NON-HUMAN COMMUNICATION CONCERNING PRIVATE STATES: A SECOND LOOK

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0. Introduction

A decade ago, Lubinski and Thompson (Lubinski and Thompson 1993) discussed their non-human laboratory model of natural socialization processes by which children learn to identify and communicate their feelings and of communicative practices such socialization processes enable. Their model, first presented a half dozen years earlier (Lubinski and Thompson 1987), is an example of behavioral synthesis, a method often used in behavior analytic investigations of phenomena denoted by common sense psychological terms. Behavioral synthesis is controversial because it is most often used to provide a model of phenomena widely believed to require methods and concepts explicitly rejected by radical behaviorist approaches to the experimental analyses of behavior. Many critics argued that the Lubinski and Thompson demonstration once again exhibited the inadequacies of radical behaviorist approaches to common features of human psychology, the ability to learn and communicate using natural language, the kind of sentience exhibited in conscious experience of thought and feeling, and in general the capacity to report and converse about the richness of conscious mental life. Specifically, it was alleged that Lubinski and Thompson's efforts to model communication concerning private feeling states failed to provide a model of communication, feeling, or for that matter any private (mental) phenomena whatever. Nevertheless, Lubinski and Thompson's article was selected for the American Psychological Association George A. Miller Award - Division I (Outstanding/Best Research Article in General Psychology.) There appears to have been little subsequent discussion and few citations of this article or the experimental work (Lubinski and Thompson 1987), (Lubinski and MacCorquodale 1984) on which it was based. Recent increased interest in empathy (e.g., (Gallup and Povinelli 1998; Preston and Waal 2002), (Singer, Seymour et al. 2004)) provides occasion to revisit the provocative behavioral synthesis that Lubinski and Thompson reported and discussed.

1. The Lubinski and Thompson Experiment

In the Lubinski and Thompson synthesis, one pigeon (the cue bird) was trained to respond selectively to the interoceptive effects of substances - cocaine, Pentobarbital, saline - with which it had been injected. The cue bird learned to selectively peck one of three illuminated response keys each displaying a different letter. Each letter marked the target for a correct response to effects of one of the three injected substances. Thus, pecking the S key (a Greek sigma was used by L &T) was correct in the presence of cocaine effects, the D in the presence of Pentobarbital, and the N in the presence of saline. Another bird (the decoder) was trained to selectively respond to a single sample key on which an S, D, or N was projected. A correct response consisted of pecking the "matching" key in an array of three illuminated comparison keys each imprinted with a different letter. Thus, pecking C was correct when S was projected, P when D was projected, and W (L& T used S here) when N was projected. The decoder was also trained to peck one key (the "How do you feel?" key) on the chamber floor when it was illuminated, and the other (the "Thank you." key) when a letter was projected on the sample key in its chamber.

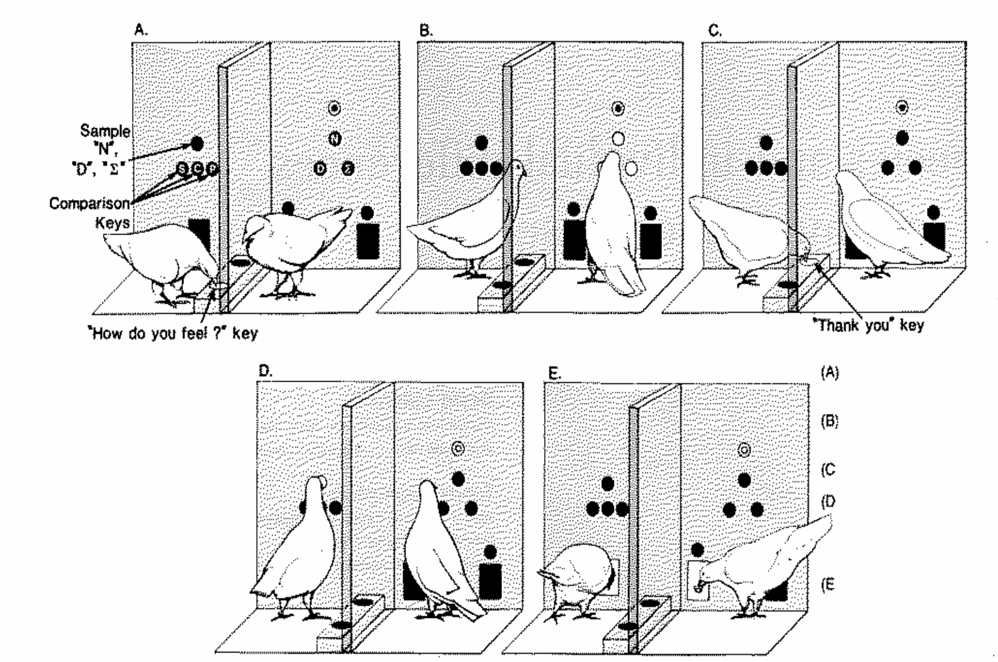

Figure 1. A two-pigeon communicative exchange based on the internal state of one of the birds (Decoder, left; Drug-cue bird, right). A: The Decoder pecks the "How do you feel?" key. B: The Drug-cue bird pecks the drug-class letter corresponding to its internal state. C: The Decoder pecks the "Thank you" key, which presents the flashing blue light to the Drug-cue bird. This response also presents to the Decoder the drug-class letter previously pecked by the Drug-cue bird. D: The Decoder matches the drug-class letter (projected on its sample key) by pecking it and then pecking the letter representing the specific drug that the Drug-cue bird is currently experiencing. The Drug-cue bird attends to the flashing blue light. E: The Decoder receives food upon correctly completing the communicative exchange and the Drug-cue bird receives water (adapted from Lubinski & Thompson 1987).

