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## **The Intentionality of Plover Cognitive States**

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### **Abstract**

This paper attempts to clarify and justify the attribution of mental states to animals by focusing on two different conceptions of intentionality: instrumentalist and realist. I use each of these general views to interpret and discuss the behavior and cognitive states of piping plovers in order to provide a substantive way to frame the question of animal minds. I argue that attributing mental states to plovers is warranted for instrumentalists insofar as it is warranted for similar human behavior. For realists about intentionality, the complexity, adaptability and flexibility of the plovers' behavior, along with its ability to utilize the content of its representations and to satisfy the conditions of concept attribution, justifies attributing intentionality to plovers. Getting clearer on what is meant by animal minds, provides a better idea of what to look for in animal behavior. In many respects, investigating such phenomena is similar to investigations in other sciences.

## 1. Introduction

Interpreting the causes of animal behavior presents difficult problems to the animal observer.

One of those problems is determining whether the animal's behavior is the result of psychological states or nonpsychological states. In the 17<sup>th</sup> century Rene Descartes argued that animals are mechanisms and probably do not think in any sense, as evidenced by the fact that they do not possess anything like human language. More recently, Donald Davidson (1982) has argued that since having beliefs depends on having concepts and speech, and since animals are not speakers or interpreters of a language, animals do not have thoughts. Amongst some animal scientists such as comparative psychologists there is a reluctance to attribute mental states generally to animals. Some, such as Heyes and Dickinson (1990) and Wynne (2001), even argue that this should be avoided. The famous biologist G.C. Williams (1992) suggests that the mental be left out of biology entirely. The following quote from Patrick Colgan's *Animal Motivation* (1989) puts forward this very idea.

The central defect of mentalism is the admitted non-translatability of intentional terms into behavioural terms. There can be no historical doubt that behaviourism has advanced ethology as a science, whereas the methods advocated by cognitivists have yet to prove their worth. Until mental concepts are clarified and their need justified by convincing data, cognitive ethology is no advance over the anecdotalism and anthropomorphism which characterized interest in animal behaviour a century ago, and thus should be eschewed. (Colgan 1989, 67)

This puts ethologists, and cognitive ethologists in particular, into an uncomfortable position since, at least for cognitive ethologists, it is their goal to provide accounts of animal behavior in

terms of both ultimate and proximate mechanisms where many of the proximate mechanisms are assumed to be cognitive ones. In this paper I take up the challenge to better clarify and justify the attribution of mental terms to nonhuman animals.

In particular, I present Carolyn Ristau's experiments on piping plovers (1991). I suggest that there are different approaches to the problem of whether plovers have minds depending on whether one is a realist or an anti-realist regarding intentional states. If one is an anti-realist, one can either refuse to use intentional terms altogether or one can employ them in certain types of descriptions of behavior. If one refuses to use them, then the case is closed and they will not use them in regards to plovers. If one does use them, then every reason we have for using them in human scenarios similar to the plover scenarios carries over, and plovers, in a sense, have minds. If one is a realist and naturalistically minded, then one will likely adopt a representational theory of mind. On this view, given the complexity, adaptability and flexibility of the plovers' behavior, along with its ability to utilize the content of its representations and to satisfy the conditions of concept attribution, one is justified in attributing intentionality to plovers. I begin with a brief description of the concept of intentionality before moving on to Ristau's studies. I will have more to say about the concept of intentionality in sections 4 and 5.

## **2. Intentionality**

Intentionality is a key characteristic of mental states. Generally, it refers to the fact that mental states are directed at things or are about things. For example, the hope that the party will turn out well, is a mental state (hope) about how the party will come off. The hope is directed at a future state of affairs.

Intentional states are typically taken to have at least three important qualities (see, for example, Cling 1991). One, they have an aboutness. As mentioned above, mental states are directed at or are about things/states of affairs. Two, they are representational, i.e. they represent something to be the case. The representational feature of intentional states includes the notion of content, where the content of the representation is what the representation is about and is taken to refer to things in the world. The content of a representation is typically held to be made up of concepts that the subject possesses, and in its being directed at the world, can be either true or false about the world. The hope about the party turning out well has the content “the party turns out well.” This represents the world as being such that the party turns out well. More specifically, as a hope, it is the projection of this state of affairs into the future, and it may turn out to be a false projection of the future state of affairs since the party may not turn out well. A third crucial feature of intentional states is the particular specificity of the content of the state. The specificity characteristic refers to the fact that not all substitutions of co-referential terms or of logically equivalent statements can be made in the context of an intentional state and yet maintain the truth value or specific content of the state. The belief that there is too much salt in the margaritas at the party is not the same as the belief that there is an overabundance of sodium chloride in the margaritas at the fiesta. For one thing, the believer may not know that salt is sodium chloride, or that ‘fiesta’ is the Spanish word for ‘party’. Or even if they do know this, it may not be the case that they actually had the occurrent thought that tokened ‘sodium chloride’ and ‘fiesta’, but instead specifically tokened ‘salt’ and ‘party’.

It is worth noting an important difference between intentional states such as beliefs and states that are solely bearers of information. Beliefs are much more specific in their content than information states are. Andrew Cling (1991), for example, elaborates the specificity of beliefs in

the following way. A state *S* is a belief (or what he calls a 2<sup>nd</sup> order intentional state) only if the following conditions are met.

- 1) it is a natural law that Fs are Gs
- 2) *S* has the content that something, O, is F
- 3) *S* does not have the content that O is G.

