*  
(Group-Qualification Question)



We can consider a ‘proxy question’ here by considering creatures called ‘Alternative Antheads’ (inspired by the ‘Antarean Antheads’ in Schwitzgebel 2015):

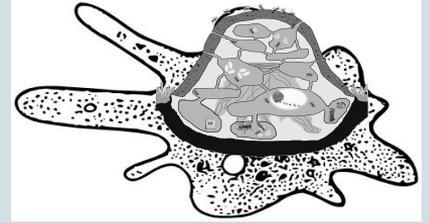
Alternative Antheads: Unitary organisms whose brain is a functional replica of an ant colony.

To make the Anthead’s brain, take all the ganglia of the ants in a colony, put them in a skull together; provide neural connections that replicate the sensory and motor interactions among ants; provide connections to the environment via. sense-organs and muscles that replicate the interactions between the ants and their environment.



# Section 1: Mapping Out Questions

Proxy Question: *Would an Alternative Anthed be conscious?*



Partly an empirical question:

*2a. What sort of capacities (cognitive, sensory, behavioural, etc.) do ant colonies have?*

Partly the same conceptual/metaphysical question as before:

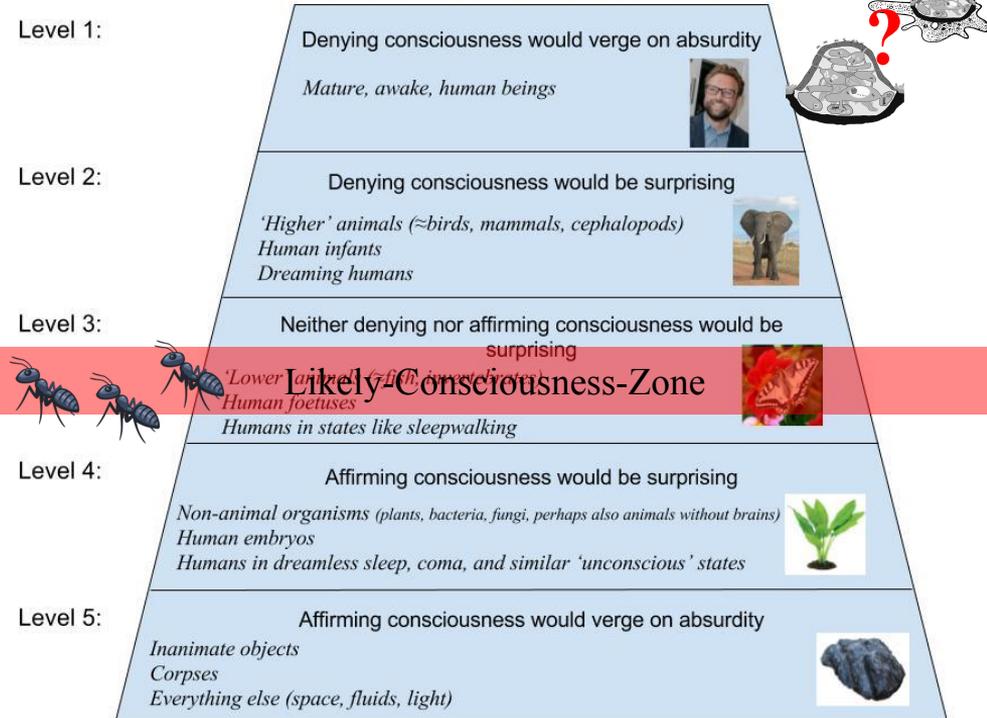
*1a. What sort of capacities (cognitive, sensory, behavioural, etc.) does consciousness require?*

# Section 1: Mapping Out Questions

Back to the consciousness-probability scale!

Analogy between brains and ant colonies is popular but speculative (e.g. Hofstadter 1982, Bonabeau 2010, Kawamleh 2017).

Not obvious whether ant-colony-structure is **more** or **less** consciousness-apt than ant-ganglion-structure.



# Section 1: Mapping Out Questions

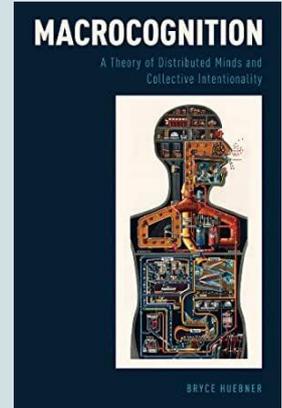
Huebner 2014 discusses collective cognition, and takes a mixed view of eusocial insects:

- Termites building nests *don't* exhibit group cognition, because their (pheromone-based) interactions are too simple to be called representations.
- Honeybees dancing *do*, because they are exchanging informative representations.



He concludes that honeybee colonies are collective minds.

(Cf. Seeley 1992, 1995, 2003)



# Section 1: Mapping Out Questions

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Ant foraging is more like the former, not the latter, so maybe not macrocognition.

(The current consensus is that ants do not exchange rich information about food sources, though see Reznikova and Ryanko, 1994, 2011 for disagreement.)

But other colony-level activities might qualify (e.g. change their patterns of contact and interaction to minimise disease transmission, Stroeymeyt et al. 2018).

