

# VB News

Official Publication of the Verbal Behavior Special Interest Group

Volume 6 – Issue 1

May 2006

## Table of Contents

---

<b>Normand, M.</b> <i>Florida Institute of Technology</i> . Editorial.	2
<b>Potter, W.</b> <i>California State University, Stanislaus</i> . Report from the chair.	3
<b>Schlinger, H. D.</b> <i>California State University, Los Angeles</i> . B. F. Skinner's theory of mind.	4
<b>Schoneberger, T. S.</b> <i>California Behavior Analysis Group</i> . Toward an evolutionary biology of language: A new book by Philip Lieberman.	8
<b>Weitzman, R. S.</b> <i>California State University, Fresno</i> . A Brief Commentary on "Recursive syntactic pattern learning by songbirds" by T.Q. Gentner, K.M. Fenn, D. Margoliash & H.C. Nusbaum.	10

---

## Announcements

VB SIG Business Meeting at ABA.	2
Student Award Winners	11
<i>The Analysis of Verbal Behavior</i> Announcement and Table of Contents.	12
Guidelines for submissions.	13

## Editorial

**Matthew Normand, Ph.D.**

*Florida Institute of Technology*

Spring is upon us, as is the annual meeting of the Association for Behavior Analysis. That can mean only one thing: time for me to scramble and put together another issue of VB News! As happens each and every year, I waited a bit too long to kick it into high gear but was fortunate enough to get support from a number of excellent contributors. The result is another issue with contributions spanning a nice array of submission types. The lead article is an excellent piece of good scientific interpretation by Hank Schlinger, dealing with a behavioral interpretation of Theory of Mind. Two reviews of work that should be of interest to verbal behavior enthusiasts follow. First,

Ted Schoneberger whets the appetite for the latest book on language from Philip Lieberman (an invited speaker at ABA 2004 in Boston). Next, Ray Weitzman provides a review of a recent study (published in *Nature*) suggesting that the capacity for language is not necessarily a distinctly human characteristic.

As always, I would like to thank all of the contributors to this issue of VB News and encourage others to think about possible contributions for the next issue. (The guidelines for submission can be found on p. 13.) See you all at ABA !!

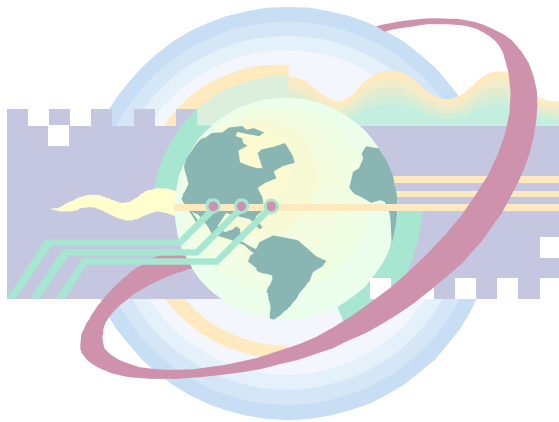


**Join Us for the VB SIG  
Business Meeting  
@ ABA 2006!**

**Sunday, May 28<sup>th</sup> 2006  
Hyatt Regency Atlanta  
Spring Room  
7:00 PM – 7:50 PM**

---

## Want To Get Involved?



**Visit us on the Web**

<http://www.vbsig.org>

**Join the VB Listserv**

[verbalbeh@listbot.csustan.edu](mailto:verbalbeh@listbot.csustan.edu)

## Report from the Chair

**Bill Potter, Ph.D.**

*California State University, Stanislaus*

Please join us at the annual VB SIG business meeting at ABA. It will be held on Sunday May 28<sup>th</sup> at 7 pm in the "Spring" room – all are welcome to attend. The VB SIG is dedicated to the promotion and dissemination of research related to Verbal Behavior – come and meet other ABA folks working/researching in the area.

This year the SIG helped sponsored one of the VB invited addresses – Jeffrey Elman,, of the University of California- San Diego, has titled his talk "Generalizing Beyond Our Experience: Lessons from Neural Networks". The talk will be on Saturday, May 27<sup>th</sup> at 3 pm in Centennial Ballroom I. Elman is widely recognized for his research on language processing, development, and computational models of cognition.

The SIG has also resurrected its student competition. Thanks to Judah Axe, the competition winners will be provided their awards at the SIG meeting. The following is an excerpt from the requirements for submissions:

*A submitted paper can be a study conducted under the tenets of basic research, a contribution of a conceptual analysis, or an empirical investigation conducted under an applied framework. Submissions are restricted to researchers who are student members of ABA.*

Feel free to send submissions, or inquiries either to me - [wpotter@csustan.edu](mailto:wpotter@csustan.edu), or to Judah at [axe.3@osu.edu](mailto:axe.3@osu.edu). Many thanks go to Ted Schoneberger who donated the funds for the awards to be presented to the winning researchers.