In the two bird interaction, (see Figure 1) the first bird was injected with one of the three substances whose effects it had been trained to discriminate. After a waiting period sufficient to allow diffusion of the injected substance, the two birds were placed in adjacent chambers separated by a clear Plexiglas wall (see Figure 2/5), and the "How do you feel key?" was illuminated. The decoder pecking the "How do you feel?" key illuminated the cue bird response keys. The cue bird pecking the correct response key projected the corresponding letter on the decoder sample key. The decoder pecking the "Thank you." key illuminated the comparison keys in the decoder chamber, started a blue light flashing in the cue bird chamber and made food and water available to the cue bird. The decoder pecking the matching comparison key completed the interaction and made food available to the decoder. An incorrect response at any point by either the cue bird or the decoder caused the lights to go off in the adjacent chambers and stopped that trial. At this point, either the session was terminated or after 20 seconds the lights came on and the interaction was started again by illuminating the "How do you feel? key. The causal structure of the two bird interaction is depicted in Figure 3/6.[1]

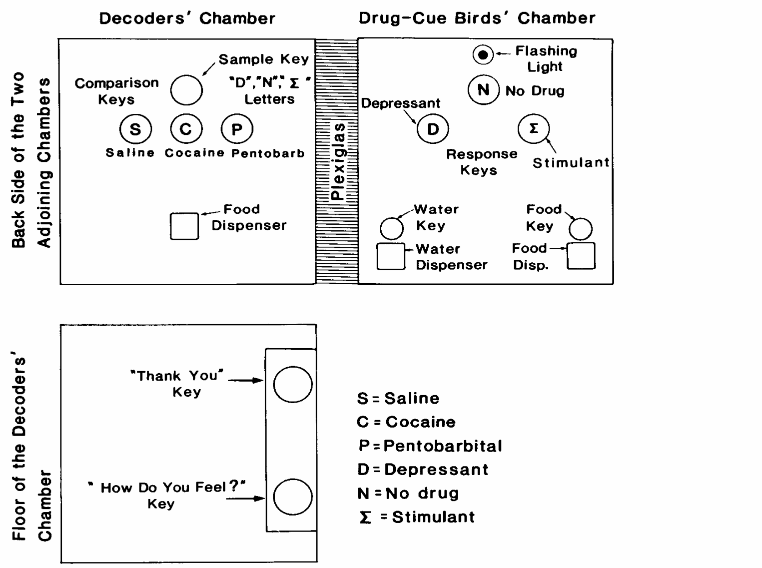

Figure 5. The details of the response operandi, stimulus configurations, and reward mechanisms structuring the experimenta synthesis in Figure 1 (adapted from Lubinski & Thompson 1987).

Figure 2

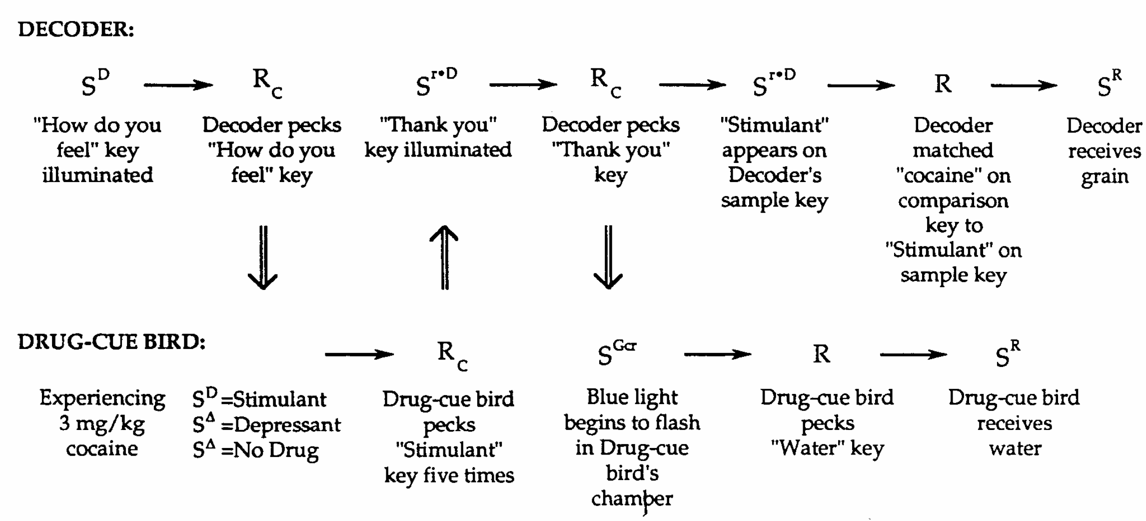

Figure 6. Interlocking communicative paradigm illustrates the technical features of the stimulus events exchanged betwee subjects. The notational system follows: S^D = discriminative stimulus; S^Δ = S - delta (i.e., nonavailability of reinforcement); $S^{r \cdot D}$ = conditioned reinforcer, which also functions as a discriminative stimulus; R_c = a communicative response; S^R = unconditione reinforcer; R = response; S^{Gcr} = generalized conditioned reinforcer.

Figure 3 (adapted from Lubinski and Thompson 1993)

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[1] From Lubinski, D. and T. Thompson (1993). "Species and Individual Differences in Communication Based on Private States." Behavioral and Brain Sciences **16**: 627-680.. Figure 6 depicts an instance of the "interlocking paradigm" first described by B. F. Skinner, (1948). Verbal Behavior. The William James Lectures. Cambridge, MA.. For discussion see Keller, F. S. and W. N. Schoenfield (1950). Principles of Psychology: A Systematic Text in the Science of Behavior. New York, Appleton-Century-Crofts, Inc., Winokur, S. (1976). A Primer of Verbal Behavior: An Operant View. Englewood Cliffs, N.J., Prentice-Hall, Inc.