This marks an important difference between simple information-bearing states and beliefs. For example, I might have the belief that the bottle of liquid in my hand is water without having the belief that the bottle of liquid in my hand is H<sub>2</sub>O. Or I might have a belief about the pressure of a gas in a container without thereby believing anything about further properties of the gas such as its volume, even though Boyle's Law documents the relationship between these two properties of gas. On the other hand, the simple presentation of water carries information about H<sub>2</sub>O since the two are the same. Likewise, the measurement of a gas' pressure carries information about the gas' volume since the two are in fact inversely proportional. The difference between informational states and intentional states suggests that simply pointing to the existence of information-bearing states, perhaps neural states in the brain of some animal, will not be sufficient to ground the attribution of beliefs or similar intentional states to such an animal.

In fact, the difficulty of being able to determine the specificity of an animal's psychological state is taken by many philosophers as a strong reason to deny the attribution of mental states to animals altogether. While we might, for example, find it attractive to say that an elephant believes the bones it is caressing with its trunk are the bones of a dead elephant, there may be problems lurking in such an attribution. Philosophers such as Donald Davidson (1982) argue that we cannot know enough about the specificity of the elephant's belief (if it has one) in order to say the elephant really does have such a belief and to warrant such an ascription (see also

Stich 1979). Since we do not know what the precise content of the elephant's belief really is, we cannot say how the elephant conceives of things. Knowing this would enable us to make sense of the actual conditions that the belief ascribes to the world, and it would designate the truth conditions for the belief. If there are no such conditions, then there is no meaningful specificity of the content of the elephant's experience, in which case, there is no belief. As our attribution stands, we have simply assumed that the elephant belief has the content that the bones it is caressing with its trunk are the bones of a dead elephant. But for this to serve as specific, intentional content, the elephant would need to have concepts of 'bones', 'death' and 'elephants', and perhaps even 'trunks' and 'caressing'.

While I think that arguments regarding knowing the specific content of animal psychological states and about their possession of particular concepts are important reminders about what any particular animal mental state might be like, I do not think they are the end of the matter for those interested in animal minds. For one thing, our inability to know the precise mental content of an animal is a distinct issue from whether that animal does in fact have mental states. One might pursue the latter issue even though they cannot fulfill the former requirement. To do this, one needs to look for evidence in as many places as possible. Knowledge from field studies and controlled laboratory settings can provide important information about animals that can be used to try and gain a better understanding of the appropriateness of mental attributions. This evidence can suggest the sorts of things different animals are sensitive to, what their social interactions are like, what they seem to value, and how they respond to varying circumstances and challenges. Knowing these things can, in turn, help approach whether the characteristics of intentionality mentioned above seem justified. In the next section, I look at a series of

experiments focused on piping plovers, and then in the following section apply the results of these experiments to the question of plover intentionality.

### **3. The Plover Studies**

Consider a nice sandy beach in the New York/New Jersey area. A strange man has been walking by you repeatedly, once at 20 meters and then again at 5 meters, the whole time staring at you intently. You are also in possession of the only copy of the structural layout of the Los Alamos nuclear compound. As a well-seasoned spy, you know that this character would love to get his hands on those documents, and would be inclined to follow you since that would make it more likely for him to find the documents. You see the man, and you leave the documents fairly well hidden in the sand and move away from them. You make sure that you have his attention and move slowly so that he thinks he can catch up with you or follow you easily enough. You look back occasionally to make sure that he is still following you. After you have taken him far enough from the documents, you slip away and double back. Mission accomplished: you wanted to lead him away from the documents. You did not want to lead just anyone away from the documents, but you believed that he, that particular person, wanted them. You even believed that the best way to lead him away was to make sure that he was following you, and you believed that he thought he stood to gain something by following you.

Now, 50 meters away, on the same beach, other people are milling about as well, but one person in particular approaches the nest of a small bird. This person has recently been here before, at which time they scanned the ground visually, bent over and sifted through the nearby grass, and in all ways, appeared to be searching for the nest. Sitting on a nest, incubating her eggs, a female

piping plover suddenly springs up and begins to walk away from it. She stops and turns her head, but the person is not looking towards her, so she situates herself into a position where the person can see her. The plover begins to act as though its wing is broken, dragging it on the ground in an awkward manner. The person takes notice of the bird's condition and follows it away from the nest containing the eggs. After they have moved a sufficient distance from the nest and the person has gained ground on the bird, it flies away. Is this bird's behavior like the person's, i.e. is it similarly brought about by psychological states?

In "Aspects of the Cognitive Ethology of an Injury-Feigning Bird, the Piping Plover," Carolyn Ristau describes a series of studies of similar circumstances involving piping plovers and argues that a low-level intentional stance towards the plovers seems like a promising hypothesis regarding their behavior (Ristau 1991). The hypothesis is that the plover *wants* to lead the intruder away from its nest and young (Ristau 1991, p.98). The hypothesis is "low-level" because she is only claiming that there is something like first-order intentionality, i.e. that the plover wants/desires/aims to lead the intruder away. She does not claim, as the above stories might suggest, that the plover has certain beliefs about the intruder, the intruder's motives, or the effects of the plover's deceptive acts on the actions or beliefs of the intruder. Of course, these attitudes might seem natural states or descriptions to attribute to a human, or even a non-human primate in the plover's position, but they would be immensely difficult to test for a non-human animal in an experimental situation.

Ristau (1991) presents three sets of experiments conducted with plovers: 1) plover response to intruders; 2) plover response to gaze; and 3) plover discrimination between safe and dangerous intruders. The first experiment is designed to address Ristau's hypothesis that the plover *wants* to lead the intruder away from its nest and young. As alluded to above, plovers display an



interesting form of behavior when confronted with intruders who come into close proximity with their nest/young. They are known to exhibit a variety of distraction behaviors including walking in front of the intruder and emitting a peeping sound, showing off their underside and bright wings while flying overhead of an intruder, falsely appearing to sit upon a nest, and feigning injury (Ristau 1991, p.94). Ristau focuses on the latter type of behavior because it is more easily observed. This is the broken-wing display (BWD) which, though there are degrees of severity, primarily involves the plover arching its wing or wings, dragging them and walking awkwardly (Ristau 1991, p. 94).

