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Verbal hallucinations and language production processes in schizophrenia

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Abstract: How is it that many schizophrenics identify certain instances of verbal imagery as hallucinatory? Most investigators have assumed that alterations in sensory features of imagery explain this. This approach, however, has not yielded a definitive picture of the nature of verbal hallucinations. An alternative perspective suggests itself if one allows the possibility that the nonself quality of hallucinations is inferred on the basis of the experience of unintendedness that accompanies imagery production. Information-processing models of "intentional" cognitive processes call for abstract planning representations that are linked to goals and beliefs. Unintended actions – and imagery – can reflect planning disruptions whereby cognitive products do not cohere with concurrent goals. A model of schizophrenic speech disorganization is presented that postulates a disturbance of discourse planning. Insofar as verbal imagery can be viewed as inwardly directed speech, a consequence of such planning disturbances could be the production of unintended imagery. This link between the outward disorganization of schizophrenic speech and unintended verbal imagery is statistically supported by comparing the speech behavior of hallucinating and nonhallucinating schizophrenics. Studies of "borderline" hallucinations during normal, "goal-less" relaxation and drowsiness suggest that experiential unintendedness leads to a nonpathological variant of hallucinatory otherness that is correctable upon emerging from such passive cognitive states. This contrasts with the schizophrenic case, where nonconcordance with cognitive goals reinforces the unintendedness of verbal images and sustains the conviction of an external source. This model compares favorably with earlier models of verbal hallucinations and provides further evidence for a language production disorder in many schizophrenics. *Short Abstract:* How is it that many schizophrenics identify certain instances of verbal imagery as hallucinatory? This paper proposes that the critical feature identifying hallucinations is the experience of unintendedness. This experience is nonpathological during passive conscious states but pathological if occurring during goal-directed cognitive processing. A model of schizophrenic speech disorganization is presented that postulates a disturbance of discourse planning that specifies communicative intentions. These alterations could generate unintended verbal imagery as well. Statistical data are offered to support the model, and relevant empirical studies are reviewed.

Keywords: cognition; hallucinations; imagery; language; memory; planning; schizophrenia; thought-disorder; volition

Verbal hallucinations (hereafter referred to as VHs) or "voices" (the term most frequently used to refer to such phenomena by patients themselves) are a frequent, though not invariant, component of schizophrenic symptomotology (Bleuler 1950; Seitz & Molholm 1947; see also current DSM-III diagnostic criteria for schizophrenia, American Psychiatric Association 1980). Simply stated, the susceptible patient claims to "hear" the speech of another in the absence of an actual speaker. These experiences are vexing and mysterious for both the schizophrenic and the investigators who wish to decipher their meaning as expressions of pathological cognitive processes.

Psychiatrists generally explain VHs in terms of a "loss of ego boundaries" or "inner/outer confusion." These terms, at best, describe aspects of the schizophrenic's irrationality while offering no new understanding of the cause(s) of such phenomena. This paper will instead attempt to develop a cognitive-processing model by conceptually linking VHs and speech disorganization. The latter, often referred to as "loose associations," is also a frequent clinical manifestation of schizophrenia and has undergone extensive scrutiny over the last 10 years, including a recent BBS target article (Schwartz 1982; also see reviews by Maher 1972; Rochester and Martin 1979; Wykes 1980). The present author, in collaboration with colleagues, has investigated schizophrenic speech disorganization as a disturbance in generating multipropositional discourse plans that specify communicative intentions. This paper will argue that such language-planning disruptions also induce VHs.

The major components of this argument – which compose the first four sections of the paper – are as follows: (1) Sensory properties of VHs are not distinct from ordinary verbal imagery; (2) VHs are verbal images that are accompanied by a feeling of unintendedness; (3) disruptions in language-planning processes associated with schizophrenia can cause verbal images to be experienced as unintended; this claim is supported by a recently completed study that correlates the severity of speech disorganization in schizophrenia and the presence of VHs; (4) if such images are nonconcordant with concurrent cognitive goals then the experience of unintendedness provides the basis for the sustained conviction of a nonself origin.