Lubinski and Thompson (Lubinski and Thompson 1993), (Lubinski and Thompson 1987) acknowledged several disanalogies between their behavioral synthesis and aspects of human social processes and practices for which their synthesis was offered as a model. Specifically, they acknowledged that neither communicative intentions nor natural language use was evidenced in their two pigeon interaction, and that only unilateral significance was exhibited by the "symbolic" elements in the exchange. They also acknowledged that they did not (nor did they see how they could) model the "Leibnizian" privacy[2] often claimed for conscious mental life.

The absence of natural language prevents the demonstration from exhibiting a close analogy to interactions in which feelings are *reported* as they are thought to be in normal human conversation. The absence of communicative intentions and the fact that only unilateral significance is exhibited by the "symbolic" elements exchanged in their interaction prevents the Lubinski and Thompson synthesis from serving as a model of *communication* of feeling or any other internal state, for example of empathic responding by one organism to interoceptive stimulation identified and indicated by another.

We propose a modification of the Lubinski and Thompson task that removes this last shortcoming and provides a better laboratory model of the type of communication concerning feeling that involves such empathic responding. We describe a "thought experiment" in which the selective responses of one pigeon to current interoceptive stimulation convey to another (what we allege to be important aspects of) "what it is like" to occupy the discriminated state. This second bird exhibits its empathic capacities by its selective responding to the interoceptive stimulation ("vicarious experience") evoked by the selective responding of the first. We discuss the significance of this thought experiment as a model for symbolic communication concerning private states.

2. A Thought Experiment

The Point of the Experiment

Evidence suggests that much interoceptive stimulation consists of unconditioned responses to salient aspects of the environment including the behavior of others. In some cases at least some of the covert responses evoked by one animal's behavior apparently match the covert (interoceptive and proprioceptive) stimulation expressed by the other's behavior. Distress behavior of many animals evokes covert distress responses (and usually behavior expressing this stimulation) in animals for whom the original behavior is salient.[3] Such interactions lack one basic feature of human communication, namely the conventional ("non- natural" or artifactual) character of the communicative events. Many such interactions, at least, seem to be instinctive or reflexive. The behavior patterns are relatively fixed. They are species-specific, and they appear, for the most part to be unlearned. Lubinski and Thompson introduce arbitrary learned stimuli and responses to model (at least some aspects of) the conventional character of human communication.

[2] The term is from Gunderson, K. (1984). "Leibnizian privacy and Skinnerian privacy." Behavioral and Brain Sciences **7**: 628-629.
[3] This illustrates interesting parallels between imitation and some kinds of empathic understanding.

Lubinski and Thompson demonstrated that pigeon's have the capacity to respond on cue in ways that indicate distinct interoceptive phenomena. They also illustrated processes by which this capacity can be shaped by learning to fit the constraints of a social environment. The discriminative responses of the cue bird set the occasion for (learned) discriminative responding by the decoder. Both the process by which this interaction is established and the pattern of the resulting interaction are of some significance for studies of (behavioral and neural substrates that could have served as scaffolding for) the evolutionary and ontogenetic development of cognitive, emotional and communicative capacities and of the social practices by which these capacities are shaped and used by humans and other species of social organisms.

Lubinski and Thompson note that in human communication the exchanged symbols typically have shared significance for participants in the exchange. They acknowledge the unilateral significance of the selective responses that serve in their non-human model as analogues to symbols used in human communication. The cue bird repertoire does not include the matching responses the decoder has learned, and the decoder repertoire does not include the discriminative responding to drug induced effects that the cue bird has learned. There has been no "cross training" to enable each bird to assume the role of the other. Lubinski and Thompson note that under these circumstances the "role reversal" typical of speakers and listeners in human conversation is not likely to occur. They acknowledge that the capacity for such "role reversal" is not exhibited in their model, but they suggest that appropriate cross training is feasible with pigeons, and would enable successful role reversal.[4] They present this suggestion to illustrate how the analogy can be extended between their nonhuman model and the human practice of enabling and engaging in the practice of identifying feelings and communicating them to others.

We agree with Lubinski and Thompson's that the relevant analogies can be strengthened between the human case of identifying and communicating feelings and non-human laboratory models of the sort exemplified in their work. We suggest, however, that producing a fuller model of empathic processes and practices requires rather different procedures than they apparently envision. We also believe they devote insufficient attention to relations between the conventionality of symbolic (e.g., linguistic) communication, the functions such conventional symbols serve as indicators of specific objects, events, properties, or states of affairs, and the shared significance of the symbols for achieving and understanding communicative intentions. We briefly discuss this point below, but that is not what we emphasize here. Rather, we focus on processes that would enable empathic responding to learned indicators of discriminated interoceptive stimulation. We sketch a "thought experiment" that exhibits these processes and then consider reasons for concluding that our modification of the original Lubinski and Thompson's demonstration removes some basic limitations of the original and of the extensions of the original that Lubinski and Thompson consider. Our main point is that in spite of their success in shaping capacities to indicate distinct interoceptive stimulation to fit patterns of interaction with others, they fail demonstrate capacities for appreciating

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[4] Evidence that such cross training is feasible is reported in Epstein, R. and B. F. Skinner (1981). "The spontaneous use of memoranda by pigeons." Behavior Analysis Letters **1**: 241-246.

the distinct interoceptive events indicated or processes that can shape those capacities to fit patterns of social interaction. Our aim is to address this shortcoming.

The Experiment

Our thought experiment is quite straightforward. We propose using a training regimen that is somewhat different than Lubinski and Thompson's to produce a very similar two pigeon interaction. Both our decoder and cue bird receive the drug discrimination training used by Lubinski and Thompson. Thus, we propose conducting part (but not all) of the cross-training Lubinski and Thompson suggest. In our proposed cross training the letters imprinted on the cue bird response keys are different from those imprinted on the decoder's response keys. (See Figure 4/2) Specifically, our cue bird is trained on response keys marked S, D, and N, respectively. Our decoder's discriminative response keys are marked C, P, and W, respectively. Neither our decoder nor our cue bird receives training in matching to sample. Instead, our decoder receives stimulus substitution training. This is the most significant modification we propose of the procedures used or suggested by Lubinski and Thompson.

