

# Mental Maps, Representations, and Skeptical Worries

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# The Problem:

- ▶ If we want to completely understand any other minds, it seems we need an account of their subjective experience.
- ▶ There are classic philosophical arguments meant to show that at least some of this subjective information is unknowable by an outside source for even other humans.
- ▶ How are we to get around these concerns if we want to study animal minds?

# The Plan:

## Step 1: Case Study.

Analyze some experiments about mapping focusing on claims about the animals' subjective states (that either are stated directly or can be implied from their study). For this project, I will focus on questions about how/whether the animal represents various relevant features of the world.

# The Plan:

Step 2: A Bit More Analysis.

Compare the cases with Dennett's Intentional Stance and Morgan's Canon. Everyone seems to be in agreement: attribute a lower mental ability if you can.

# The Plan:

## Step 3: A Problem

Perhaps when we use this rule, we are confusing an epistemological point for a metaphysical one. Our theories about what we can know may be getting in the way of our theories about what exists.

# Case Studies

Tolman, Shettleworth, and Clayton, Emery, and Dickenson all make claims about the internal states of the animals they study.



# Tolman [1948]

## “Cognitive Maps in Rats and Men”

- ▶ Tolman wanted to argue that his rats had cognitive maps (representations of the various problems he set up for them).
- ▶ The basic idea is that the rats were innocent of having a cognitive map until proven otherwise.
- ▶ Once Tolman had behavior that he thought was novel enough, he came to the conclusion that his rats did have mental maps.

# Shettleworth [2002]

## “Spatial Behavior, Food Storing, and the Modular Mind

- ▶ Shettleworth’s project tells us that black-capped chickadees have the impressive abilities to find stored food after long periods of time based on spatial memory.
- ▶ She is more skeptical of her rats having cognitive maps: “fascinating natural behavior like storing and retrieving can be studied while remaining at best agnostic about the nature of the animals’ possible awareness.”
- ▶ In other words, her birds have not behaved in any way that has forced her to make any claims about their mental states.



# Clayton, Emery, and Dickenson

## “The Rationality of Animal Memory: Complex Caching Strategies of Western Scrub Jays”

The jays' behavior is so complex that they are lead to believe that “The jay’s behaviour is psychologically rational to the extent that it is caused by the interaction of a belief and desire in such a way that performance of the behaviour in question fulfils the desire if the belief is true (and fails to do so if the belief is false). Such an account is intentional because it requires that the antecedent mental states, the belief and the desire, have intentional properties, such as truth and fulfillment, because their content represents current or desired states of affairs.”

# In Case It Isn't Obvious Yet

- ▶ The name of the game appears to be “we only attribute representations when the evidence makes us.”
- ▶ This is the case whether the researcher wants to prove that there are representations (Tolman and Clayton et al.) or argue against it (Shettleworth).
- ▶ Sound familiar?

# Morgan's Canon

- ▶ “In no case may we interpret an action as the outcome of the exercise of a higher psychical faculty, if it can be interpreted as the outcome of the exercise of one which stands lower in the psychological scale.”
- ▶ This is what our studies have done so far: hold back on attributing higher mental states unless the facts lead them to deny that something lower could be at work.

# Dennett's Intentional Stance

“One adopts the strategy of treating the systems in question as intentional systems, approximations of rational agents, to whom one attributes beliefs, desires, and enough rationality to choose the actions that are likely to fulfill their desires given the truth of their beliefs. We all adopt the intentional stance towards our friends and relatives and other human beings, but one can also get results by adopting the stance when designing or diagnosing certain artifacts - typically computer systems - and when studying the behavior of non-human animals.”

# What does it do for us?

When one uses the I.S.:

“One says to oneself, in effect: “Now if these animals really believed such-and-such and really desired such-and-such, they would have to believe (desire, intend, expect, fear) such-and-such as well. Do they?” It is the intentional stance’s rationality assumption that generates the consequent to be tested. Such an exercise can help uncover particular aspects of falling-short, particular hidden cheap shortcuts in the design, and help explain otherwise baffling anomalies in an animal’s behavior.”