The VB website has been redesigned, and can be viewed at [www.vbsig.org](http://www.vbsig.org). If you would like to contribute your presentations, or papers to be available on the SIG site, email me at [wpotter@csustan.edu](mailto:wpotter@csustan.edu). Please include in your

email a letter giving the SIG permission to post the presentation. The SIG reserves the right to limit the number and type of presentations that will be placed on the site – we are primarily interested in articles related to Skinner's analysis of VB, as well as extensions of that analysis. The SIG also has a listserv, which you can sign up for at:

<http://listbot.csustan.edu/mm/listinfo/verbalbeh>.

One of the SIG's main goals is to support the journal The Analysis of Verbal Behavior. Go to <http://www.abainternational.org/avbjournal/> for information about the journal. For subscription information visit <https://apps.abainternational.org/onlinestore/index.asp>. If you have a manuscript that you would like to have considered for publication in the journal, contact:

*Dr. Jack Michael, Editor  
1000 Berkshire Dr.  
Kalamazoo, MI 49006*

You can also email Jack at:  
[jack.michael@wmich.edu](mailto:jack.michael@wmich.edu).

If you need to pay your dues, or would like to contribute to the efforts of the VB SIG, please send your contribution to our treasurer, David Reitman at:

Center for Psychological Studies  
Nova Southeastern University  
Fort Lauderdale, FL 33314

Dave's email is [reitmand@nova.edu](mailto:reitmand@nova.edu).  
Dues for full members are \$10 for one year and \$5 for students.

Finally since you are reading this Matt Normand did another great job of putting together the VB News. Matt has consistently put together a well rounded newsletter. See you at ABA!

## B. F. Skinner's Theory of Mind

Henry D. Schlinger, Ph.D., BCBA

California State University, Los Angeles

### Theory of Mind as Meme

In the last chapter of his book, *The Selfish Gene*, Richard Dawkins introduced the term *meme* to refer to a unit of cultural replication or imitation analogous to the biological unit of replication – the gene. Examples of memes include tunes, ideas, and catch phrases. According to Dawkins, “just as genes propagate themselves in the gene pool by leaping from body to body via sperm or eggs, so memes propagate themselves in the meme pool by leaping from brain to brain via a process, which in the broad sense can be called imitation” (1976, p. 206).

While we behavior analysts may at the very least disagree with Dawkins' description and explanation of imitation, the term *meme* has attained a certain level of descriptive currency in some circles. I mention memes because an excellent example is the idea of theory of mind (ToM). As Kurt Salzinger recently wrote,

*"Times they are a-changin'," as Bob Dylan succinctly put it. ... When you enter theory of mind in PsycINFO, it returns 2,176 entries—books, book chapters, and journal articles. Not only that, its frequency of use is such that it has been awarded an acronym, namely, ToM . . . (Salzinger, 2006).*

I have personally seen ToM mentioned by a variety of authors, from the usual suspects such as Steven Pinker to the unexpected such as Clive Wynne in his book, *Do Animals Think*. In the popular book *Blink*, author Malcolm Gladwell devotes several pages to ToM and the problem of mind-blindness (lacking ToM) that some (e.g., Baron-Cohen, 2001) claim is a defining feature of autism.

### Defining and Studying Theory of Mind

The phrase “theory of mind” was first introduced by Premack and Woodruff (1978) who, writing about chimpanzees, defined it as the ability to impute mental states to oneself and others. Although it has since been used in a variety of ways, it usually refers to “being able to infer the full range of mental states (beliefs, desires, intentions, imagination, emotions, etc.) that cause action. In brief, having a theory of mind is to be able to reflect on the contents of one's own and other's

minds” (Baron-Cohen, 2001, p. 174). According to Baron-Cohen et al. (1985), “The ability to make inferences about what other people *believe* to be the case in a given situation allows one to predict what they will do. This is clearly a crucial component of social skills. There is growing evidence for the ability to attribute mental states to others, and its development from the second year of life onwards” (p. 39).