The fifth section of the paper reviews the merits and limitations of other theories of schizophrenic hallucinations in comparison with the model presented here. The

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final section further details the model in relation to other clinical observations and experimental studies of schizophrenic neurocognitive disturbances.

1. Sensory properties of VHs

VHs are instances of auditory imagery that are phonetically organized as words. Verbal images are a normal component of human consciousness whose frequent occurrence during cognition has been extensively investigated (Luria 1961; Sokolov 1972; Vygotsky 1962; 1978; Zivin 1979). Regardless of how one understands the function of these imagery processes, that we can "hear" voiced images cannot be denied.

This immediately raises the central issue of the paper. What specific factors lead schizophrenic persons to experience certain instances of verbal imagery as if they were actually coming from another person?

Many investigators of the VH problem have assumed that sensory attributes such as exceptional loudness, vividness, or clarity cause certain verbal images to be labeled as deviant. Another approach would be to propose that schizophrenia causes some major diminution in the capacity to produce auditory imagery in general. Then if any auditory imagery occurred, it would be noted as exceptional and labeled as deviant. Solid empirical evidence supporting either point of view is lacking, however. Seitz and Molholm (1947) reported that schizophrenics with auditory hallucinations demonstrated weaker auditory imagery on subjective rating scales compared to control patients, a finding that was supported by a later study by Starker and Jolin (1982). On the other hand, Mintz and Alpert (1972) reported a general tendency toward stronger auditory imagery among hallucinating schizophrenics compared to controls. Brett and Starker (1977) indicated that there were no differences at all between hallucinating and nonhallucinating patients with respect to the vividness or accessibility of voluntarily induced imagery. Slade (1976a) reported enhanced imagery vividness for both hallucinating and nonhallucinating psychotics compared to normals, but no differences between the first two groups. Heilbrun, Blum, and Haas (1983) compared vividness of imagery in the auditory and visual modes for schizophrenics with VHs, but they found no differences.

Approaches that consider other sensory attributes of hallucinatory experience are of doubtful significance. For instance, one might propose that the subjective "amplitude" of auditory imagery has significant pathological effects. However, both Bleuler (1950) and Sedman (1966a) reported that schizophrenic VHs were at times so faint that the words were experienced as a whisper or were not discernible at all. Also, as part of an unreported study, the present author asked a small series of hallucinating schizophrenics to gauge their VHs against an externally generated sound input. Subjects were requested to indicate whether their "voices" were louder than, as loud as, or softer than the external sound. Subjects indicated a full range of subjective amplitudes that included both soft and loud levels. Linn (1978) and Frank, Rendon, and Siomopoulous (1980) indicated that VHs are most often heard in the second-person voice, perhaps a distinguishing feature of VHs. However, this also seems unlikely for two reasons. First, one does not normally label auditory images of another's voice compared to one's own as hallucinatory or otherwise pathological. Second, Schneider (1957) and Sedman (1966b) have emphasized that schizophrenics at times experience their own voiced image as alien and pathological; thus a non-first-person voice seems not to be a necessary feature of schizophrenic hallucinatory imagery.

2. Imaging and Intending

How is it, then, that a VH can seem deviant or alien to the schizophrenic when no specific sensory features can be identified that contribute to this experience? Individuals have extremely limited awareness of the complexity of actual cognitive processes (Bem 1967; Dennett 1978; Nisbett & Wilson 1977; Pylyshyn 1973; 1981). This suggests that there are many information-processing steps besides the actual conscious "display" of sensory information during mental imagery production that may be subject to pathological alterations leading to hallucinatory attributes. In particular, Dennett (1978) differentiates the occurrence of an imagery event, which he calls α, and the immediate cognitive consequences of α, which is the β-manifold of α. The β-manifold of the imagery event includes a set of inferences about the nature of α. People are notoriously poor at assessing their own guiding presuppositions and predispositions, and certain apparently perceptual attributes of an imagery event may actually result from more or less automatic inferential processes that alter how the image is experienced. This distinction of α and β components of imagery experience highlights subtle though critical issues involved in understanding the etiology of VHs. If a verbal image is also a VH, then its β-manifold would include some representation of what the image "said," as well as the "sensation" that the image somehow derived from the "outside." But there is no *a priori* way of knowing whether the "alien/nonself sensation" of the image derives from the α- or the β-processing levels.[1]