# In other words...

- ▶ We take a stab at a level of intentionality for a system (animal, computer, etc.), and then experiment to see if the system is at that level.
- ▶ Think of the Intentional Stance as a process that helps us zero in on the level of intentionality of the system in question.

# All Together Now!

There is a connection between the subjective experiences and outward behavior of the systems we are studying, if a system's behavior can be described by a lower mental ability, then that mental ability is what is going on in the mind of the system (or lack thereof).

# The Worry

I fear that we are confusing an epistemological point with a metaphysical one (or at least, using an epistemological strategy to come to metaphysical conclusions), by the assumption that we know that a certain behavior accords with a certain internal state. Just because we attribute lower mental states when possible, it doesn't follow that those lower states are actually occurring.

On a side note, Dennett's complete view of consciousness, this isn't a problem, but his view raises some of its own problematic conclusions.



# The Worry

- ▶ For instance, it is said that if rats or birds can solve novel problems, then they have cognitive maps. If they can't, then what? Does this mean they don't have mental representations? Isn't it possible that they have the maps but not be able to use them (either because of some processing problem or because it is used for something else)?
- ▶ How would we test for this and other related problems?
- ▶ While we ponder this, it is time to set up some...

# Sea Turtles Facts!

## From “Regional Magnetic Fields as Navigational Markers for Sea Turtles” [Lohmann 2001]

“Hatchling loggerhead sea turtles (*Caretta caretta*) from eastern Florida begin a long-distance migration immediately after entering the sea. Turtles swim from the Florida coast to the North Atlantic gyre, the circular current system surrounding the Sargasso Sea, and remain within the gyre for a period of years. During this time, they gradually migrate around the Atlantic before returning to the North American coast.”

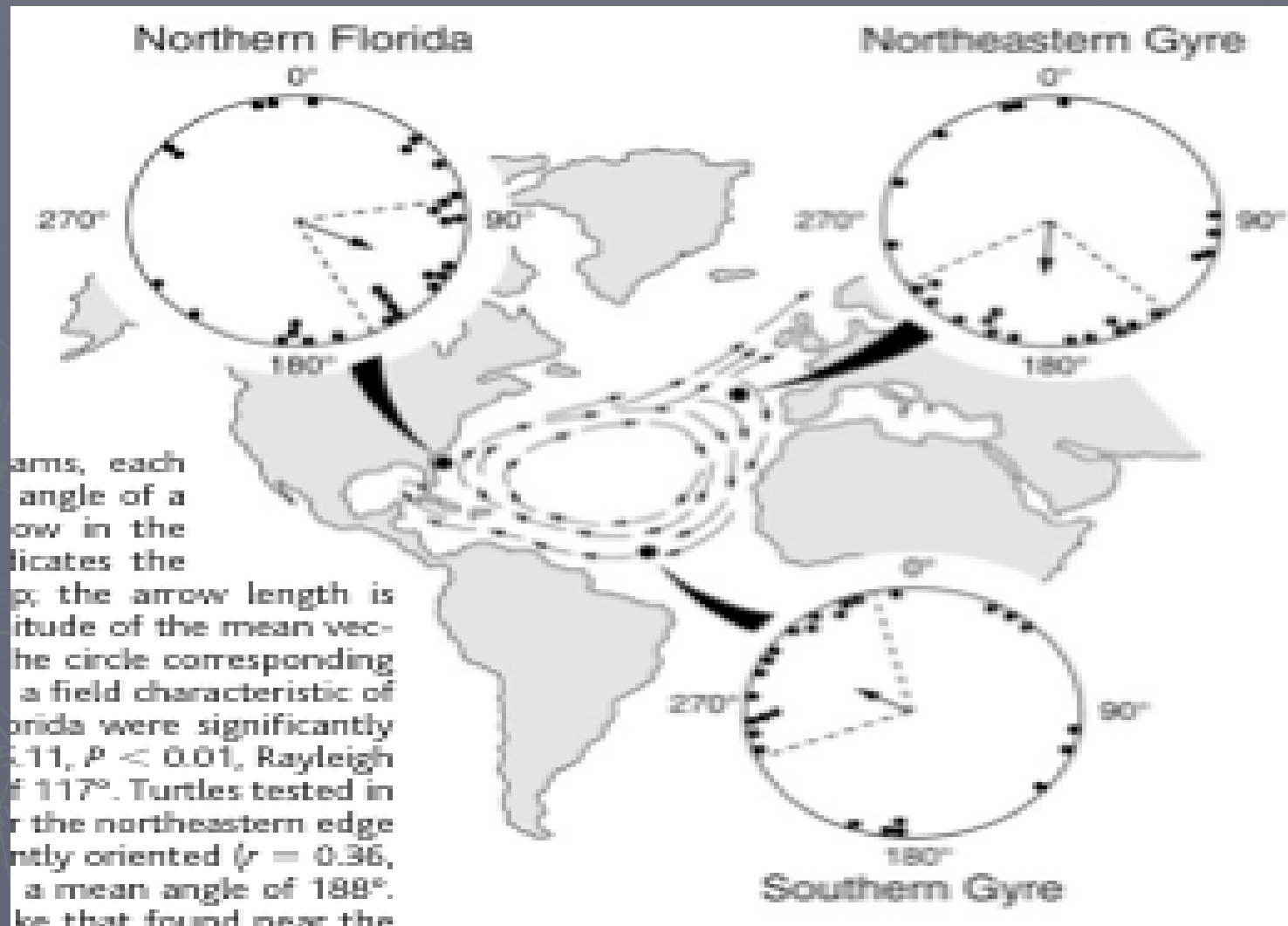
# Sea Turtle Facts!