Researchers interested in ToM have utilized several tests to study it. One, called the false-belief task, is a variant of Piaget's AB search error that occurs in Stage 4 of the sensorimotor period of development. In the AB search task, if an object is hidden under a cloth at position A, infants will lift up the cloth and retrieve the object. If, however, while the object is still within full view, it is hidden under a cloth at position B, infants will continue to search for it under cloth A, especially if there is a delay between re-hiding the object and allowing the child to search for it. Salzinger (2006) describes the false-belief task:

*The child (the subject in this experiment) watches together with another individual (say, a puppet) as the experimenter places a toy inside a green box. The puppet then leaves the stage and unbeknownst to the puppet, but in full view of the subject, the experimenter moves the toy from the green box to a red box. The child is then asked where the puppet will look for the toy when she returns. What many studies report is that younger children, deaf children, children with mental retardation, and children who are autistic are more likely than other children to say that the puppet will look in the red box, that is, where the toy now resides rather than where the puppet thinks or believes it to be on the basis of the information she has. This phenomenon is given the name false belief. The interpretation of this result is that these children cannot take on the point of view of another individual, or in more colorful words, cannot read other peoples' minds.*

*continued on p. 5*

## Theory of Mind

*continued from p 4*

### Theory of Mind Tasks as Stimulus Control Problems

It is important to note that performance on the false-belief task hinges on the child's ability to answer the question, "Where will the puppet look for the toy when she returns?" As Salzinger points out, failure to answer this question correctly represents a fairly simple "example of stimulus control gone wrong." The very young child's answer is controlled by the most recent placement of the toy rather than the placement when the puppet was present. The error is similar to that in Piaget's AB search error problem. Most likely the reason older children are able to solve these respective problems is because they have had more experiences in which responding correctly in the presence of both stimulus situations has been reinforced. Such a hypothesis would be easy to test.

Before being able to say where another person would look for a toy, children probably learn to answer the question, "Where is the toy?" or "Where would you look for the toy?" In Piaget's AB search problem, if the child has always found the object under cloth A, even if she sees the object placed under cloth B, she will look for it under cloth A because that behavior has always produced the object (i.e., has been reinforced) (Schlinger, 1995). Not until seeing where the object is placed becomes the stimulus condition under which removing a cloth is reinforced by finding the object will the child look under the cloth where she saw the object placed. Likewise, in the false-belief task, a child probably first learns to look in the box where she saw the experimenter place the toy and then learns to answer the question, "Where would you look for the toy?" Once a child has learned to answer this question, the response may generalize to questions about where another person (or a puppet) would look for the toy.

Although we may describe a child that displays such behavior as having a ToM or as "mind reading," a more parsimonious, though much less captivating, way of describing it is in terms of stimulus control.

### B. F. Skinner's Theory of Mind

Salzinger (2006) also points out that the false-belief task has implications for an analysis of private events. If ToM is defined as "being able to infer the full range of mental states (beliefs,

desires, intentions, imagination, emotions, etc.) that cause action," being "able to reflect on the contents of one's own and other's minds," and being able to predict what another person will do based on such inferences (Baron-Cohen, 2001, p. 174), then it can be argued that B. F. Skinner proposed a theory of mind as long ago as 1945.

In his seminal 1945 paper, "The Operational Analysis of Psychological Terms," Skinner argued that in order to understand the meanings of psychological terms one must undertake a functional analysis of how the terms are used, in other words, the circumstances that cause someone to utter the term and, more importantly, the reinforcing consequences provided by the verbal community. Thus, Skinner extended a scientific analysis of behavior in general to the verbal behavior of psychologists in particular. Skinner described how the verbal community can teach a speaker so-called objective terms, such as the response "red," by reinforcing instances of the response in the presence of red stimuli, because "the stimulus acts upon both the speaker and the reinforcing community" (1945, p. 272). But when it comes to subjective terms, this "provision is lacking." In his attempt to explicate how one learns verbal responses to private stimuli, Skinner, perhaps unknowingly at the time, distinguished his brand of behaviorism, called radical behaviorism, from the standard methodological behaviorism of the day. Skinner's interpretation of how we learn subjective terms also constitutes his theory of mind in that he provided an account of how, as Baron-Cohen puts it, we can reflect on the contents of our own and others' minds, infer another person's beliefs, intentions, or emotions, or predict another person's behavior (Baron-Cohen, 2001; Baron-Cohen et al. 1985).

### Learning to respond to one's own private events

Skinner described at least four ways the verbal community teaches someone to respond verbally to (or to label or describe) private stimuli. I'll focus on two. The first is that the verbal community can look for some public event that reliably accompanies the private one. Interoceptive pain is a good example. In

*continued on p. 6*

## Theory of Mind

*continued from p 5*

the case of learning to say a cut or bruise hurts, the sight of the cut or the bruise is the publicly accompanying event. When parents see a cut or bruise on a child, they ask the child if it hurts and then reinforce verbal responses such as "It hurts."