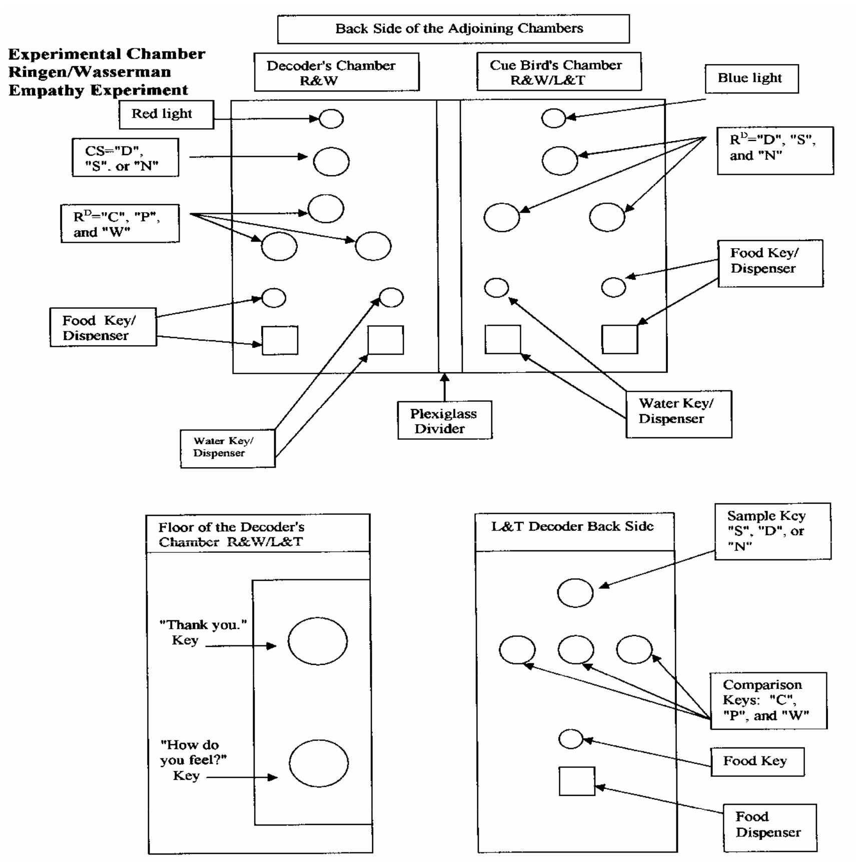

Figure 2: The details of the response operandi, stimulus configurations, and reward mechanisms structuring the R & W Empathy Experiment. A comparison with the features of the Lubinski and Thompson setup is included.

Figure 4

Our proposed stimulus substitution training is a classical (Pavlovian/respondent) conditioning procedure. The decoder is injected with the substance selected. After a delay, but at an appropriate time prior to the onset of interoceptive effects of the injected substance, a letter is projected on the decoder sample stimulus key. The letter - drug pairing in our proposed stimulus substitution training matches the substance - response key pairing established during cue bird (but not decoder) discrimination training. For example, S, the letter identifying a correct cue bird response to effects of cocaine, serves as the letter projected on the decoder sample key after the decoder is injected with cocaine. After repeated pairings, the previously neutral projected letter becomes a conditioned stimulus (CS) that elicits conditioned interoceptive responses (CR) similar to the unconditioned interoceptive responses (UCR) previously elicited only by the unconditioned stimulus (UCS), the interceptive effects of the injected substance. In a pilot study, stimulus substitution might be attempted using only one of the three substances used in drug discrimination procedure. In a full blown behavioral synthesis, decoders might receive stimulus substitution training on each of the three drug discrimination substances. Thus, in addition to establishing a projected S as a CS for conditioned cocaine effects, a display of P is made a CS for conditioned effects of Pentobarbital injection, and W a CS for conditioned effects of saline

We expect that a novel set of behaviors will emerge in decoders trained as we propose and subjected to the following test. A decoder previously given both drug discrimination training and stimulus substitution training are placed in an experimental chamber equipped with a sample stimulus key and three discriminative response keys. A CS is displayed on the sample key, and the three discriminative response keys are illuminated. We expect the decoder to peck the response key that in the decoder's drug discrimination training constitutes the correct response to the drug whose effects the displayed CS evokes. If our prediction here is correct, then it should be a straightforward and interesting, if tedious and resource intensive, project to establish an interaction that, except for minor details, and significantly different procedures for producing it, is identical with that presented by Lubinski and Thompson.

Proposed Experimental Protocol

The setup for our proposed demonstration consists of adjacent experimental chambers separated by a transparent Plexiglas wall. The chambers are equipped as in Figure 4/2. The back wall of the decoder's chamber is equipped with a sample stimulus key, three response keys marked C, P, W, respectively, a water dispenser, a food dispenser, and a red light that flashes signaling the availability of food and water when the decoder completes its part of the interaction. The back wall of the cue bird chamber is similarly equipped except for lacking a sample key, having response keys marked S, D, and N, respectively, and having a blue light that flashes signaling the availability of food and water when the cue bird completes its part of the interaction. The floor of the decoder chamber is equipped with two keys, a "How are you?" key and a "Thank you." key that can be independently illuminated. The floor of the cue bird chamber is unadorned.

To initiate the two pigeon interaction, the trained cue bird is injected with one of the three training substances, and after an appropriate delay, is placed in the darkened cue bird chamber. The trained decoder is placed in the adjacent darkened decoder chamber. The house lights are turned on and the decoder's "How do you feel?" key is illuminated. The interaction proceeds as in Figure 5/3. Thus, the decoder pecks the "How do you feel?" key when it is illuminated. This illuminates the three imprinted response keys in the cue bird chamber. If the cue bird pecks the correct response key, the letter imprinted on that key is projected on the sample key in the decoder's chamber, and illuminates the decoder's "Thank you." key. The decoder's pecking this key starts the blue light flashing in the cue bird chamber, makes food and water available to the cue bird, and illuminates the imprinted response keys in the decoder's chamber. The decoder's pecking the response key matching the sample key starts the red light flashing in the decoder chamber and makes food and water available to the decoder.