A parallel problem presents itself within the realm of normal experience.[2] When one is listening to a tape recording of one's own voice a common reaction is that the voice sounds alien – as if the speaker is not really oneself. A possible cause of this experience could be the sensory qualities of the recording itself. We might be sensitive to subtle distortions of the sound of our own voice due to the recording process; these distortions could be experienced as alien. On the other hand, the alien/otherness sensation might derive from a more or less automatic inference: If I need to decode a series of speech sounds in order to derive the propositional message of the speech sounds, and in doing so I rely on external speech perceptual-processing capabilities, then it is fair to expect that someone else is doing the speaking. Conversely, one ordinarily does not need to decode one's own speech while one is speaking in order to know what one is saying; we already have a message more or less in mind while we speak. But if the propositional message of one's own taped speech is recreated upon relistening, then the predisposition regarding undecoded external speech might cause one to experience tape-recorded speech – including one's own – as if it were generated by

another speaker. The plausibility of the second explanation is supported by the observation that in general only one's own voice sounds alien; the taped voices of others (unless fidelity is very bad) are quite recognizable and acceptable; they are consonant with a nonself inference. On the other hand, we may be uniquely sensitive to sound-reproduction distortions of our own voice. No solution for the tape-recording problem has been explored, though I think it raises significant issues. The problem is nonetheless useful insofar as two distinct hypotheses – one referrable to primary sensory information and the second referrable to automatic or preconscious inferential processes – are suggested that can account for the alien sense of a certain class of self-generated verbal images.

The position of this paper is that the alien/otherness attribute of VHs derives from a β-level inference that is generated on the basis of action-like attributes of image production rather than primary sensory attributes. Wittgenstein has written: "The concept of imaging is rather like one of doing rather than receiving" (Wittgenstein 1980, section 111). He substantiates this statement by noting that images can be willfully induced. I can decide to walk or talk and simply do so. Similarly, I can decide to picture a tree or hear a friend's voice, and consequently "produce" the corresponding image.

Empirical data substantiate the image/action/output relationship. Finke (1979) demonstrated that visual imagery interacts with both central and peripheral cognitive processes that subserve motor events, suggesting a common pathway for imagery and action sequences. Motor events can also modify imagery. This is illustrated by the phenomenon of efferent copy, whereby, for example, moving one's eyeball with one's fingers rather than one's ocular muscles displaces the image; this "passive" movement of the eyeball lacks the proprioceptive feedback from ocular muscle efferents that normally corrects for changes in the image secondary to ocular displacement. Also, covert speech muscle activity has been shown to occur concurrently with normal verbal imagery (Sokolov 1972) as well as VHs (Cerny 1965; Gould 1948; Inouye & Shimizu 1970). These findings again suggest the convergence of imagery processes and manifest action sequences. Finally, the outer/inner speech linkage is suggested by the study of language behavior in children. Shortly after the acquisition of social, adult-directed speech, the child begins to demonstrate egocentric speech (talking out loud to himself) during creative play and goal-directed activity (Luria 1961; Vygotsky 1962; 1978; Zivin 1979); egocentric speech then evolves into unspoken verbal imagery that continues throughout the remainder of childhood and adulthood (Sokolov 1972).

Just as action, speech, and imaging can be intended or willed, so can certain actions (such as nervous tics) and speech (such as slips of the tongue) be experienced as unintended. Certain images can also be experienced as unintended; an obvious example is ordinary dreaming. The dream, expecially during rapid-eye-movement (REM) sleep, is generally experienced as completely out of control of the dreamer, with the source of the dream presumed to be some nonsubjective outside world.