A second way others can teach us about our own private events is by relying on additional or corresponding responses. Consider the example of a headache. If parents see a child holding her head and perhaps moaning, the parents might ask, "Do you have a headache?" or "Does your head hurt?" If the child says "headache" or "head hurt," the parent reinforces the response. In neither case do the parents have direct access to the child's pain, so they must rely on the indirect evidence of public accompaniments or corresponding responses. The result, however, is that the child's verbal response reporting pain comes under the control of the private painful stimulus such that in the future such stimulation will be sufficient to evoke the response "It hurts" or "I have a headache."

As Skinner (1945) points out, the same process occurs when we are taught such expressions as "I'm depressed," "I'm scared," "I'm anxious," or "I'm sad." Even then, others need more information to teach the correct description. For example, simply observing someone crying gives us little to go on to accurately teach him to describe how he is feeling. Is he sad, hurt, or extremely happy? In such cases we need to observe the precipitating environmental conditions.

### Learning to predict others' behavior

Once a child has learned to report on her own private stimuli (and behavior) she is in a better position to infer another person's thoughts and feelings. For example, consider how a child might infer that someone else is hungry and likely to eat. First, she probably learns to say that she is hungry. According to Skinner's analysis, parents teach children to report that they are hungry by asking, "Are you hungry?" or saying, "You must be hungry" or "Do you want to eat?" all occasioned by such corresponding responses as food-seeking behaviors, voracious eating, or talking about food and such publicly accompanying events as time without eating. Time without eating may be correlated with the private stimuli we call "hunger pangs," such that those stimuli come

to control the response, "I'm hungry." Once a child learns to report her own hunger, the responses may automatically generalize to the behavior of others or the parents may assist by asking similar questions or making similar statements about others, including younger siblings, or family pets and teaching children to respond in similar ways. Thus, a child may infer another person's hunger and predict whether they are likely to eat based on the public accompaniments and corresponding responses relevant to that person. In this way, the child may be said to "mind read" or to have a ToM.

### Theory of Mind and Language Development

The verbal behaviors said to indicate ToM are likely a function of the language environment to which children are exposed. A study comparing children with varying conversational backgrounds, including native signing deaf children, oral (speaking and listening) deaf children, signing deaf children from hearing families, autistic children and normal preschoolers, indicates that the children's conversational experience is directly correlated with success on a variety of ToM tasks including the false-belief task. In particular, normal preschoolers and fluent-signing and oral deaf children performed much better than autistic and signing deaf children from hearing families (Peterson & Siegal, 1999; see also Woolfe, Want & Siegal, 2002). This study suggests that the amount of conversational experience, in particular that involving teaching children to explain others' behavior in terms of their mental states, may account for their ability to predict the behavior of others. Of course, since another person's mental states (i.e., private stimuli or covert verbal behavior) are not directly accessible, children can only be taught to explain or predict a person's behavior in terms of public events (e.g., corresponding responses or public accompaniments) that may correlate with their mental states.

A number of other studies support the suggestion that the amount and particular types of conversational experience a child is exposed to are responsible for the child's ToM and, moreover, that the verbal behaviors comprising the ToM occur beginning in about

*continued on p. 7*

## Theory of Mind

*continued from p 6*

the second year of life. For example, gains in language have been shown to be a predictor of preschoolers' ToM performance (Astington & Jenkins, 1999), and the style of maternal language used with very young children, especially about what others think, feel, or would do in a particular situation, predicts their later ToM performance (Harris, de Rosnay, & Pons, 2005). One study found that mothers' mental state utterances (e.g., "I think it's a cat," "I don't know whether it's a dog," "I wonder what that is? It could be a cat," including the use of a variety of emotion terms such as "happy," "sad," "feel" and physical state terms such as "cry," "smile," "hurt") were correlated with their children's mental state utterances and ToM (Ruffman, Slade, & Crowe, 2002). In trying to determine exactly what syntactical configurations in conversation with adults may be responsible for developing their ToM, Harris et al. (2005) suggested that an emphasis on pragmatics rather than on the lexicon or syntax of the child's verbal interactions better explains the general findings of the importance of verbal environment of children on their development of ToM. The development of these verbal behaviors in children would be an area ripe for behavior analysts to mine for the role of basic verbal operants, multiple control, and autoclitics as outlined by Skinner (1957).