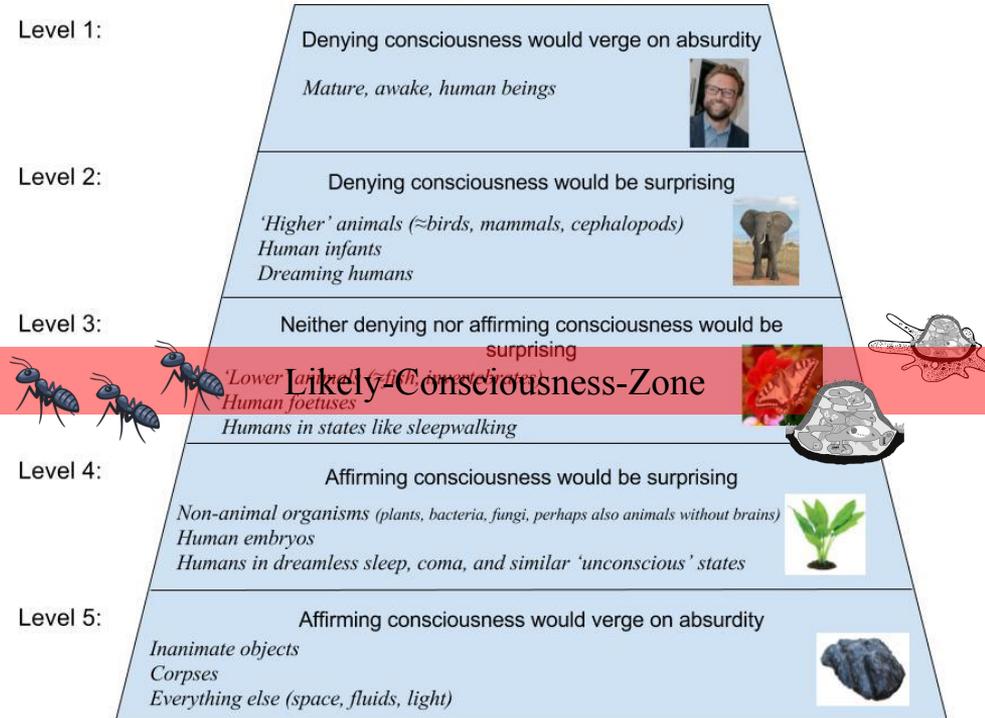
# Section 1: Mapping Out Questions

Suppose ant colonies, like bee colonies, are cognitive systems.

They are in a sense ‘mobile’ (they coordinate movement through space).

Do they integrate ‘sensory information’ to guide ‘action selection’?

If so, plausibly they have the right structure for consciousness.



# Section 1: Mapping Out Questions

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3. *Does being made of ants stop the colony being conscious?*  
(Disqualification Question)

**DISQUALIFIED**

Maybe the Alternative Anthed *would* be conscious, but actual ant colonies are not, because something ‘disqualifies’ them. There are three particular candidates:

*3a. Is being spatially scattered incompatible with consciousness?*

*3b. Is being made of multiple organisms incompatible with consciousness?*

*3c. Is being made of multiple conscious beings incompatible with consciousness?*  
(‘Anti-Nesting Principle’, Schwitzgebel 2015, p. 1702)

# Section 1: Mapping Out Questions

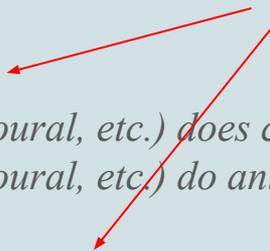
Title Question:

*What is it like to be an ant colony?*

Preliminary Question:

*Is there something it's like to be an ant colony?*

I won't defend any definite answer to questions 1 and 2



1. *Are individual ants conscious?*

*1a. What sort of capacities (cognitive, sensory, behavioural, etc.) does consciousness require?*

*1b. What sort of capacities (cognitive, sensory, behavioural, etc.) do ants have?*

2. *Is the structure of an ant colony sufficient for consciousness?*

*(Proxy Question: Would an Alternative Anthed be conscious?)*

*2a. What sort of capacities (cognitive, sensory, behavioural, etc.) do ant colonies have?*

3. *Does being made of ants stop the colony being conscious?*

*3a. Is being spatially scattered incompatible with consciousness?*

*3b. Is being made of multiple organisms incompatible with consciousness?*

*3c. Is being made of multiple conscious beings incompatible with consciousness?*

My aim is to argue 'no' on question 3, particularly 3c.