Along these lines, this paper proposes that VHs are verbal images that are experienced as unintended. In support of this hypothesis, Horowitz claims that hallucinations are never accompanied by conscious intent (Horowitz 1975). Kass (1968) also notes that the voluntary production of images by schizophrenics is *never* experienced as hallucinatory. This has been confirmed by the present author, who asked the series of schizophrenics mentioned earlier to reimagine a previous VH in the present. They were then asked to contrast the two experiences in terms of loudness, vividness, and so forth. Invariably the subjects reported that the reimaginings were different from true "voices," but were not generally able to identify any particular sensory qualities that distinguished the two. It might be argued that the subjects simply were not attentive to the task or adept at self-reports of subjective experience. On the other hand, their responses are consistent with the hypothesis that intended images are not, in general, experienced as hallucinations even if sensory qualities are kept constant. Other clinical evidence supporting an "unintentional" model of VHs is offered by hallucinating patients who also demonstrate involuntary overt speech.[3] Assuming that the generation of verbal imagery and overt speech reflect similar cognitive processes, the occurrence of involuntary external speech among these patients suggests that their VHs are composed of parallel, involuntary language events.

In the following section, a model of language-production disturbances in schizophrenia is described that could also cause unintended verbal imagery. Unintendedness is taken to be a necessary precursor that can lead to the induction of hallucinatory attributes; an empirical test of this hypothesis is described. In the subsequent section conditions are proposed and discussed that are sufficient to cause the schizophrenic to acquire a sustained conviction that the unintended image is of nonself origin.

3. Language planning processes in schizophrenia

Workers in cognitive science and artificial intelligence have convincingly argued that even modest attempts to model intelligent sequential behavior require the representation of plans that are precursors to the action itself (cf. Allen & Perrault 1980; Hayes-Roth & Hayes-Roth 1979; Sacerdoti 1977; Schank & Abelson 1977; Wilensky 1983). Cognitive plans provide coherence to action sequences and insure that behavior is consonant with associated goals and beliefs. These planning processes frequently occur outside of conscious awareness. For example, consider walking to my car. It so happens that I can, if I wish, consciously access a set of goals and subgoals (wish to drive car, wish to be transported to work, wish to be on time for work, etc.), certain beliefs (my car will start, my work place is accessible by certain roads, etc.), and the rudiments of a behavioral plan (walk to car, open door, turn ignition key, etc.). Though I generally get myself to work without being explicitly conscious of any such plan and its relationship to goals and beliefs, it is almost impossible to imagine how such goal-directed behavior could occur without representations such as these in a psychologically real sense (Pylyshyn 1980).

This perspective suggests an account of the experience of unintendedness that accompanies certain of our ac-

tions. A nervous tic feels involuntary because it does not reflect a motor plan consonant with accessible goals/beliefs. Similarly, a slip of the tongue feels involuntary because it is not consonant with the current speech goal, that is, to articulate a particular "message."

Research in psycholinguistics and computational linguistics has suggested that normally a speaker generates an abstract cognitive plan that reflects the gist or intention of what he will say and is sensitive to the goals and beliefs of the speaker (Allen & Perrault 1980; Cohen & Perrault 1979; Deese 1978; Hobbes 1979; Kintsch 1974; Kintsch & Van Dijk 1978; Van Dijk 1980). This plan is then transformed into lower level representations such as syntactic units and phonetic strings (Arbib 1982; Garrett 1975; Hoffman & Sledge 1984). Without this initial stage of language processing, the speaker could not utilize multiple sentences or clauses in a coordinated fashion to express a single, coherent "message" and thereby attain communicative goals. The consequence of such planning difficulties would be "loose associations" and related forms of speech disorder typically linked to schizophrenia.[4] As is the case for behavioral plans, discourse planning generally occurs outside the conscious awareness of the individual.