Ristau reasons that if the plover wants to lead the intruder away, then there are various behaviors which should be observable and which, if observed, would lend support to the hypothesis that they want to lead the intruder away from their nest/young. These expected behaviors include: 1. The direction the plover moves in should be adequate, if followed by the intruder, to lead them away from the nest. 2. The plover should monitor the intruder's behavior. 3. The plover should alter its behavior according to the intruder's behavior that it is monitoring. For example, if the intruder stops following the plover, the bird should be expected to try and regain the intruder's attention or attempt to reengage the intruder into following the plover. 4. The plover should show flexibility of behavior, i.e. not exhibit broken-wing displays in contexts which do not involve intruders or in which there are no young to protect (Ristau 1991, p.98-99).

The experiments involve human intruders who approach and stop at the plover nests. If the bird engages in a BWD, then the intruder either does or does not follow the bird. Ristau's experiment shows that the plovers fulfill conditions 1-4 above. In 98% of the cases, the plover moved to a location which took the intruder away from the nest/young. The plovers also performed BWDs in the visual field of the intruders in 44 out of 45 cases, and the birds always moved before

making BWDs. If BWDs are nothing more than reflexes, it seems likely that the plovers would begin BWD when they first encounter an intruder, instead of first moving into the visual field of the intruder. During BWDs the plovers also appeared to monitor the intruder by turning their heads to position their eyes in a way that situated the intruder into their visual field. In the cases where the intruder continued to follow the bird as it engaged in its BWD, the bird did not stop its BWD or reapproach the intruder. In the cases where the intruder did not follow the bird, 17 of the 31 situations involved the plover reapproaching the intruder; 9 of the 31 cases involved continued or intensified BWD; 3 of the 31 involved the bird returning to its young; 1 of the 31 involved the bird flying away; and in the final case, the bird did not reapproach or fly away (Ristau 1991, p.101-102).

Though one might initially expect a better performance of attracting the intruder's attention in the cases where they did not follow the plover, it should be noted that 1. The claim is not that plovers are perfectly rational creatures (and of course, neither are we) and that 2. On further reflection, the results do not seem so far away from what would be expected even of a creature such as a human. For example, in the majority of the cases one would expect a person to try and reapproach the intruder to reestablish its attention. Of course, it would also be a reasonable strategy to try and intensify the dramatics of ones act since that might be fairly effective in gaining the intruder's attention as well. Yet, there would likely be some people who might fear that this act is not working, and so they return to the side of their children. Or perhaps they are scared and cannot figure out what to do next, so they instinctively return to their children. Maybe they panic and run away or freeze and cannot move. None of these possibilities would be very surprising, and in fact, are not far off from experiences we have or learn about from others everyday.

The second set of experiments, the Gaze Experiments, attempts to determine if plovers are responsive to the attention of an intruder. This set of experiments is designed to observe the plovers' behavior when encountered by a person who walks near the nest/young and keeps the direction of their eye-gaze away from the nest vs. a person who walks near the nest and keeps their gaze in the direction of the nest/young. The studies show that the birds stay off their nest longer when a passer-by gazes towards the nest. Since a longer duration of time off of the nest is an indication that the plover regards the passer-by as an intruder/threat, or at the least, that the plover is engaging in a distraction behavior, it seems to indicate that the bird is sensitive to passers-by whom direct their gaze towards the bird's nest. Additionally, the toward-nest gaze of an intruder from up to 25 meters away causes the plovers to become more aroused than the gaze directed away from the direction of the nest (Ristau 1991, p.103).

The third experiment conducted by Ristau investigated the ability of the plovers to discriminate between intruders who exhibit "dangerous" behavior (i.e. a passer-by who approaches the nest, keeping their gaze directed towards it and appears to hunt/search for the eggs) and intruders who exhibit "safe" behavior (i.e. a passer-by who walks within 12-32 meters of the nest and keeps their gaze away from the nest). The dangerous and safe intruders wore distinctively different clothes to aid the discrimination task. After each performed an initial distanced walk-by, a safe intruder and a dangerous intruder would perform their respective passes by the nest. Then each would again perform a distanced walk-by. Two basic categories of responses involve the bird getting off of the nest or remaining on the nest. Within each category there are gradations of responses including, within getting off of the nest: making a BWD, spending a varying amount of time off of the nest, and going a particular distance from the nest. Within the category of

staying on the nest, the bird may stand up but remain on the nest, crane its neck, change its orientation, or make no movement (Ristau 1991, p. 110).

It was found that the birds became more aroused when the dangerous intruders made their final distanced walk-by than when the safe intruders made their distanced walk-by in 81% of the trials. Additionally, among the plovers that were aroused in those cases, 52% of them reacted in a more dramatic fashion by leaving the nest when the dangerous intruder approached but not when the safe intruder approached (Ristau 1991, p.112).

Though one might expect the numbers to be higher if the plovers are really thought to have learned to discriminate between dangerous and safe intruders, Ristau suggests that there are several possible explanations for this. For example, the behavior of the intruders was not really dangerous, and perhaps that played a role in the plovers' discrimination. Also, the group of plovers in the experiment are, in Ristau's words, "...among the most habituated to humans" and "...the experiments were performed under less than ideal conditions" (Ristau 1991, p.115-116). The less than ideal conditions involve a lack of participants, which results in intruders doubling as observers, and the association of the participants with one another in the presence of the birds under study. All of these factors might play a role in keeping the plovers from making a higher percentage of correct discriminations, however, it should be noted that they were correct in a large number of trials.