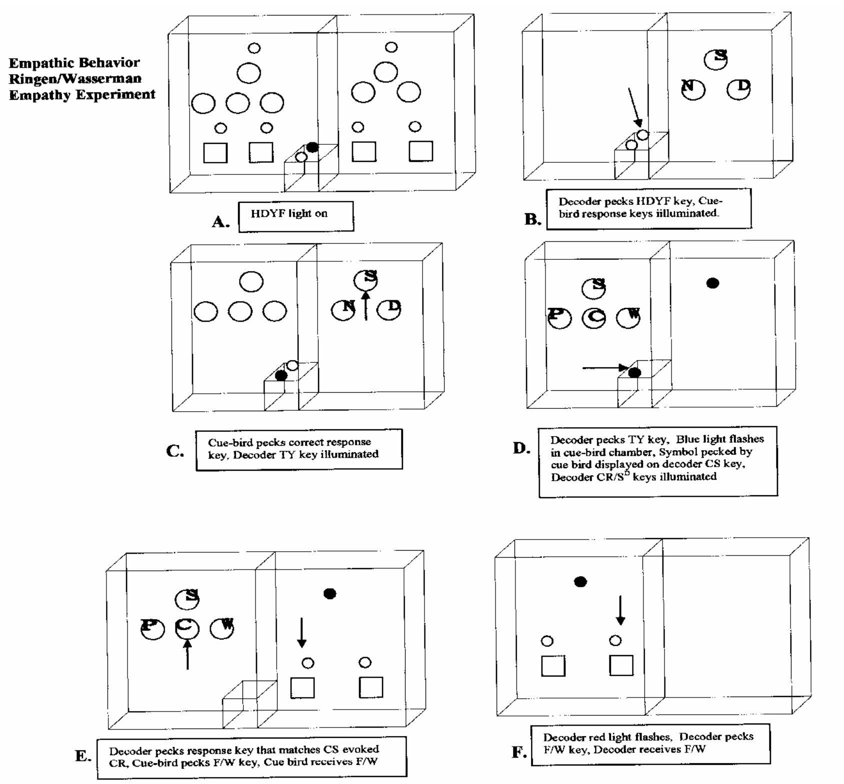

Figure 3: A two-pigeon communicative exchange based on internal states of both birds (Decoder,left; Drug-cue bird, right). A. The "How do you feel?" key is illuminated. B. The Decoder pecks the HDYF key. C. The Drug-cue bird pecks the drug-class letter corresponding to its internal state. D. The Decoder pecks the "Thank you" key which presents the flashing blue light to the Drug-cue bird. The Decoder response also projects on the Decoder's conditioned stimulus key the drug-class letter previously pecked by the Drug-cue bird. The Drug-cue bird attends to the flashing blue light. E. The Decoder pecks the letter that represents the specific drug whose evoked effects the Decoder experiences after being presented with the CS (and whose direct effects the Drug-cue bird is currently experiencing). The Drug-cue bird receives Food or Water. F. The flashing red light is presented to the Decoder. The Decoder attends to the flashing red light. The Decoder receives Food or Water .

Figure 5

The causal structure of this interaction (and its relation to the interaction reported by Lubinski and Thompson) is depicted in Figure 6/4.