Deese (1978) has discussed a particular model of discourse planning whereby abstractly represented propositions that compose a communicative intention are arranged into a hierarchically organized data set.[5] Topical propositions occupy high nodal positions in the tree. Structural subordination within the tree occurs if the truth of one proposition is presupposed in order to discern the pragmatic sense of a second (dependent) proposition. This model of discourse planning was used by Hoffman, Kirstein, Stopek, and Cicchetti (1982) to formalize a model of textual coherence. The rudiments of the model can be summarized as follows: A text (either written or spoken) is experienced as coherent if the presupposition relationship imposes a complete "partial ordering" of the constituent statements of the text. "Partial ordering" breaks down into two axioms:

(I) For all statement pairs, s_1 and s_2, belonging to some text T, either s_1 presupposes s_2, or s_2 presupposes s_1, or there exists a third statement, s_3 in T such that s_3 is presupposed by both s_1 and s_2.

(II) If s_1 presupposes s_2, and s_2 presupposes s_3, then s_1 presupposes s_3, i.e., transitivity holds.

A well-formed discourse-planning structure can be illustrated on the basis of a speech segment produced by a 47-year-old woman who was hospitalized for depression (also discussed in Hoffman, Stopek & Andreasen, in press):

(A) Interviewer: Can you describe where you live?
Patient: Yes, I live in Connecticut. We live in a 50-year-old Tudor house. It's a house that's very much a home . . . ah . . . I live there with my husband and son. It's a home where people are drawn to feel comfortable, walk in, let's see . . . a home that is furnished comfortably – not expensive – a home that shows very much my personality.

The overall message of the above segment is fairly obvious – the woman is extolling the virtues of her house in terms of how it reflects on herself as a person. This message is represented by the hierarchical discourse plan

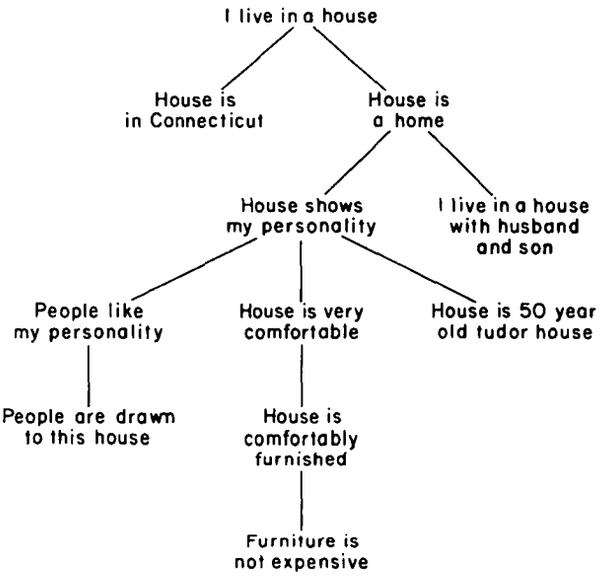

Figure 1. A hierarchical analysis of the "house is like my personality" segment. Certain statements can be located at different sites in the tree depending on how one interprets the communicative intention of the speaker. If "50-year-old Tudor" is metaphorically interpreted as referring to certain human qualities, then this statement is subordinated to the "house shows my personality" statement; otherwise the statement would be subordinated to the superordinate "house" statement (Hoffman, Stopek & Andreasen 1986). *Archives of General Psychiatry*. © 1986 American Medical Association. Reprinted with permission of the publisher.

proposed in Figure 1. Note that this figure corresponds to one particular interpretation of the communicative intention of the speaker. Alternatively, one might not take the "house is a 50-year-old Tudor house" statement as reflecting qualities of the personality of the speaker. This more straightforward interpretation is supported by the fact that speakers frequently supply orienting information such as age and style when reporting on personal possessions such as house or car. In this case the statement in question would be positioned in the nodal position directly subordinate to the "I live in a house" statement. In each reading of the passage, coherence is attained and is reflected by different hierarchical orderings of the statements in the text.