### Theory of Mind and Self-Awareness

You may have already realized that verbal responses to private events, whether they are stimuli or covert behavior, are what most people mean when they refer to self-awareness or consciousness. In fact, Skinner acknowledged this as well as some attendant difficulties on the last page of his 1945 paper when he wrote:

*. . . being conscious, as a form of reacting to one's own behavior, is a social product. Verbal behavior may be distinguished, and conveniently defined, by the fact that the contingencies of reinforcement are provided by other organisms rather than by a mechanical action upon the environment. The hypothesis is equivalent to saying that it is only because the behavior of the individual is important to society that society in turn makes it important to the individual. The individual becomes aware of what he is doing only after society has reinforced verbal responses with respect to his behavior as*

*the source of discriminative stimuli. The behavior to be described (the behavior of which one is to be aware) may later recede to the covert level, and (to add a crowning difficulty) so may the verbal response. It is an ironic twist, considering the history of the behavioristic revolution, that as we develop a more effective vocabulary for the analysis of behavior we also enlarge the possibilities of awareness, so defined. The psychology of the other one is, after all, a direct approach to "knowing thyself" (Skinner, 1945, p. 277).*

The upshot is that all others can rely on to teach awareness of private events is publicly accompanying events, corresponding responses and the stimulating environment. There is no direct access to someone else's private world. It's no wonder, then, that when we ask someone how she feels, she often doesn't know or can't put it into words.

Based on Skinner's (1945) analysis of learning verbal responses to private events, being able to "reflect on the contents of one's own and other minds" or "attribute mental states to others" may mean simply that a person can report on his own private stimuli and covert behavior and can predict what another person may be thinking, feeling or about to do. As such, Skinner may have provided a parsimonious analysis of how the verbal behaviors said to constitute a ToM are learned long before ToM became a meme.

### References

- Astington, J. W., & Jenkins, J. M. (1999). A longitudinal study of the relation between language and theory-of-mind development. *Developmental Psychology*, 35, 1311-1320.
- Baron-Cohen, S. (2001). Theory of mind in normal development and autism. *Prisme*, 34, 174-183.
- Baron-Cohen, S, Leslie, A. M., & Frith, U. (1985). Does the autistic child have a "theory of mind"? *Cognition*, 21, 37-46.
- Dawkins, R. (1976). *The Selfish Gene*. New York: Oxford University Press.
- Gladwell, M. (2005). *Blink*. New York: Little Brown and Company.

*continued on p. 8*

## Theory of Mind

*continued from p 7*

Harris, P. L., de Rosnay, M., & Pons, F. (2005). Language and children's understanding of mental states. *Current Directions in Psychological Science*, 14, 69-73.

Peterson, C. C., & Siegal, M. (1999). Representing inner worlds: Theory of mind in autistic, deaf, and normal hearing children. *Psychological Science*, 10, 126-129.

Premack, D., & Woodruff, G. (1978). Does the chimpanzee have a 'theory of mind'? *Behavioral and Brain Sciences*, 4, 515-526.

Ruffman, T., Slade, L., & Crowe, E. (2002). The relation between children's and mothers' mental state language and theory-of-mind understanding. *Child Development*, 73, 734-751.

Salzinger, K. (2006, February 22). The Mystery of Mind Reading [Review of the book *Why Language Matters for Theory of Mind*]. *PsycCRITIQUES-Contemporary Psychology: APA Review of Books*, 51 (No. 8), Article 9.

Schlinger, H. D. (1995). *A Behavior Analytic View of Child Development*. New York: Plenum.

Skinner, B. F. (1945). The operational analysis of psychological terms. *Psychological Review*, 52, 270-277.

Skinner, B. F. (1957). *Verbal Behavior*. Englewood Cliffs, N.J.: Prentice-Hall.

Woolfe, T., Want, S. C. & Siegal, M. (2002). Signposts to Development: Theory of Mind in Deaf Children. *Child Development* 73 (3), 768-778.

Wynne, C. D. L. (2004). *Do Animals Think?* Princeton, N.J.: Princeton University Press.

## Toward an Evolutionary Biology of Language: A new book by Philip Lieberman

**Ted Schoneberger**

*California Behavior Analysis Group*

An invited speaker at ABA/Boston 2004, Philip Lieberman (2006) has published a new book, *Toward an Evolutionary Biology of Language*. Lieberman, a Brown University Professor of Cognitive and Linguistic Sciences, as well as a Professor of Anthropology, has now authored eight books (Lieberman, 1967, 1975, 1984, 1991, 1998, 2000, 2006; Lieberman & Blumstein, 1998) on the origins and biology of human language.

In his previous work--*Human Language and Our Reptilian Brain*--Lieberman (2000) offered arguments, along with supporting research, for the assertion that "language is not an instinct, based on genetically transmitted knowledge coded in a discrete cortical 'language system.' Instead it is a learned skill, based on a functional language system (FLS) that is distributed over many parts of the human brain" ( p. 1).