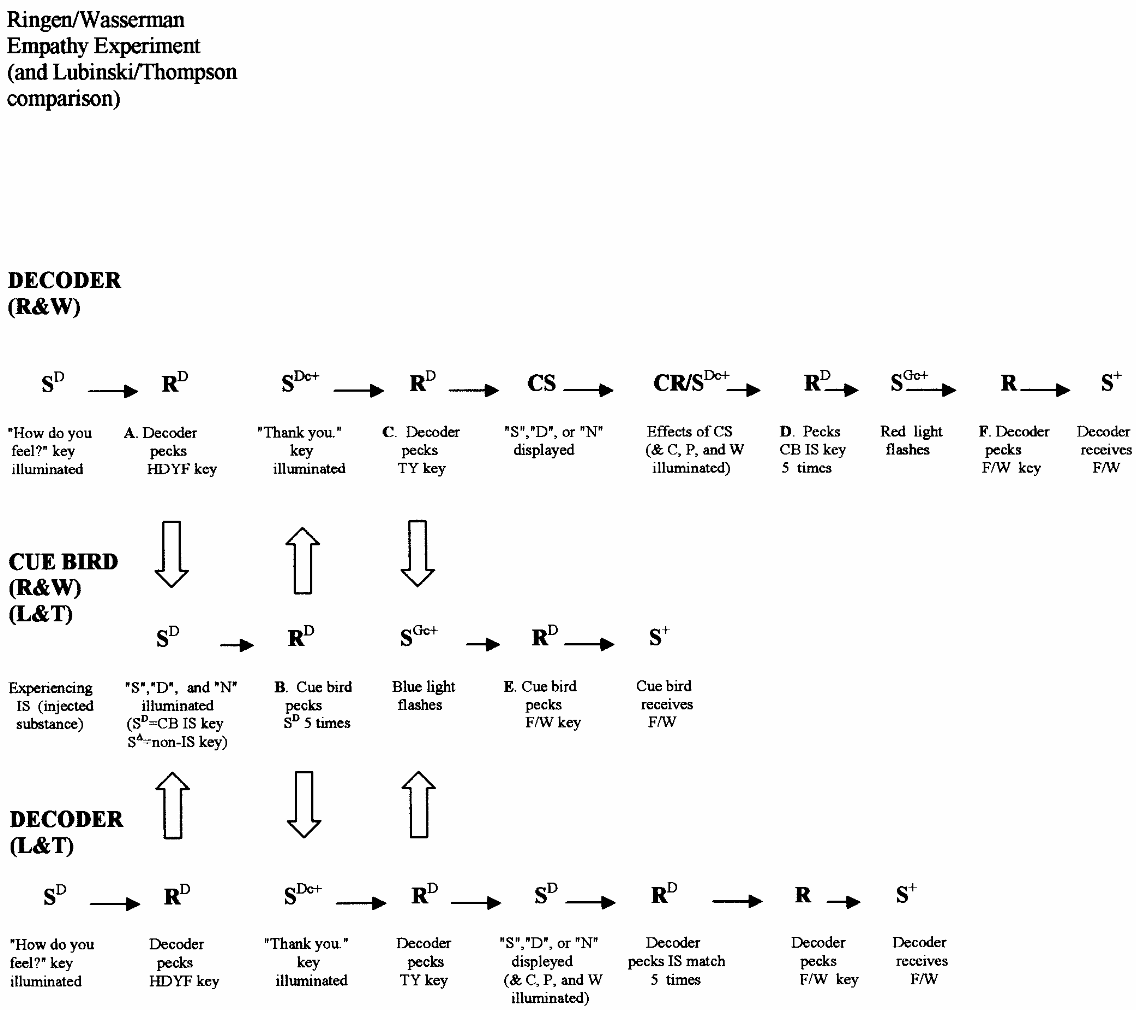

Figure 4 : The Interlocking Paradigm illustrates and compares the causal structure of the two pigeon interactions proposed by Ringen and Wasserman and that produced by Lubinski and Thompson.. The notational system is: S^D=discriminative stimulus; S^Δ=a stimulus that will not produce reinforcement; S^{Dc+}=a discriminative stimulus that also functions as a conditioned reinforcer; R^D=a discriminative response; S^+=unconditioned reinforcer; S^{Gc+}=generalized conditioned reinforcer; CS=conditioned stimulus; CR=conditioned response; R=response.

The diagram of the Ringen/Wasserman thought experiment illustrates a two-pigeon communicative exchange based on internal states of both birds (the Decoder, top and the Drug-cue bird, middle). A: The Decoder pecks the "how do you feel?" key. B: The Drug-cue bird pecks the drug-class letter corresponding to its internal state. C: The Decoder pecks the "Thank you" key, which presents the flashing blue light to the Drug-cue bird. This response also projects on the Decoder's conditioned stimulus key the drug-class letter previously pecked by the Drug-cue bird. D: The Decoder pecks the letter that represents the specific drug whose evoked effects the Decoder experiences after being presented with the CS (and whose direct effects the Drug-cue bird is currently experiencing) that matches the drug-class letter (projected on the conditioned stimulus key). The Drug-cue bird attends to the flashing blue light. E: The Drug-cue bird pecks the F/W key and receives Food or Water. The flashing red light is presented to the Decoder. The Decoder attends to the flashing red light. F: The Decoder pecks the F/W key and receives Food or Water .

Figure 6

We suggest that our interaction provides a fuller model of communication concerning feeling than does Lubinski and Thompson's. We propose that each bird be exposed to effects of the same injected drugs and learn to selectively respond to them. It seems a reasonable (but possibly false) working hypothesis that the cue bird's discriminative responses to effects of a given drug evoke effects in the decoder similar to the effects elicited by that drug in the decoder.[5] We predict that relevant effects will be evoked by the conditioned stimulus presented by the cue bird's selective responding, so that the drug elicited effects and the conditioned stimulus evoked effects will match or at least exhibit significant similarity. This match/similarity of drug elicited and conditioned stimulus evoked effects is the feature of our thought experiment that captures a significant feature of one type of communication concerning feeling. We suggest that the processes that establish the interlocking behavior that produces that match are processes that establish discrimination of interoceptive effects of drugs, occasion selective responses that indicate these effects establish conditioned stimuli that evoke similar effects, and establish discrimination of these evoked effects. This does seem and instance of identification and communication concerning the interoceptive effects of drugs. Specifically, we suggest that the thought experiment provides a model of empathic communication in which the medium for communication is a set of arbitrary conditioned and learned discriminative stimuli and responses.

3. Discussion

Empathy and Communication

Descriptive and Empathic Communication

The practice of communicating feelings to another may involve reporting those feeling or it may simply involve evoking those feelings by some other means. Thus, for example, in *The Seven Percent Solution*, (Meyer 1974) Sherlock Holmes is tricked into consultation concerning his addiction to cocaine. Holmes' friend, Dr. Watson reports and remarks on a conversation between the physician (Sigmund Freud) and Holmes before Holmes began withdrawal. Holmes exclaimed, "It is no use. Even now, I am overcome by this hideous compulsion!" Freud nodded [and said] "I have taken cocaine and I am free of its power. If you will allow me, I will help you free yourself as well." Holmes responded, "You cannot do this." [And Watson, the narrator, comments] "Holmes's voice was breathless. Though he protested that he did not believe, yet his tone told me how desperately he wished to hope." (p. 68)] When Holmes awakens from several days in withdrawal, Freud asks him how he feels. Holmes responds "Not well." (p. 83)

Sherlock Holmes is naturally described as identifying and communicating feelings to his listeners. But different kinds of communication are exemplified in the

[5] Some difference due to genetic variation and past history is, of course, to be expected, but it should be possible to independently test the neurological effects of each drug on each bird, and to compare these with the effects of presentation of the conditioned stimulus on the decoder. Some of the relevant effects of the drugs are discussed by Lubinski and Thompson 1993 see, p.636-637. It should also be possible to identify and investigate other dimensions of the conditioned and unconditioned internal/covert/interoceptive or proprioceptive responses of the decoder and cue bird, respectively.

exchange. Holmes reports being "overcome by this hideous compulsion." He also reports that he does not feel well. In each instance, he is describing a current feeling. Holmes also conveys to Watson "how desperately he wished to hope." Holmes may well have conveyed this unintentionally. Watson describes the experience Holmes conveyed. Holmes does not. No report is involved in the behavior that conveys this feeling. Similarly, Freud and Watson are naturally described as responding with empathy to Holmes, albeit in somewhat different ways. Freud had experienced cocaine addiction. He might be said to understand what it is like for Holmes to feel the power of addiction. In addition, when informed of Holmes addiction, Freud acted to help. . Watson had not tried cocaine. We might think that in some respects he could not appreciate what it was like for Holmes to be addicted, but he surely responded with empathy of a different sort. From the tone of Holmes' voice and perhaps various other forms of “body language”, Watson understood "how desperately [Holmes] wished to hope." And, of course, Watson was largely responsible for getting Holmes the help he needed.