The above formulation is not intended to indicate that such discourse-planning structures represent all meaningful propositional relationships embedded within such speech behavior; computationally motivated text analyses discussed, for example, by Schank and Abelson (1977) indicate that an exhaustive deconstruction of such relationships generates a much more densely connected network of abstractly represented atomic propositions. Rather, what is proposed is that discourse-planning structures are located in a short-term, small-capacity working memory (cf. Anderson 1983), and that a tree geometry is relied upon because it minimizes processing requirements for storage and recall.[6] These efficient data structures can then serve as inputs to a large content-addressable or associative memory (cf. Anderson 1983), which accesses a comprehensive "gestalt" for particular texts.

Deese (1978) first proposed that the disorganization of schizophrenic speech can be traced to a deviation of propositional structures from a strict tree form (see also

discussions by Chaika, 1981, 1982, of the schizophrenic's failure to subordinate propositions to topic, or to adhere to a discourse macrostructure, a term from Van Dijk, 1980). As a result, the processing requirements of these texts would be markedly increased for speakers, and the experience of "looseness" or incoherence would accompany encoding efforts on the part of listeners. Using the formalization outlined above for partial orderings, Hoffman et al. (1982) were able to devise a measure of textual deviance that reflects the degree to which the propositional structure of discourse departs from a strict tree form. This metric can be reliably determined and did very well in predicting clinician ratings of "thought disorder" in response to a set of speech segments produced by a mixed population of psychiatric patients. Moreover, the simple presence/absence of nonhierarchical discourse structure, blindly determined, differentiated between schizophrenic and nonschizophrenic speakers with 80% accuracy. Though a full description of the analysis is beyond the scope of this paper, it can be illustrated with the following three schizophrenic speech segments:

(B) Interviewer: Have you ever been out of New York?
Patient: No, I've never been no where – no where . . . If I could go I would go . . . I feel like cashing in my welfare check now and just leaving . . . and I was gonna keep my-my two checks and save them and get an apartment. I wanna save them and just leave.

(C) Interviewer: Did you ever try to hurt yourself? (patient being asked about her feelings about suicide after being admitted to a psychiatric hospital)
Patient: I cut myself once when I was in the kitchen trying to please David. I was scared for [sic] life because David didn't want me and if David didn't want me then no man would.

(D) Interviewer: Tell me about school.
Patient: School? Well there are schools of play and schools of fish, mostly you see fish school, people edumacating [sic] themselves, you see, sea is one thing and education is another. Fish is school in their community, that's why the community of man stands in the way of the community of the sea, and once they see the light of sunny sunshine then they well let it be . . .

The relatively mild incoherence of (B) is due to the fact that "saving/keeping checks" has two different senses imposed by a shifting context – in the first case to provide money to leave New York and in the second case to provide money to stay. This corresponds to the deviant tree structure represented in Figure 2. Here the two separate chains of dependencies converge on the single saving/keeping money statement. As can be seen, pre-

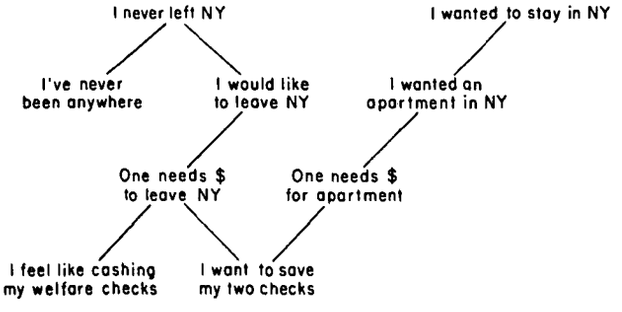

Figure 2. A hierarchical analysis of segment (B). Here there is an instance of upward branching that lends two different senses to the "I want to keep/save checks" statements.