In chapter 5 of *Human Language and Our Reptilian Brain* (Lieberman, 2000), as well as in earlier works, Lieberman presented insights into the evolution of language. In his newest book, Lieberman supplements and extends

those previous insights. Amazon.com offers the following description of the new book:

*In this forcefully argued book, the leading evolutionary theorist of language draws on evidence from evolutionary biology, genetics, physical anthropology, anatomy, and neuroscience, to provide a framework for studying the evolution of human language and cognition. Philip Lieberman argues forcibly that the widely influential theories of language's development, advanced by Chomskian linguists and cognitive scientists...are inconsistent with principles and findings of evolutionary biology and neuroscience...Fully human language involves the species-specific anatomy of speech,*

*continued on p. 9*

**Philip Lieberman***continued from p 8*

*together with the neural capacity for thought and movement. In Lieberman's iconoclastic Darwinian view, the human language ability is the confluence of a succession of separate evolutionary developments, jury-rigged by natural selection to work together for an evolutionarily unique ability.*

What follows is an excerpt from Chapter 1 (appearing on the back cover of the book):

*Evolution is opportunistic and has a "historic" logic of its own making. Existing structures and systems are adapted to serve new ends, often maintaining their original functions as well. Once a new behavior is in place, natural selection may then modify a structure to enhance that aspect of life; but some, or all, of the demands of the starting point may persist...the brain mechanisms that yield human syntax ability also have evolutionary antecedents outside the domain of language. The subcortical basal ganglia structures of the human brain that are critical elements of the neural systems that allow us to comprehend the meaning or to form a sentence also continue to support neural circuits that regulate motor control as well as aspects of cognition, mood, and much else. The evolutionary record of the changes that yielded human language is evident in the morphology and physiology of the brain and body; disputes concerning the evolution of*

*language follow from different readings of the text. Uncertainty arises because the text has become obscured; the species who possessed intermediate stage of language are extinct... Nonetheless, the situation is not hopeless...the present anatomy and physiology of the human brain and body reveal its evolutionary history, which, in turn, provides insights on the nature of the biologic bases of human cognition, language, and other aspects of human behavior."*

This book is published by Belknap Press and is 448 pages in length. It's release date is May 15, 2006 and available from Amazon.com for \$49.95. A review is planned for an upcoming issue of *The Analysis of Verbal Behavior*.

**References**

- Lieberman, P. (1967). *Intonation, perception, and language*. Cambridge, MA: MIT Press.
- Lieberman, P. (1975). *On the origins of language: An introduction to the evolution of speech*. New York: Macmillan.
- Lieberman, P. (1984). *The biology and evolution of language*. Cambridge, MA: Harvard University Press.
- Lieberman, P. (1991). *Uniquely human: The evolution of speech, thought, and selfless behavior*. Cambridge, MA: Harvard University Press.
- Lieberman, P. (1998). *Eve spoke: Human language and human evolution*. New York: W. W. Norton.
- Lieberman, P. (2000). *Human language and our reptilian brain: The subcortical bases of speech, syntax, and thought*. Cambridge, MA: Harvard University Press.
- Lieberman, P. (2006). *Toward an evolutionary biology of language*. Cambridge, MA: Belknap Press.
- Lieberman, P., & Blumstein, S. E. (1988). *Speech physiology, speech perception, and acoustic phonetics*. Cambridge: Cambridge University Press.

**A Brief Commentary on "Recursive syntactic pattern learning by songbirds" by T.Q. Gentner, K.M. Fenn, D. Margoliash & H.C. Nusbaum  
Raymond S. Weitzman, Ph.D.**

*California State University-Fresno*

It has been hypothesized (Hauser, Chomsky, & Fitch, 2002) that human beings are endowed with a language faculty that is differentiated from the language faculties of all other species by having a recursive computational (syntactic) system (I-language) that generates a potentially infinite set of internal sentence representations which map on to other central and peripheral cognitive interfaces, such as the sensory-motor system, the conceptual-intentional system, etc. Hauser, et al. refer to this position as the faculty of language - narrow sense (FLN). This theoretical system is said to be the core element of the language faculty of human beings. It is thus implied that other species, lacking this recursive generative core, are incapable of learning a 'language', i.e., a signaling system or set of discriminative stimuli, with recursive properties.