- ▶ They return to the same beach that they were born at after swimming this incredible distance.
- ▶ How do they do this? “Previous experiments have shown that hatchling loggerheads can detect magnetic inclination angle and field intensity, two geomagnetic features that vary across Earth’s surface and could, in principle, provide positional information to a migrating turtle.”

# The Experiment

- ▶ Catch the turtles.
- ▶ Put them in a kiddie pool and tie them to a harness that is attached to a computer that monitors which direction they swim.
- ▶ Zap them with a magnetic field that corresponds with some dangerous portion of the gyre.
- ▶ See if they swim to safety.

# The Results (They do!)



# Discussion:

So what do these results tell us about the internal states of the sea turtles?



# Discussion

Lohmann gives us two options:

- (2) The turtles have a magnetic map that enables them to continuously approximate their position anywhere in the North Atlantic.
- (3) The turtles have innate programming to swim in a specific direction according to the appropriate stimulus. The turtles have no real conception of their geographic position and are without the ability to determine their position relative to a goal.

# Lohmann's First Option: The Magnetic Map

- ▶ On this view, the turtles' behavior is explained by a mental representation of the Atlantic, based on their ability to perceive magnetic fields.
- ▶ This magnetic perception forms a layout of where they need to go according to where they are.



# Lohmann's Second Option: Stimulus-Response

This option can be split into two.



# Lohmann's Second Option: Stimulus-Response Magnetic Compass/Strip-Map

- ▶ Their magnetic perception tells them to head towards a specific direction.
- ▶ There is no sense of position, goal, or ocean layout, but there is a “representation” of the proper direction to swim in.

# Lohmann's Second Option: Stimulus-Response Strict Stimulus-Response

- ▶ The turtles have no representations of the Atlantic, their path, or the proper direction to swim in.
- ▶ They are the equivalent of philosophical zombies swimming mechanically around the ocean.