#### **4. Plovers and Intentionality**

Now that we have a rough understanding of Ristau's experiments, we are faced with a difficult question: should one credit the plovers with intentionality? At first glance it certainly seems that

their behavior is *about* something. One might suggest that making a BWD is an action *about* deception or *about* leading an intruder away from the nest and young. But one could just as easily say the same thing about the activities of an amoeba, an odometer, or an ant. Their behaviors, or activities, are surely about something. But this is not what is generally meant by asking if a system is an intentional system. We do not seem to doubt that their behavior is about some state of affairs, but we seem to want to know something about the nature of that behavior and what is behind *it*.

Though intentionality may have to do with *aboutness*, inquiring as to whether a plover should be credited with intentionality may invoke many different ways of understanding the question.

While the piping plover BWD behavior has been discussed in terms of emotion (Stieg 2007), I intend the notion of intentionality here to be more general. One possible understanding is whether one ought to treat the plover as an intentional system (i.e. as having beliefs, desires, hopes, etc. which play some role in its cognitive and behavioral activities) regardless of whether it really has these intentional states or not. On this view, “treating” the plover in this manner involves, among other things, predicting its behavior by considering the bird to be a creature that acts as if it were rational and acting on the basis of its beliefs, desires, etc. Another way of approaching this question might be to treat the plover as an intentional system, though it is not clear whether they are or not, in an effort to design and create experiments that might shed light on whether the birds actually have beliefs and desires. This seems to be the sort of approach that Ristau takes in her discussion of plovers.

Yet another variant of this view is to treat the creature as an intentional system in explanation and prediction of its behavior, but to hold that any further question as to whether the creature actually has mental states is mistaken. On this view, mental states are not “things” to be

discovered, but are more like heuristic abstractions which are used to describe/interpret behavior from a certain perspective. This seems to be the sort of view that Dennett takes (Dennett 1994) (Dennett 1998). In a similar vein, John Dupre (1996) argues that there is no meaning to the question of whether there really are mental states like beliefs and desires independent of a creature's behavior. The meaning of particular mental states is crucially tied to particular sorts of behavior, and to insist that there are separate mental states, which are independent of and precede certain acts, is to fall into the problematic view of a Cartesian theater where the mental states exist and play themselves out on some inner stage. This view should be distinguished from behaviorism. Dupre does not insist that certain mental states *are* certain behaviors but that the behaviors are criteria for the mental states. Talk of them beyond the criteria for them is meaningless, i.e. sense of them cannot be made.

The above views all take what might be called the intentional stance, i.e. they all use the structure of folk psychology, incorporating explanations of behavior by referring to common mental terms or states, in explaining and/or predicting various animals', and in Dennett's case, even thermostats' activities. Does adopting the intentional stance to describe the plovers' behavior work? Ristau argues that it does. The four conditions that she sets out as being indicative of what an intentional plover would do in regards to intruders and making BWDs seem to be observationally confirmed in her studies. They also seem like intuitively plausible behaviors to expect from an intentional system.

But what about other possible explanations of the distraction behavior in general and the BWD in particular? Ristau, herself, does a nice job of listing possible alternatives: Reflex and Fixed Action Pattern (FAP) explanations, Pre-programmed sequence of behavior explanations, Conflict behavior explanations, etc. (Ristau 1991, p. 95-97). She also gives good reasons for why these

explanations are inadequate, mostly relying on their simplifying assumptions about the plovers' behavior. For instance, it is difficult for the FAP explanation to explain why the plover will almost always move in a direction away from the intruder and the nest, which requires complex perceptual and motor manipulation, as opposed to a variety of other possible directions the plover might take (Ristau 1991, p.96).

The failure of other hypotheses and explanations of the plovers' behavior, coupled with the apparent success of the intentional hypothesis that the plover *wants* to lead the intruder away, seems to leave the intentional hypothesis as the most favorable hypothesis. Furthermore, conceiving of plovers as intentional creatures even helps to explain apparent problems in the data results such as the varying behaviors observed under similar conditions. It seems that there are a lot of good reasons for treating plovers as creatures with minds.

But taking the intentional stance towards a particular entity does not commit one to being a realist about intentional states. So there may be a further question which some might be interested in posing: Do animals (really) have beliefs? Dennett addresses this very question in his article by the same name (1998). In Dennett's view, it is a mistake to keep asking "*but* do they *really* have beliefs"? As mentioned above, for Dennett there is not anything beyond our ability to use intentional terms to describe a creature's behavior that having intentional states is like. In his usual style, he provides stories and analogies for his readers to glean important points from, and though they are sometimes obscure, his story about a race of alien creatures who talk of 'having fatigues' instead of 'being tired' helps elucidate the sort of view that I think provides many important points to consider (Dennett 1978). The aliens, upon meeting earthlings, want us to tell them what fatigues are, where they are, what physical states they are identical with, etc. But of course, this would seem completely mistaken to us. We do not consider fatigues to be

‘things’ that we have, that we can point to, etc. We may talk about being fatigued, showing fatigue, and so on, but we do not suppose that fatigues are the sorts of things one looks into the body and finds. Rather, it is a term that plays a certain role in describing behavior.

The same sort of confusion might be involved in asking about the reality of intentional states.