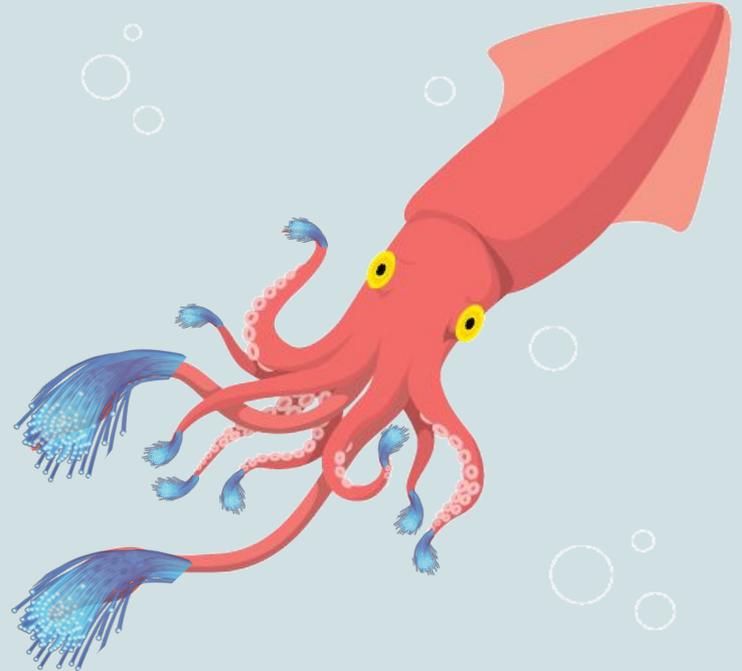
## Section 2: Against Anti-Nesting

*3a. Is being spatially scattered incompatible with consciousness?*

(Cf. Barnett 2008, Madden 2012, Schwitzgebel 2015)

Three reasons to say ‘no’:

- No obvious relevance
- Everything is spatially scattered, because ‘contact’ is a matter of degree
- Implausible implications regarding Eric’s ‘Sirian Supersquid’:



## Section 2: Against Anti-Nesting

*3b. Is being made of multiple organisms incompatible with consciousness?*

(Cf. Van Inwagen 1990, Varela et al. 1991)

Three reasons to say ‘no’:

- An essential connection between consciousness and biology is a minority position
- Why can't organisms themselves be nested?
- We may be nested organisms ourselves



## Section 2: Against Anti-Nesting

*3c. Is being made of multiple conscious beings incompatible with consciousness?*

(Cf. Putnam 1965, Tononi 2012, Schwitzgebel 2015, Kammerer 2015, Mørch 2019)

Three reasons to say ‘no’:

- Most properties admit of nesting - why not consciousness?
- Risks extrinsic zombification
- Implausible implications for Eric’s ‘Antarean Antheads’:



## Section 2: Against Anti-Nesting

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Are there compelling reasons to accept Anti-Nesting?

Argument: We need anti-nesting to avoid an implausible multiplication of minds.

(Consider car-with-human-inside)

But this can be avoided by focusing on the minimal sufficient basis for a given set of mental states.

No ant is sufficient for the colony's cognition, so this won't rule out colony consciousness.

## Section 2: Against Anti-Nesting

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Are there compelling reasons to accept Anti-Nesting?

Alternative argument (from Tononi 2012):

- Consciousness at multiple levels violates Ockham's razor
- Consciousness at higher levels will be epiphenomenal

But why aren't these problems for other properties?

(I suggest: unarticulated assumptions about the metaphysics of consciousness)

## Section 3: Shared Experiences and Divergent Structure

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Critics of collective consciousness often worry about ‘ontological extravagance’.

Why is multi-level consciousness, specifically, extravagant?

My hunch:

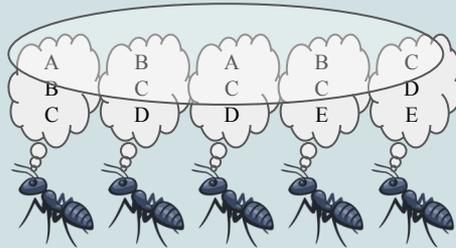
- For most multi-level properties, the whole’s property is composed of properties shared with the parts.  
=> Hence no unparsimonious ‘addition’.
- Consciousness is often taken to be ‘exclusive’, not amenable to sharing.  
=> Hence any extra consciousness is something new and extravagant

## Section 3: Shared Experiences and Divergent Structure

We should reject the ‘exclusivity’ of consciousness (see Goff and Roelofs Forthcoming).

When a phenomenal state supervenes on a physical basis that is part of two systems, it can belong to both (cf. Sutton 2014).

- A colony’s consciousness depends largely on (interacting) ant ganglia
- Each ant’s consciousness depends largely on its ganglia
- Hence most of the colony’s experiences will be experiences of individual ants



# Section 3: Shared Experiences and Divergent Structure

Does it follow that:

What it's like to be an ant colony = what it's like to be an ant?

No.



- Only some ant experience is shared
- Having lots of experiences feels different from having a few
- Experiential structure is likely to be different

## Section 3: Shared Experiences and Divergent Structure

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What is experiential structure? Good question!

- It seems that our consciousness at a moment is a structured whole with multiple elements.
- If individual ant minds provide the ‘elements’ of the colony’s mind, what ‘structure’ are they arranged in?
- The structure should reflect the flow of information between ants.
- This implies a large divergence of experiential structure, despite the shared elements.
- Making sense of such sharing-with-divergence is challenging but interesting (Cf. Lee 2019, Roelofs 2019)

# Section 3: Shared Experiences and Divergent Structure

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## Conclusion:

If both ants and ant colonies are conscious, their consciousnesses probably display:

- Shared experiences
- Divergent structure

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