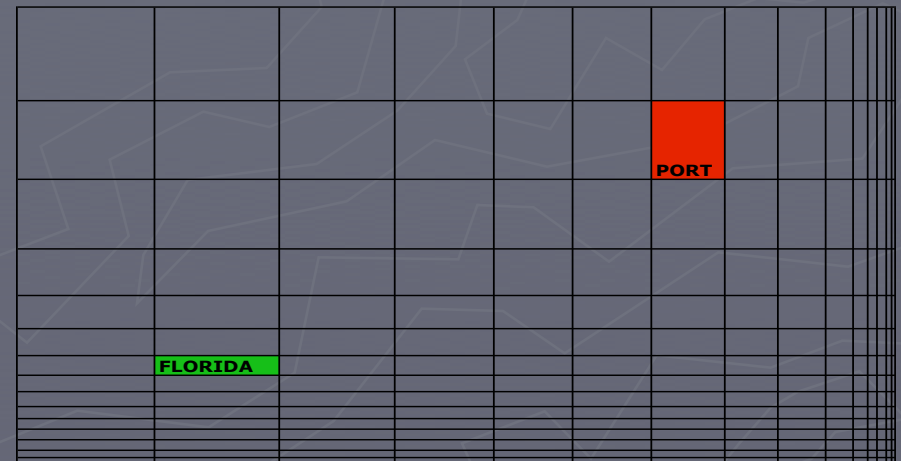
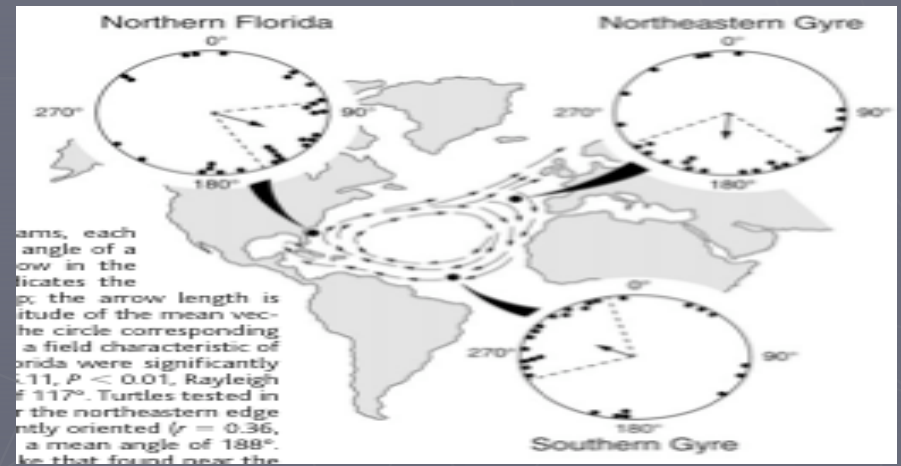
# The Trip So Far...

- ▶ We have three ways that we can explain the turtles' behavior: (1) cognitive maps, (2) strip-maps, or (3) strict stimulus response.
- ▶ The big question is: how can we figure out what is going on inside their head when each explanation works for the behavior?

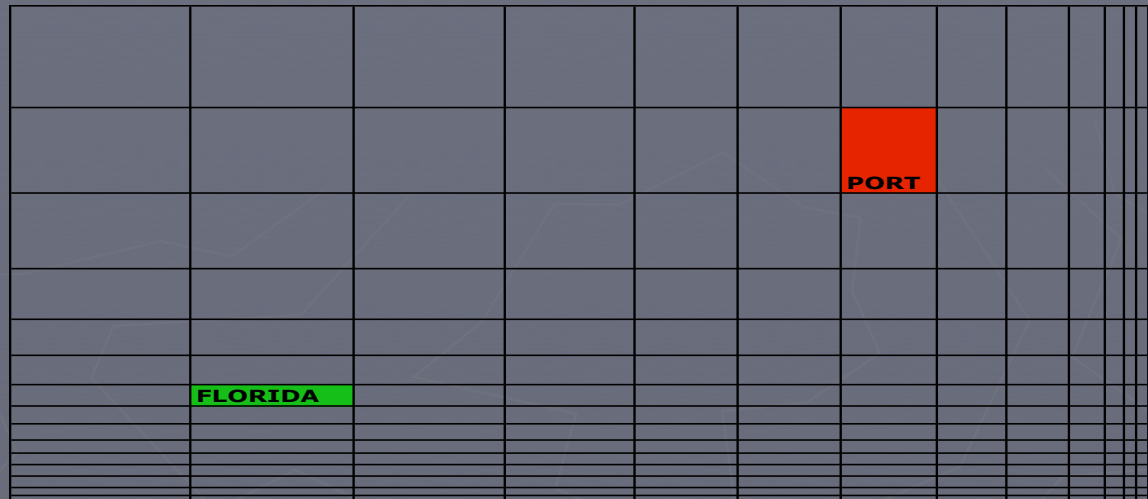
# Confused?

## Let's think about it visually.

- ▶ Instead of the Atlantic with lines of magnetic fields, think of a big room with lines that increase or decrease as they move from North to South and East to West.
- ▶ The green and red square represent the relevant end points of a particular creature's migration across the room.