To test this hypothesis Gentner, et al. trained 11 European starlings to discriminate stimuli that had recursive patterns fitting the context free grammar (CFG)  $A^n B^n$  from stimuli that had non-recursive patterns fitting the finite state grammar (FSG)  $(AB)^n$ , where As consisted of eight possible 'rattle' motifs of a starling's song and Bs consisted of eight possible 'warble' motifs of a starling's song. The subset of the CFG and the FSG used in the training consisted of the patterns  $A^2 B^2$  and  $(AB)^2$  respectively to create a total of 4,096 possible token stimuli for each grammar. Out of this set of possible stimuli for each of the CFG and FSG grammars eight from each were randomly selected to be used in the baseline training, as long as no one motif of either a rattle or warble occurred consecutively. The baseline training employed a go/nogo operant procedure (see article and online supplement for details). After criterion was reached in the baseline training, tests of generalization were given involving familiar  $A^2 B^2$  and  $(AB)^2$  stimuli, novel  $A^2 B^2$  and  $(AB)^2$  stimuli, agrammatical stimuli of the patterns AAAA, BBBB, ABBA, BAAB, novel  $A^n B^n$  and  $(AB)^n$  stimuli, where  $n = 3, 4$ , as well as stimuli consisting of speech syllables. Only four of the eleven starlings were subjected to the testing portion of the experiment, because these learned the discriminations the most quickly, i.e., reached criterion much earlier than the others. Five of the birds learned more slowly

and two birds did not reach criterion. It should be noted that reaching criterion ( $d' = 1.0$ ) required at least approximately 125 blocks of 100 trials for the four quickest learners.

The tests results indicated that the four subject starlings were generalizing to new CFG and FSG sequences (see article for details). Furthermore, in the probe sessions with new  $A^n B^n$  and  $(AB)^n$  sequences appropriate discrimination responses were above chance. The responses of all four birds to agrammatical sequences differed significantly from new  $(AB)^2$  stimuli and from  $A^2 B^2$  stimuli in the responses of three of the four birds.

Based on this evidence, the investigators conclude that learning of recursive syntactic patterns, at least at an elementary level, is a faculty not beyond the capacity of other animals and thus, not unique to human beings. I'll leave it up to experts on operant conditioning to assess the procedures and methods and the use of  $d'$  as a measure of criterion in the Gentner, et al. study. But there are several other issues in regard to their interpretative conclusions that I would like to briefly discuss.

Assuming the experimental procedures to be valid, Gentner, et al were able to establish a discriminative stimulus class consisting of a sequence of rattles followed by a sequence of warbles. While the particular pattern of rattles and warbles can be described as exemplars of a recursive CFG of the formal form  $A^n B^n$ , it seems to me they are going beyond their data to claim "that starlings can recognize syntactically well-formed strings, including those that use a recursive centre-embedding rule." That starlings can learn to discriminate one discriminative stimulus class that involves a sequence of rattles followed by a sequence of warbles from another discriminative stimulus class that involves repeated sequences of a single rattle followed by a single warble shouldn't be too surprising, given that there have been numerous studies by behavior analysts demonstrating that all sorts of discriminative stimulus classes, as well as

*continued on p. 11*

**Brief Commentary***continued from p 10*

functional stimulus classes, can exert stimulus control over the behavior of animals, including other species of birds. But the empirical evidence certainly isn't sufficient to claim such occasioned behavior is the result of an internal generative mechanism.

Furthermore, the agrammatical probes add nothing really to supporting such a claim, since none of them (see above) are crucial to the distinction. Some crucial agrammatical probes would have been AAAB or AABA. A negative response to such probes would tell us at least that the starlings had generalized that equal numbers of rattles and warbles were essential for membership in the discriminative stimulus

class. Of course, then one could argue that the birds were simply counting the number of rattles and warbles, not recognizing them as exemplars of a recursive CFG. On the other hand, a positive response to these stimuli would suggest that the only a sequence of rattles followed by at least one warble was essential for membership in the discriminative stimulus class.

Of course, the ultimate question still remains: Does the human faculty of language have at its core a recursive generative computational system?

**References**

Gentner, T. Q., Fenn, K.M., Margoliash, D., & Nusbaum, H. C. (2006). Recursive syntactic pattern learning by songbirds. *Nature*, 440, 1204-1207.

Hauser, M. D., Chomsky, N., Fitch, W. T. (2002) The faculty of language: What is it, who has it, and how did it evolve? *Science*, 298, 1569-1579.

**2006 VB SIG STUDENT PAPER COMPETITION WINNERS**

1st place: **Tina Sidener** (*Western Michigan University*)

Title: Effects of Single versus Multiple Verbal Operant Arrangements on the Acquisition of Mands and Tacts in Preschool Children.