What sort of answer could one give when asked what they are, where they are, etc.? How do you point to a belief amidst a bundle of cellular processes? Various forms of answers may be given (e.g. identity theory, supervenience, emergence, etc), but they do more metaphysical postulating than real answering. And this is probably because beliefs, desires and the like, are not the sorts of ‘things’ one simply points to, or sees, or touches. Of course, nobody really expects these sorts of mental states to be visible if one were to open up a cranium and peer into a brain, but what does that tell us? It tells us that these psychological terms we use, such as belief and desire, are really theoretical terms that we use to describe behavior. As theoretical terms, they may or may not correspond to an external reality, but the point is that we have learned to use these terms, and they have gained the sort of meaning that they have, by being used to describe behavior. In Dupre’s way of putting it, the sense, or meaning, of these terms is confused, or meaningless, when we start talking about the existence of mental states independent of behavior.

I do not mean to imply that observability determines existence, or *realness*, but that the sort of existence, or *realness*, we often inquire about regarding intentional states, is mistakenly the sort of existence that is closely related to observability. For instance, we might think about both tables and centers of gravity (or numbers or scores) as existing, but we might also want to say the way in which they exist is very different. Tables are observable, you can touch them, etc. Centers of gravity play a role in descriptions of phenomena, but you wouldn’t expect to “discover”, see or spray them. Intentional states may exist, or be real, but since we don’t really



expect to see them, touch them, etc., we should embrace other ways in which they might exist (e.g. as descriptions) and let the chips fall where they may. Allowing this sort of existence, and not expecting the other sort, may make it more apparent why it is mistaken to ask ‘*but do animals really have beliefs*’.

On this view, if an animal displays the sort of behavior that commonly is described using intentional terms, then there is no further question about the matter; the animal has intentionality. In the scenario at the beginning of this paper regarding the spy at the beach, it is only natural to describe the spy and the spy’s opposition in intentional terms. They both *wanted* certain things (or states of affairs to obtain), believed certain things about one another and their motives, and believed that performing certain actions would most likely bring about certain desired states of affairs. The spy case is analogous to the plover scenario, and every reason that we have for attributing intentionality to the spy and the spy’s opposition, applies *mutatis mutandis* to the plover.

One might object that we have more reason, in the same case, to attribute intentionality to a fellow human than we do to the plover for a variety of reasons. First, as humans, we can safely infer the existence of minds in other humans (the inference/analogy argument to the other minds problem). Secondly, humans share language and this is necessary for thought. It is widely agreed, however, that the inference objection is problematic. If recognizing that some of our mental states are correlated with some of our behaviors, and upon seeing similar behaviors in others, we conclude that they have the same mental states, we appear to be reaching a much larger conclusion than our premises warrant. All we have to go on, according to this argument, is a single instance or experience of the conjunction of behaviors and mental states. From this we conclude that every, or at least billions (population of humans) of instances of the behaviors

are conjoined with the mental states. If this is the sort of justification we give for believing in other human minds, then it is not very strong. The second objection is more complicated, but I will attempt to address it below.

## **5. The Representational Alternative**

The above may seem too liberal, or even completely unsatisfactory, in its quickness to attribute mental states to plovers. It might also be unattractive because of its treatment of the ontological status of intentional states generally. But what would it mean for one to be a realist about intentional states? Would we be committed to an ontology of intentional states in the plovers' brains, in humans? That is probably too naïve and a generally mistaken way to view the status of intentional states, but we might try to make sense of what it means to be a realist about intentional states by adopting a naturalistic approach and inquiring into contemporary scientific theories regarding psychological states and functions.

If, as Fodor (1975) argues, it is correct that the general structure of current psychological theories of cognition treat cognitive processes as computational, then, since computation must be carried out on something (representations), it appears that taking a naturalistic approach commits one to adopting a representational theory of mind. If one does adopt a representational theory of mind, then giving a little more substance to the question regarding animal minds might not be as difficult to get a handle on.

On a representational view mental states are relations between mental representations, and the mental representations are the basic components of cognitive processes. So, for example, having a belief might be being in a certain relation to a mental representation. Fodor's representational

theory views mental representations as the basis of intentionality from which the propositional attitudes, beliefs and so on, and language derive their content and meaning (Fodor 1998).

Furthermore, thought is computation on mental representations where computation is understood as a content-responsible, causal relation between symbols (mental representations) (Fodor 1998, pp.9-11).

It is important to note that this view allows for both thought without language, since thought is necessary and prior to language, and mental representation without thought, since there could be mental representations which do not have computations performed on them. To determine that an animal has intentional states, one would have to have suggestive evidence that the animal has mental representations and that they are in a certain sort of relationship to that representation. Presumably, the sort of relationship would be one in which the content of the representation determines the content of the animal's intentional state, and this might be lent support by evidence/observations which suggest that the content of an animal's representations contributes to its behavior in certain ways. Though it might not be possible to specify the exact content of an animal's intentional state (Stich 1979), it might be possible to determine it to within a reasonable degree. Of course, if an animal has language, then it necessarily follows that they have propositional attitudes and intentionality since language, on this view, derives its meaning from the bottom-up as it were.

To determine that an animal has thought, it would need to be shown that there is some sort of computation on the animal's representations in light of the content of those representations.

Showing that content plays some causal role in the creature's cognitive and/or behavioral repertoire of activities is then necessary, and so in fulfilling the above criterion that the content of an animal's representations contributes to its behavior, it should be sufficient to show that an

animal has thought. One way of getting at the causal role of a state's content is to examine the variation of the creature's behavior in light of varying circumstances. Given assumed goals, or motivations, a creature's perceptual representations should elicit particular types of behaviors. In the case of the plovers, this can be addressed by paying attention to the variation of their BWDs and attempts to garner the intruder's attention in the situations where intruders vary their response to the initial BWD. The same behavioral sensitivity is seen in the other two experimental set-ups as well. These provide reasons for thinking the plovers' representational content causes its behavior in some way. An additional, promising feature of using this behavioral data to assess plover minds is that it provides some reason for supposing that the content they are utilizing has a certain amount of specificity to it. This is seen in the sensitivity of the birds to the particular gaze and intruder-like behaviors of the human participants. The specificity condition arises in another form below in what I refer to as the conditions indicative of concept-mediated behavior.