Consider a similar interaction between a physician and a crying child. The child may report being in pain and describe the location. The child may, however, simply cry, show various signs of distress such as wincing, withdrawing quickly, and crying more loudly when touched firmly in the lower right abdomen. The report and the behavior expressing the pain may or may not evoke in the physician a sense of what it is like to experience what the child is feeling. It may or may not occasion thoughts about the nature (pain, not pleasure), quality (sharp, not throbbing) and location (lower right abdomen, not the head, throat, leg, or finger) of the pain. And, any vicarious experience evoked in the physician may or may not be similar to the child’s experience just as the physician’s thoughts about the character and location of the child’s discomfort may or may not accurately represent the state the child is in.

Often, linguistic and non-linguistic means are used in deliberate efforts to evoke and even convey or communicate feelings. One type of communication of this sort aims to convey "what it is like" to have feelings and other experiences. This type of communication might be said to provide empathetic understanding, and to depend on a capacity for empathy (empathic responding/understanding) on the part of the recipient.[6]

Such "empathic" communication might be contrasted with descriptive communication in which conveying what an experience is like is of less importance than highlighting specific significant aspects of the experience. Physicians, for example, may have little interest in (vicariously) experiencing what a patient reports. Indeed, vividly experiencing

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[6] There is a large philosophical literature on empathic understanding, and relevant discussion of related topics such as distinctions between "knowledge by acquaintance" and "knowledge by description". There is a growing literature on empathy in contemporary psychology and neuroscience. For discussion of empathy in non humans, see Gallup, G. and D. Povinelli (1998). Can Animals Empathize? Scientific American.
Hauser, M. (2000). Wild Minds: What Animals Really Think. New York, Henry Holt and Company.. A more widely ranging discussion is presented in Preston, S. and F. d. Waal (2002). “Empathy: Its ultimate and proximate bases.” Behavioral and Brain Sciences **25**(1): 1-72.. For a brief conceptual and historical discussion see Wispe', L. (1987). History of the concept of empathy. Empathy and its development. N. Eisenberg and J. Strayer. New York, Campbridge University Press.

what the patient feels may be so distressing that it impedes the physician's efforts to help. Physicians are, however, concerned with what experience is present (dizziness, a ringing in the ears, hearing voices, acute pain) and perhaps its location (e.g., acute pain in the lower left region of the abdomen rather than the head). In a therapeutic context, accuracy about these features of experience may be more important than success in evoking in the physician distinctive experiences qualitatively similar to those experienced by the patient.[7] Such descriptive communication of feeling may depend on a capacity for expressing thought using natural language or some other symbolic representational system.[8]

Efforts to provide empathetic understanding succeed only to the extent that the "right" (e.g., intended, or simply matching) feelings are evoked, conveyed, or communicated.[9] Unlike successful descriptive reports, however, success of this sort does not depend on precise, accurate, or otherwise correct descriptions (models or symbolic representations) of what is evoked, conveyed, or communicated. Success can consist primarily in evoking the right (e.g., a sufficiently qualitatively similar) feeling in the recipient of the communication. What a given experience is like is sometimes conveyed directly, by exposure to circumstances that elicit the experience. Sometimes it is done indirectly, by exposure to some event that (naturally or conventionally) serves as a functional equivalent for circumstances that directly elicit the experience. For example, common sense suggests that striking the appropriate key on a piano will, under normal circumstances, elicit an experience of middle C in humans. Furthermore, seeing an appropriate mark on a musical score can produce a similar experience in some. Similar remarks could be made concerning the experience of seeing a red ball in relation to exposure to a red ball and reading or hearing the sentence, "Imagine seeing a red ball."

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[7] The suggestion here is NOT in conflict with the views that empathic understanding and responding may be important in therapeutic contexts. Our point concerns the features of the physician's model of the patient that are critical in therapeutic contexts. One might be concerned with how a physician's model of the patient may be organized and accessed. It does not seem likely that the physician experiencing what it is like to be the patient is a critical feature of a model of the patient. It may be, however, that the physician's vicarious experience is the way the physician represents the experience reported by the patient (and so - a representation of - this vicarious experience is part of the physician's model of the patient.) It may also be that helping behavior is in part motivated by empathic understanding. Suggestive studies document cases in which patients correctly identified circumstances and feelings of others, but failed to show normal concern for those feelings. (Anderson, et. al./UI Empathy Conference, compare footnote 8 below.)

[8] For discussion of symbolic representation, see Deacon, T. W. (1997). The Symbolic Species: The Co-evolution of Language and the Brain. New York, W. W. Norton and Company..