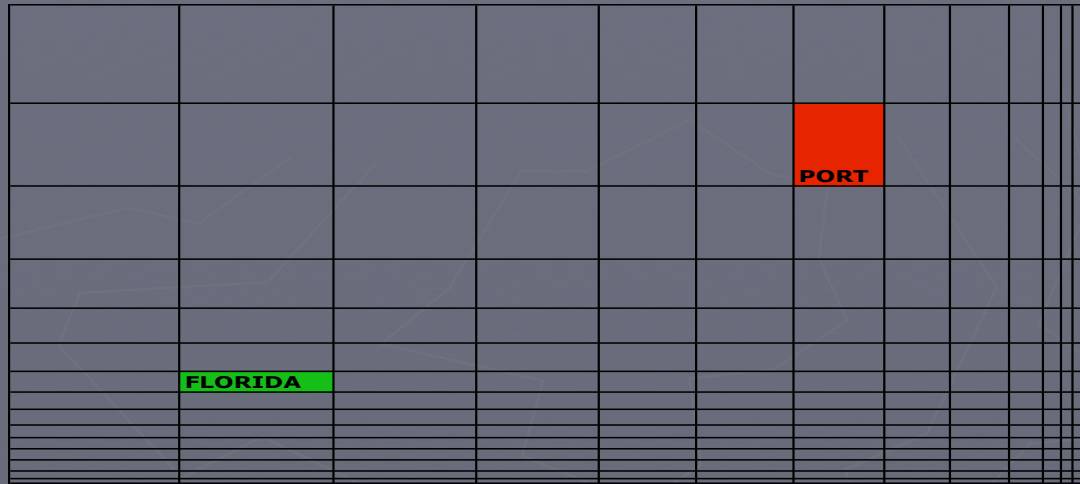


# Our Visual Metaphor



- ▶ The creature can perceive these lines, but not the colored squares.
- ▶ Not only can this creature get back and forth from the exact same squares, if we were to abduct it on route from (for example) green to red and move it to a different part of the room, it would head in a new and efficient vector towards the red square.

# Our Visual Metaphor



How is our fictional creature doing this? Like the turtles, it either:

- (1) has a cognitive map [a full representation of the room]
- (2) has a strip-map [a “representation” of the proper direction]
- (3) simply follows stimulus-response [some automatic algorithm]

How could we tell which one of the three it has (assuming that we couldn't talk with it)?

# In Other Words...

- ▶ We know the layout of the world and what the creature can perceive in the world.
- ▶ We know what its behavior will be according to these two factors.
- ▶ What knowledge could we add to these facts to help us figure out what is going in its mind?



# Deciding on Levels of Mapping Empirical Solutions?

- ▶ This could be an empirical matter, but I have been having a hard time coming up with an experiment that would prove to us whether and what type of representation the turtles have.
- ▶ That the turtles can get home from novel places could be accounted for with each level.

# For example...

- ▶ **Strict Stimulus-response:** The turtles are mindless calculators that use some mathematical equation that enables them to move from “the green box to the red one.”
- ▶ **Strip-Map:** The turtles perceive the “squares” around them and make a decision about which direction to go because of their “directional representation”.
- ▶ **Cognitive Map:** The turtles perceive the “squares” that are around them and make a decision about which direction to go because of their mental representation of their world.

# So now what?

- ▶ Can we think of an experiment that would eliminate one or more of these options?
- ▶ If we can't, then where do we go from here?



# Deciding on Levels of Mapping Morgan's Solution

As Sober pointed out, there are a few ways to interpret Morgan's Canon, but none of them help us out of this problem.



# Morgan's Solution: The Historical Interpretation

- ▶ On this interpretation, Morgan's Canon is a warning: Be careful not to attribute a higher level of mental ability haphazardly.
- ▶ This doesn't help us choose between our three options at all (assuming we have been careful).

# Morgan's Canon

## The Occam's Razor Interpretation

- ▶ On this interpretation, Morgan's Canon says something like: All things being equal, attribute a lower mental ability than a higher one.
- ▶ Sober does a good job of knocking down this interpretation.