I take it, however, that the notion of concept-mediated cognition and behavior is actually a more stringent requirement than the condition that the content of an animal's representation play a causal role in its behavior, and it is this requirement that I will employ for plovers. First, the notion of concepts is more closely aligned with "higher-level" cognition and abstraction in a variety of ways. For example, at least part of the use of concepts involves abstraction from purely perceptual stimuli. Second, there seem a plethora of examples in the animal kingdom, and in a variety of inanimate materials, where it appears that there are representations being employed whose particular content seems very relevant and responsible for the object's behavior, but to which we would not be inclined to attribute the sort of cognitive powers we are here interested in. For example, mosquitoes most likely utilize some representational system in

coordinating flight patterns, and thermostats represent the temperature of a room. Furthermore, the content of that representation is responsible for future actions the thermostat engages in (e.g. turning up the heat or keeping the temperature where it is). However, discussion regarding the cognitive powers of thermostats seems very odd and probably mistaken. At the very least, though we might attribute representations to these entities, we would almost certainly not attribute concepts to them. One major reason is due to the difference in content-specificity between intentional states and informational states mentioned in section 2. For the above reasons, I take it that evidence suggestive that the animal is employing concept-mediated representations/behavior is sufficient to establish thought and that it is a stronger criterion than the aforementioned one.

With this criterion in mind, we might ask our question regarding plovers and intentionality again, however, there are a few important points that need to be spelled out regarding concepts. Allen and Hauser (1996), in their discussion of concept-mediated behavior regarding the concept of death remark that the notion of concept

...fits well into functional explanations of flexibility in animal behavior. Concepts are capable of explaining complex abilities to generalize over variable stimuli, to rapidly produce appropriate responses to the common features underlying those stimuli, and to modify behavior when it is discovered that perceptual stimuli are unreliable guides to underlying features. Furthermore, this notion of a concept can be tested by suitably ingenious experimental design (Allen and Hauser 1996, p.59).

According to Allen and Hauser, a concept involves representation of some aspect, property or feature independently of its perceptual components (Allen and Hauser 1996, p.55). Attribution of a nonperceptual (abstract) concept, in this sense, to an animal at time  $t$ , relies on evidence that

the animal is utilizing a mental representation that is independent of information which might be provided perceptually at  $t$ . Allen and Hauser set out two conditions which they think are indicative of an animal with concept-mediated behavior and which are testable and observable: 1) the ability to generalize information from perceptual inputs and to use it in various behavioral situations; 2) the ability to alter what is taken as evidence for an instance of that concept (Allen and Hauser 1996, p.55).

The second set of experiments (the gaze tests) offers a few possible insights into the first condition. In the gaze experiment, the plovers demonstrated the ability to recognize or discriminate between two classes of passers-by: those who directed their gaze towards the nest and those who directed their gaze away from the nest. Since the birds proved to be consistently sensitive to the former but not to the latter, it shows that they have the ability to respond to perceptual stimuli in a way which suggests that the stimuli, or the objects of the stimuli, have been classified into different categories by the plover. This does not show that the plover has a concept of intruder or dangerous/safe, merely that its categorization of the classes is likely the same as that which would be expected if one were acting with one of those concepts. However, the experiment does detail the extreme sensitivity to perceptual stimuli by the plover, and give one reason to wonder why it is that the bird reacts to the one stimulus and not the other. That the plover distinguishes between the two indicates that the bird has a representation about/of the objects in its field of vision and that the representations differ, and apparently, the way in which they differ is due to their content. Since the different contents are highly correlated with the different behaviors, it looks like there is some form of computation occurring which “takes notice” of content. This would likely satisfy the condition that Fodor’s view requires, but it does

not seem to move us closer to abstract generalization away from mere perceptual stimuli. Still, it does provide us with a sense of the discriminatory powers of the plover.

The third set of experiments (intruder vs. non-intruder discrimination) seems to be a better set to consider in regards to Allen and Hauser's first condition. According to that condition, the plover should be able to take information it has received at some point in the past and use it in some way later in time to affect its behavior. This is precisely what the plovers do in the third experiment. The plover, upon receiving various forms of perceptual stimuli, comes to discriminate intruders from non-intruders. Since its behavior/response to these intruders is the type of response given in the face of threats, or as an attempt to alleviate a threat, we might say that the plover recognizes certain participants in the study as intruders. So suppose that plover P recognizes person X as an intruder. Now, later in time, the plover is presented with a situation that would normally elicit a certain type of response towards X if X were a non-intruder. For example, X walks by P at a very removed distance. Whenever a non-intruder walks by at that distance, P shows no signs of arousal, but when X walks by at that same distance, P shows signs of arousal which are dramatic the majority of the time. The plover is taking perceptual information from one time and using it at a later time to alter the behavior/response which it would most likely have performed given the later perceptual state of affairs. This is precisely the sort of behavior one would expect from a creature whose behavior is concept-mediated.

Before considering the second condition of concept attribution, I should consider a possible objection to the above treatment of the plovers' fulfillment of the first condition. It might be replied that this ability to use or generalize past information is really nothing more than what is called learning and that there is nothing special about learning such that it requires the postulation of concepts. Surely there are instances of learning, such as imprinting, habituation

and perhaps forms of conditioning, which do not require concept possession and which occur in many lower organisms. So why should we take the plover achievement to be special?