2nd place: **Rocio Rosales** (*Southern Illinois University*)

Title: Contriving Transitive Conditioned Establishing Operations to Establish Derived Manding Skills in Adults with Severe Developmental Disabilities

3rd place: **Meagan K. Gregory** (*University of Maryland, Baltimore County and the Kennedy Krieger Institute*)

Title: Assessment of Prerequisite Skills for Manual Sign and Picture Exchange Communication Systems.

The first and second place finishers each receive a small cash award from the Verbal Behavior Special Interest Group. All winners receive a commemorative plaque and a copy of the latest issue of *The Analysis of Verbal*. Many thanks go to Judah Axe (*Ohio State University*) who organized this year's competition.

**NOW AVAILABLE**  
**THE ANALYSIS OF VERBAL BEHAVIOR**  
**VOLUME 22, 2006**

---

Maria Amelia Matos, Alessandra Lopes Avanzi, and William J. McIlvane: Rudimentary Reading Repertoires via Stimulus Equivalence and Recombination of Minimal Verbal Units.

Janet I. Yi, LeeAnn Christian, Glenda Vittimberga, and Barry Lowenkron: Generalized Negatively Reinforced Manding in Children with Autism.

Rachael A. Sautter & Linda A. LeBlanc: The Empirical Applications of Skinner's Analysis of Verbal Behavior with Humans.

Linda A. LeBlanc, John Esch, Tina M. Sidener, and Amanda M. Firth: Behavioral Language Interventions for Children with Autism; Comparing Applied Verbal Behavior and Naturalistic Teaching Approaches.

Alicia M. Alvero and John Austin: An Implementation of Protocol Analysis and the Silent Dog Method in the Area of Behavioral Safety.

Matthew P. Normand and Melissa L. Knoll: The Effects of a Stimulus-Stimulus Pairing Procedure on the Unprompted Vocalizations of a Young Child Diagnosed with Autism.

A. Charles Catania: Words as Behavior.

Frank Hammonds: Toward An Awareness Of The Relationship Between Task Performance And Own Verbal Accounts Of That Performance.

R. Douglas Greer: Summary and Commentary on D. and S. Premack's Original Intelligence.

David W. Sidener: Joint Control for Dummies; An Elaboration of Lowenkron's Model of Joint (Stimulus) Control.

Barry Lowenkron: An introduction to Joint Control.

Barry Lowenkron: Joint control and the Selection Of Stimuli From Their Description.

Anhvinh N. Wright: The Role of Modeling and Automatic Reinforcement in the Construction of the Passive Voice.

David W. Sidener and Jack Michael: Generalization of Relational Matching to Sample in Children: A Direct Replication.

Rick D. Gutierrez: The Role of Rehearsal in Joint Control.

Joyce C. Tu: The Role of Joint Control in the Mand Selection Responses of Both Vocal and Non-vocal Children with Autism.

David C. Palmer: Joint Control; A Discussion of Recent Research.

**Order the Journal On-Line at**  
<https://apps.abainternational.org/onlinestore/avb.asp>

## **Guidelines for the Submission of Articles**

VB News publishes articles related to the functional analysis of verbal behavior. Article types include, but are not limited to, discussion and review articles, verbal behavior program reports, pilot research reports, book reviews, and brief commentary. Each of these categories is described in more detail below. If you would like to submit an article that does not fit into any of these categories, simply E-mail me a summary of your article and I will let you know if it would be appropriate.

All submissions should be prepared as a Microsoft Word document and sent as an E-mail attachment. The manuscript should be single-spaced in 11-point Times New Roman font. APA style conventions should be followed.

### **Discussion and Review Articles**

Brief surveys and/or analyses of verbal behavior related research or theoretical discussions will be accepted. These reviews should not exceed six-pages.

### **Program Reports**

Brief descriptions of the application of verbal behavior to language curricula are welcomed. These reports should not exceed six-pages and may include up to an additional two-pages of appendices.

### **Pilot Research Reports**

Descriptions of innovative pilot research targeting verbal behavior related phenomena are acceptable. These reports should not exceed three-pages and must include a complete description of your methods, a brief summary of your results with one figure, and only a one or two paragraph introduction.

As VB News is a newsletter publication, these reports need not meet the stringent methodological requirements for publication in a peer-reviewed journal. The intention is to inform interested parties so as to stimulate discussion and further research.

### **Book Reviews**

Brief reviews of books likely to be of interest to the verbal behavior community are encouraged. These reviews should not exceed two-pages and should include only a short reference list.

### **Brief Commentary**

Short articles, in the mold of traditional op-ed pieces or letters to the editor, will be accepted at the discretion of the editor. Articles should not exceed a single page.

**Please Send All Submissions to:**

**Matthew Normand @ [mnormand@fit.edu](mailto:mnormand@fit.edu)**