# Morgan's Canon

## The Modern Interpretation

- ▶ On this interpretation, Morgan's Canon tells us to take the lower explanation because it doesn't require us to talk about scary and dualist-sounding mind talk.
- ▶ Even if this were true, this doesn't get us to any metaphysical conclusions, instead it would guide our epistemological considerations.
- ▶ (“Stay away from the mind!”). Why?

# Deciding on Levels of Mapping

## Dennett's Solution

Dennett would have two solutions:

- (2) Apply the Intentional Stance and see what other experiments we have to run.
- (3) Deny that there is anything subjective going on in the mind of the turtle.



# Dennett's Solution

## The Intentional Stance

- ▶ Use the Intentional Stance to figure out further experiments.
- ▶ Again, I just don't see how to conduct any further informative studies of the turtles.  
(Hopefully someone else does.)

# Dennett's Solution

## Instrumentalism

- ▶ Just deny that there is anything that there is any subjective experience in the turtle.
- ▶ “If you want to know the deep, objective truth about the contents of animal minds, then either you are curious about the actual design of their brains, and the rationale of that design or you just want to know the most predictive intentional stance characterization of the animal, with all its idealizations. If you think there is another, deeper sort of fact about animal minds, then the intentional stance won't help you find it - but then nothing will, since if that is your curiosity, you are no longer doing the cognitive science of wild animals; you are on a wild goose chase.”

# Dennett's Solution

## Instrumentalism

- ▶ This does solve the problem, but it assumes a major point: that animals have no subjective experiences.
- ▶ So the worry that we don't know how the turtles' behavior links up with mental states is shouldn't be. There is no link because there are no mental states.
- ▶ But if we don't accept Dennett's arguments that there are no subjective experiences (which I have neither the time nor the knowledge to present on), then we still have our problem.

# Um... So where are we?

- ▶ We have a particular phenomena that can be adequately described by three different levels of mental ability.
- ▶ More experimenting, Morgan's Canon, and the Intentional Stance can't help us choose between these three options.
- ▶ What happened?

# My Guesses

There are a couple of reasons why I believe that this problem occurs:

- (A) We have been assuming that we have to choose one level of description to describe the behavior.
- (B) There is a bigger gap between behavior (stuff that we can see) and mental occurrences (stuff that we can't) due to skeptical worries.

# (A) Levels of Description

- ▶ If we link what we can empirically test to mental states, it seems that we can only choose one of Lohmann's options. After all, either something in particular is going on in the turtles' mind (options 1 or 2) or nothing is (3).
- ▶ The first question is why can't all three be going on inside of the turtle? It seems possible that all three are happening at some level inside the turtle.
- ▶ Though we have to keep in mind that this is a possibility, can we have proof that all three are in fact going on?

# (A) Levels of Description

- ▶ We have another option: keep our theorizing in the epistemological realm, then we can utilize any or all of these explanations to predict or describe the turtles' behavior.
- ▶ This way, we get many potentially fruitful ways of analyzing the organism in question.

# The Problem with (A)

- ▶ We aren't making any claims about the organisms' inner states, we are describing them (in a Dennett-like move) *as if* they have these inner states for the purposes of predicting or describing their behavior.
- ▶ This is different than Dennett, though, because he seems to want to make us choose a level of description.
- ▶ What if we aren't satisfied with only these epistemological attributions? What do we do if we want to know what is going on in the mind of our organisms?



## (B) Skeptical Worries

- ▶ The bland philosophical worry: We have never seen another's subjective experience, so how do we know that a certain behavior matches up with a particular experience?
- ▶ Surely anatomy can help; the comparisons between the physical structures and behavior could lead us to some views about animal minds that we can be fairly certain about.

## (B) Skeptical Worries

- ▶ But, we know relatively little about how our cognitive systems [insert your favorite mind/brain relationship theory here] our minds.
- ▶ We do know that certain structures are somehow correlated with certain mental experiences, we don't know what the nature of that correlation is.
- ▶ It seems the further we go from behavior and anatomy like ours, the weaker the assumption that an organism has this this correlation becomes.

# Wrap Up

- ▶ Searle's Chinese Room
- ▶ Why this doesn't seem to be a problem for rats, but it is for turtles