I do not doubt that the plover has learned to distinguish intruders from non-intruders and learned that particular passer-bys are intruders. It is also true that there are a variety of types of learning, but the types of learning which presumably do not employ the use of concepts, such as imprinting and habituation, are not the sort at play in the case of the plover experiments. It is also unlikely that classical conditioning can be used to explain the plovers' discriminative abilities since the birds have not been exposed to as many trials in these experiments as would seem needed to form the relevant associations. Moreover, it is not even clear how an explanation using classical conditioning would negate the hypothesis of concept-mediation. For the intruders presence (at a distance) to become a conditioned stimulus for the plover's arousal, the participant would already have to be associated, or in a relationship with the plover such that it caused the arousal of the bird. Only after there is such a causal relationship, could the subsequent stimulus (the intruder at a distance) become associated with the same behavior of arousal. But then we are left to wonder how it is that the original relationship arose. Is it a purely hard-wired response, a reflex pattern, etc.? The complexities of the plovers' behavioral repertoire and Ristau's experiments (especially the first set) seem to indicate that there is much more involved in the plovers' distraction displays than that. If this is correct, then more attention should be paid to the plovers' intelligence, adaptability, and flexibility.

There are various characterizations of general modes of learning. One such characterization is that of learning which involves representations and that which does not. This distinction is supposed to express the sort of difference portrayed between that of memories vs. habits; knowing that vs. knowing how; etc. The ability to recognize, or discriminate objects as



something or to use past perceptual information at a future time is most likely learning of the representational sort, i.e. using memory, or knowing that, etc. Having said all of this, it is apparently a matter of dispute whether classical conditioning involves representational types of learning, habit, or mixes of the two (Rosenzweig and Leiman 1989, p.633). So it is not immediately damaging to a concept-mediated hypothesis that the plover is learning to discriminate via classical conditioning. So even if conditioning were responsible for the plovers' behavior, which seems unlikely, concepts might be an important factor in classical conditioning.

The second condition of concept attribution requires that the animal be able to alter what it takes as evidence for an instance of a concept. This is a tricky condition and seems difficult to demonstrate. In the case of the plover, an example of this might involve a plover recognizing a participant as an intruder, or being presented with perceptual evidence that the participant is an intruder, but then being subjected to evidence which is suggestive that the participant is not an intruder. According to the condition, the plover should be able to modify its responses to the former types of evidence. Admittedly, Ristau's experiments do not provide as convincing results for this condition as they do for the first. The experiments, especially the third set, might have been able to address this condition if they had been extended for longer periods of time. For example, the third set of experiments might have been telling if, after the birds had come to discriminate between intruders and non-intruders, the intruders became passive and deliberately exhibited non-threatening behavior. Then, if the plovers came to recognize them once again as non-intruders, it could be tested to see if the birds evaluated the same sort of behavior, earlier regarded as dangerous, in the same manner, i.e. as evidence of a participant being an intruder. If they did not, then it would be evidence in favor of the plovers' ability to fulfill condition two.

In some other respects, though not ideally, the experiments may contribute something to the question of the plover's ability to satisfy the second condition. In the third experiment, when the plover learns to discriminate between intruders and non-intruders, the bird seems to be not only applying old perceptual information to a new situation, but it also might be said to be altering what it takes as evidence for being a *non-intruder*. In previous trials, the plover does not respond to passer-bys at the removed distance. Passing by at that distance is evidence for being a non-intruder. However, after being presented with evidence that intruders also pass by at that distance, passing by at that distance no longer suffices for keeping one from being recognized as a non-intruder. This might lend some support to the notion that plovers can satisfy condition two. However, it should be noted that the plovers might not be altering what they take as evidence for being a non-intruder, but rather, to become an intruder, one must perform a more threatening activity than simply passing by at a removed distance.

Though experiment one does not show that the plovers alter what they take as evidence of a concept, it does show that the plovers have the ability to monitor the behavior of intruders and to alter their own behavior in complex ways in light of new developments. This involves constant perceptual updating (checking to see if the intruder is following them), combined with integrating this information in important ways with past information, e.g. that the other organism is an intruder to begin with. This ability warrants fulfillment of condition one and suggests that the plover has the ability to alter its behavior in important ways in light of new evidence it is presented with.

There is further, indirect support for fulfillment of the second criterion by a relative of the piping plover. Though Ristau does not detail any studies of the killdeer or southern lapwing birds, she does briefly note some of their documented behavior (Ristau 1991, p.95). The

killdeer, which is related to the piping plover, does not make BWDs when the intruding animal is a non-predator (i.e. does not eat the bird's eggs). Instead, the killdeer ignores the animals until they come close enough to the nest to be threats to trample it. Then the bird lunges at the animal in an attempt to startle it away from its present course. The southern lapwings perform a similar behavior when the intruding animal is a non-predator (Ristau 1991, p.95). It seems that these birds are able to recognize, not only intruders from non-intruders, but also non-predator intruders from predator intruders. If they did not make this distinction, then it would be expected that the birds would perform the same sort of distraction behaviors, for example BWDs, that they do when confronted with predator intruders. Since they do not, it seems likely that they are able to distinguish between the two. If they do distinguish between the non-predator and predator intruders, then it would most likely be a secondary discrimination to the prior one of intruder/non-intruder. If this is right, then at some point, the birds were able to alter what they took as evidence for different types of intruders, and this would go a long way towards satisfying the second concept attribution condition.

Though these secondary discriminations are seen in killdeers and lapwings, it is not clear that plovers also make these sorts of discriminations. Further experiments designed to try and make these determinations are necessary to get at these questions, but there are reasons to think that the plovers might also possess this capability. First, the killdeer are relatives of the plover, and basic cognitive skills found in the killdeer should likely be found in the plover. Second, the gradations in the response behavior of the plovers (from full BWD, to leaving the nest, to ruffling the feathers, to no response) towards different intruders suggests that the plovers might perceive the various intruders as threatening in varying degrees. If this is so, then they have the ability to distinguish between, and likely alter evidence for, instances of a concept.