[9] This feature of empathic communication is acknowledged as a commonplace in the literary tradition. It is also explicitly acknowledged in recent discussion of non-human cognition. See, for example, Hauser, M. (2000). Wild Minds: What Animals Really Think. New York, Henry Holt and Company., p. 8. Compare, Meyer, N. (1974). The Seven-Per-Cent Solution. New York, E. P. Dutton & Co., Inc., pp. 68, 83. Preston, S. and F. d. Waal (2002). "Empathy: Its ultimate and proximate bases." Behavioral and Brain Sciences **25**(1): 1-72. present the match between the experiences of different organisms as the core aspect of empathy in a "Russian Doll" model of their analysis (PAM – Perception Action Model) of various features of the phenomenon. The point of this model is that the matching found in imitation, emotional contagion, and presumably, the learned patterns of interlocking empathic responding illustrated by thought experiment constitute likely candidates for the biological and behavioral substrates/scaffolding for the evolution and social development of capacities for perspective taking and full blown empathy of the sort illustrated in the fictional conversation between Freud, Holmes, and Watson quoted above.

An interestingly different case is the set of procedures for evoking the green afterimage of the red ball, and perhaps procedures for inducing another to imagine seeing the green afterimage of a red ball.

It seems clear that the pigeons in the Lubinski and Thompson demonstration neither described distinctive drug induced states nor conveyed "what it is like" to occupy such states. Lubinski and Thompson acknowledged that their pigeons do not use natural language and so cannot engage in the practice of describing different drug induced states. This prevents their demonstration from being a full model of the practice of *reporting* feelings to others. Feelings may be conveyed in other ways than by reporting. Conveying "what it is like" to have certain experiences such as feelings may not require natural language, and it may not require communicative intentions, but it would seem to require behavior on the part of the cue bird that evokes matching or similar experiences (e.g., feelings) in the decoder.[10] However, the decoder has no experience of the effects of the substances injected in the cue bird, and the discriminative responses of Lubinski and Thompson's cue bird are not likely to evoke anything like its drug-induced state in the decoder. Hence, the decoder's "symbol" matching responses indicate no appreciation of "what it is like" to be in that state, much less an appreciation of the fact that the cue bird occupies that state.[11]

Our thought experiment is a proposal concerning how aspects of conveying "what it is like" to occupy distinctive drug induced states might be demonstrated. It is not clear to us what the limits might be on successful communication concerning such states. It may be that there are ways of communicating what it is like to those who have not "directly" experienced the effects. However, we think it unlikely that the procedures used by Lubinski and Thompson exhibit such a process, and as we noted their decoder has not experienced the effects of the drugs indicated by the cue bird's discriminative responses. It may also be that because of individual variation in genetic constitution and (current and historical) conditions of life (including the history effects of internal events and processes) an there are limits to the kind of match that can be established between relevant internal events and processes (e.g., interoceptive and proprioceptive stimuli and responses) of two organisms. However, we suggest that the thought experiment we propose does exhibit a way that one pigeon can evoke a match of its current state in

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[10] Recent work on simulation theory Gallese, V. and A. Goldman (1998). "Mirror neuron and the Simulation throry of mind-reading." <u>Trends in Cognitive Sciences</u> **2**(12): 493-501. neural activation Adolphs, R., H. Damasio, et al. (2000). "A Role for Somatosensory Cortices in the Visual Recognition of Emotion as Revealed by Three-Dimensional Lesion Mapping." <u>The Journal of Neuroscience</u> **20**(7): 2683-2690. Blakemore, S.-J. and J. Decety (2001). "From the Perception of Action to the understanding of Intention." <u>Nature Reviews Neuroscience</u> **2**: 561-567. suggests provocative relations between imitation, emotional contagion, and empathy involving perspective taking. In each case, activation of neural circuits involved in eliciting specific behavior in one creature results from behavior in another that would be activated in the creature overtly or covertly simulating what the other is doing/expressing.

[11] There may be a sense in which the decoder was sensitive to the presence or absence of the different cue bird states, but there is no evidence that the cue bird's behavior conveys to the decoder any appreciation of what interoceptive state is occupied by the cue bird. Nor is there evidence that the decoder acquired any basis for responding selectively to the cue bird's interoceptive state (rather than some related feature of the experimental setup.) The decoder clearly did not attribute any inteorceptive state to the cue bird. For discussion, see p. below.

another with previous direct experience of that state. This provides an example of how productive behavior analytic investigations of issues concerning language, consciousness, and communication can proceed and how the issues can be illuminated by close consideration of the results of such investigations.[12] The thought experiment (like Lubinski and Thompson's original demonstration) also provides an opportunity to revisit a variety of issues concerning what is and is not distinctive of radical behaviorist approaches to the experimental analysis of behavior and whether such approaches can seriously address issues concerning human and nonhuman mental life. We suggest that our thought experiment illustrates how common sense conceptions of human and non-human cognitive (and conative) capacities can guide and be critically examined from the perspective of a radical behaviorist (and, hence, non-mentalistic) approach to the experimental analyses of behavior.[13] For example, the thought experiment provides as context in which it is possible to consider what would be required to demonstrate that specific discriminative responses do or do not have indicator functions (and, hence, constitute representations in the sense specified by Dretske (Dretske 1995). It also provides a base line from which the consider what would be required to demonstrate communicative intentions of the sort delineated by Grice (Grice 1957), (Grice 1969)and attributions of the sort required for the perspective taking and full blown empathy discussed by Preston and de Waal (Preston and Waal 2002). We have, in fact begun describing behavioral syntheses that probe these issues.

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[12] Gottfried, J., J. O'Doherty, et al. (2003). "Encoding Predictive Reward Value in Human Amygdala and Orbiofrontal Cortex." Science **301**(#5636): 1104-1107. provides a recent example of behavior analytic tools used to investigate biological functions of sensory discrimination and neural and biochemical substrates implementing these functions. Adams, C. D. and A. Dickenson (1981). "Instrumental Responding Following Reinforcer Devaluation." Quarterly Journal of Experimental Psychology **33B**: 109-121. reports work on reward/reinforcer devaluation.

[13] See, for example, Skinner, B. F. (1987). Outlining a Science of Feeling. Times Literary Supplement. **490**. Wasserman, E. A. (1997). "The Science of Animal Cognition: Past, Present, and Future." Journal of Experimental Psychology: Animal Behavior Processes **23**(2): 123-135.

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