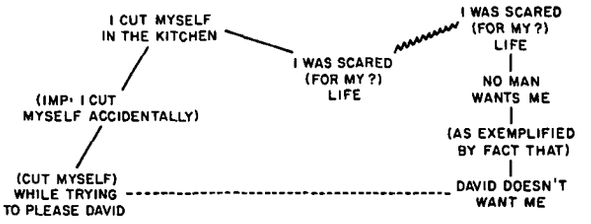

Figure 3. A hierarchical analysis of segment (C). The jagged line denotes a break in presuppositional transitivity. Extraordinary interpretations of the text could potentially restore a strict hierarchical structure (see note 8), but this requires assuming that the speaker disregarded the suicide theme without acknowledging that she changed topic.

supposed statements corresponding to staying and leaving New York do not, in themselves, presuppose any third statement; hence this "upward branching" of presuppositional chains violates axiom (I) defining partial ordering.[7]

Segment (C) also suggests a condensation of two disjoint messages. This is illustrated in Figure 3. The right-hand chain of statements describes a state of high stress of the type that might lead to suicidal behavior. This description substantiates the paragrammatical statement, "I was scared for life," which could be interpreted as "I was scared *of* life," or "I feared that my life was over," or "I was scared forever." The left-hand hierarchy seemingly refers to an incident where the speaker accidently cuts herself. In this context, "I was scared for life" seems to refer to her reaction to seeing that she had accidentally cut herself. The result is a departure from a strict hierarchical ordering of statements becuase statements such as "no man wants me" and "David doesn't want me" presuppose the "I was scared for life" statement and are referrable to the suicide theme, but not the "I (accidentally) cut myself" statement. Thus a break in transitivity of the presupposition relation (i.e., a violation of axiom II) occurs that is represented by a jagged line.[8]

Segments (B) and (C), as mild discourse deviations, yield planning structures that condense disjoint, albeit related, messages resulting in overall incoherence and deviance from a tree form. On the other hand, segment (D) represents a practically total loss of hierarchical structure such that statements are juxtaposed primarily on the basis of word play and phonetic similarity. Hence our metric of discourse deviation would score (B) and (C) as less severe than (D).

Chapman (1966) reported that schizophrenics frequently experience their manifest speech as being poorly matched to what they had in mind to say. An experimental study by Hoffman, Hogben, Smith, and Calhoun (1985) parallels this observation. Schizophrenics and nonschizophrenic psychiatric patients were given a list of input propositions and requested to combine them into ordinary conversational English. This translation task induced many more disruptions in the meaning of input propositions in the former than in the latter group.

A similar mismatching of cognitive intentions and language output is postulated for verbal imagery production in schizophrenia. This would predict that the more prone a schizophrenic is to discourse-planning breakdowns, the more likely he is to experience VHs. The relationship between breakdowns in discourse planning and VHs was

statistically supported by a recently completed study whose design has been described in more detail elsewhere (Andreasen, Hoffman & Grove 1984; Hoffman, Stopek & Andreasen 1986). The spontaneous conversational speech of 39 schizophrenics, 24 manics, and 40 normals was studied and compared using a hierarchical discourse analysis that was blindly and reliably conducted. Over $\frac{3}{4}$ of the discourse segments produced by normal subjects demonstrated strict hierarchical structure, while over $\frac{2}{3}$ of the schizophrenics and $\frac{3}{4}$ of the manic subjects demonstrated deviant discourse. Only 3 of the 24 manic subjects demonstrated VHs, so they were not studied in terms of the relationship between language disorganization and VHs. On the other hand, 26 schizophrenics reported VHs, 9 schizophrenics did not, and with 4 schizophrenics an adequate assessment of VHs was not possible. The schizophrenics with and without VHs were compared in terms of the severity of their discourse-planning disturbance; this was estimated by calculating the overall deviance score for each subject and correcting this figure for utterance length. Mean scores of severity of planning disturbance were approximately three times as great in the former group as in the latter (although there was some overlap of groups due to the large standard deviation of the former group), a result that was statistically significant ($t=2.94$, $df=33$, $p<.005$). Thus the severity of discourse disorganization correlates, at least in part, with the occurrence of VHs. This correlation is consistent with the hypothesis that disruptions in discourse planning cause disorganized speech as well as experientially unintended verbal imagery. These imagery qualities, which I postulate as a necessary precursor to the generation of hallucinations, can lead to external misattribution under particular circumstances that will be described in Section 4.