## 6. Plover Concepts

If plovers have concepts, what sorts of concepts do they have? Davidson argues that having beliefs and thought requires having concepts and that having concepts requires having language (Davidson 1982). But if there could be ways in which a creature could possess concepts without language, then it might be possible to go some way towards explaining how languageless animals have thought. I do not intend here to try and refute, or to take head-on, Davidson's arguments. Rather, in this limited space, I want to side-step it and merely suggest a possibility for concept possession in languageless animals. My suggestion does not directly answer problems that Davidson raises related to a subjective-objective contrast and notions of objective truth, but I am not convinced 1) that these conditions are not met in an animal's life through its dealings with the external world and 2) that these conditions are even as crucial to thought as Davidson makes them out to be.

An animal's representational system might be attentive to, or constructed by, different features of the world due to an animal's primary sensory modality and its evolutionary history. For example, a bat and a human will likely represent the world in very different ways given their primary modes of perceiving their surroundings, e.g. echolocation vs. primarily visual perception. Now, if concepts are either instantiated in different representations, or they are used in classifying and thus interacting with representations, then it is likely that one creature's mode of representing concepts will be different from that of other animals. If this is so, then it should not be expected that all conceptual representations be linguistic.

Various hypotheses regarding concepts exist which do not rely on linguistic representation. The exemplar view of concepts and the prototype view of concepts both allow for the possession of concepts without the possession of language. The exemplar view holds that

concepts are represented by their exemplars, i.e. the representation of a concept consists of separate descriptions of some of its exemplars (Smith and Medin 1999). The exemplars can either be specific instances of the concept or a subset of the concept. For example, the concept “bird” is represented by the disjunction of exemplars like “robin”, “eagle”, “blue-jay”, “Tweetie-bird”, and “Road-runner”. The exemplars which are subsets (“robin”, “eagle”, etc.) can be themselves represented by other exemplars such as particular robins or eagles, and/or they can be represented by a description of the relevant properties of robins or eagles. If the exemplar is a specific instance, then its representation consists of a property description. So, for Tweetie-bird we would have something like animate, feathered, yellow, whistles, caged, etc. Though the exemplar view has various “sub-views”, none of them require that instances of the representation of a concept be linguistic. The property descriptions, tuned towards various perceptual characteristics, could very well be instantiated in a variety of ways, none of which need be linguistic.

The concepts an animal may have, if one were to adopt the exemplar view or a similarly non-linguistic dependent view, may be represented differently than a human might represent them. The concepts might then also be different concepts altogether. This might make the exact specification of the content of an animal’s representations and intentional states impossible, but it would not altogether preclude approximations, which might be made with varying degrees of success depending on the extent of knowledge regarding a particular animal, its evolutionary history, behavior, environment, etc. Furthermore, the questions/problems raised by Davidson about animals not having beliefs due to their not having language, or a web of beliefs similar to ours, may be seen to be insufficient, or lacking, in being a decisive argument against animals having beliefs and intentionality in general. If one wants to be a realist regarding intentional

states and to utilize a representational theory of mind, then it would be very natural to attribute, as the evidence warrants, intentional states to plovers or to other animals.

There is still a question as to how we will know when the evidence warrants intentional attribution. It seems to me that the best approach is an empirical one: think up and design experiments. Of course, the results that are obtained by these experiments may only be observations, but that is the importance of higher-level representations, or cognitive processes, i.e. that they do something, affect behavior. So looking at behavior is not a mistaken place to look.

One might formulate observation-informed hypotheses regarding animal representations and cognition, which might evolve and change over time, and derive observations or experiments from them. Much like the hypothetico-deductive model of science, if the expected observation obtains, then, though it does not provide absolute verification of the hypothesis, it may lend support to it. There may be problems which arise, similar to Duhem-Quine type problems, but that might also be a problem in other sciences such as physics. And yet, these problems do not freeze physicists from coming up with practical solutions and ways around these problems. Similar problems regarding realism towards unobservables might arise as well. Confirming the postulated existence of intentional states in a plover might seem like going out on a limb, or even impossible, but these same sorts of difficulties do not keep scientists, and people generally, from thinking of blackholes and dark-matter in realist terms and from continuing to work on ways to derive observations and to use them in explanatory roles.

## 7. Conclusion

In this paper, I have been interested in the cognitive status of the piping plover. Ristau's experiments provide an ample amount of data in addressing this issue. I have suggested that there are different approaches to the problem of whether plovers have minds depending on whether one is a realist or an anti-realist regarding intentional states. If one is an anti-realist, one can either refuse to use intentional terms altogether or one can employ them in certain types of descriptions of behavior. If one refuses to use them, then the case is closed and they will not use them in regards to plovers. If one does use them, then every reason we have for using them in human scenarios similar to the plover scenarios carries over, and plovers, in a sense, have minds. If one is a realist and naturalistically minded, then one will adopt a representational theory of mind. On this view, given the complexity, adaptability and flexibility of the plovers' behavior, along with its ability to utilize the content of its representations and to satisfy the conditions of concept attribution, one is justified in attributing intentionality to plovers.

A possible reason for refusing to allow that plovers have mental states probably arises from a misunderstanding of what sorts of things mental states are, or what sorts of things mental terms refer to. Another reason might have to do with assumptions regarding what intentional creatures must be able to do or accomplish, e.g. possess language. If theories of concepts, which do not require linguistic ability, are plausible, then it is plausible to attribute thought and beliefs to languageless creatures.

Finally, empirical research is needed to investigate these issues. There may be difficulties in these types of studies, but these difficulties are not insurmountable.

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