Because only portions of schizophrenic utterances depart from communication goals (see segments B and C for examples of partial adherence to the goal of answering the question with other portions of the text departing from that goal), it is anticipated that only fragments of inner speech issuing from a disturbed language plan would be experienced as unintended. This would account for the observation of Frank et al. (1980) that the mean number of words of VHs was considerably fewer than that of manifest utterances for their schizophrenic subjects.

These findings are also consistent with a study reported by Heilbrun (1980), who found that hallucinating schizophrenics were less able to recognize lexical, semantic, and syntactic features of their own speech compared to nonhallucinators. These recognition failures could be understood as a consequence of poorly determined speech that was the product of disrupted planning processes.

4. Goals, plans, and the nonself inference

This section will describe how the schizophrenic may, at times, automatically or preconsciously infer that certain unintended images are of nonself origin. The importance of this question is highlighted by the fact that many of the memories and images we normally experience during wakefulness are not "willed" or consciously called forth, but occur spontaneously during mentation. Yet these images are not automatically experienced as hallucinatory.

If VHs are inferences induced by unintended verbal images, then they are close cousins to delusional beliefs. A recent review paper by Winters and Neale (1983) breaks down the etiologies of pathological or delusional beliefs into three major categories. First, delusions may derive from more or less justified inferences based on pathologically altered perceptions. Second, delusions may be motivated by a need to reduce an uncomfortable psychic state; a typical example would be the grandiose delusion of being the president of the United States as a response to a loss of self-esteem. Third, delusions may result in a primary disturbance in the logic of inferential processes. The second explanation has doubtful relevance to schizophrenia – these individuals frequently report that their "voices" are extremely frightening and anxiety-provoking (Hollender & Böszörményi-Nagi 1958).[9] The third explanation has some surface plausibility. Anecdotal reports have periodically suggested that some schizophrenics demonstrate "paralogical" or "predicate" reasoning. A classic example (cf. Oppenheimer 1971) is: "I am a virgin; the Virgin Mary was a virgin; therefore I am the Virgin Mary." However, it is hard to invoke such breakdowns in logic to account for VHs, for systematic study has demonstrated that schizophrenic subjects are no more prone to such inferential pathology than control groups (Maher 1974). Thus the most plausible explanation is that the external misattribution of a schizophrenic VH is a more or less justified inference derived from altered perceptual data.

That these alterations in perceptual data derive from the experienced unintendedness of images is suggested by studies of hallucinatory phenomena during normal mentation (Foulkes & Fleisher 1975; Foulkes & Scott 1973; Foulkes & Vogel 1965). These studies were motivated by earlier sleep studies indicating that clearcut dream/hallucinatory states are not limited to the REM stage, but occur in varying degrees during all other sleep stages as well (Foulkes 1962). Consequently, Foulkes and Vogel (1965) mapped out a four-stage progression from alert, relaxed consciousness to physiological sleep determined on the basis of electroencephalogram (EEG) and electro-oculogram monitoring. The four stages were identified as follows: alpha EEG plus rapid eye movements (relaxed, nondrowsy consciousness); alpha EEG plus no eye movements or slow ocular drift (drowsy consciousness); desynchronized low-voltage EEG (stage I sleep), desynchronized EEG with sleep spindles/K-complexes (stage II sleep). It was found that clearcut hallucinatory experience, that is, imagery that is momentarily felt to originate from the "outside" as opposed to being self-generated, was frequently reported for all four stages: 31% of mentation reports during the alpha/REM stage contained hallucinations with progressive increases to 71% during stage II sleep. Because the hallucinatory character of these experiences during wakefulness was only fleeting, Foulkes and Vogel termed these experiences "borderline" hallucinations. Nonetheless, this finding clearly indicates that the nonself attribute can be assigned to images during normal waking states of consciousness. Later studies by Foulkes and Scott (1973) and Foulkes and Fleisher (1975) indicated a similar high

frequency of hallucinatory mental contents during relaxed, nonpresleep mentation.

A careful examination of the data reported by Foulkes and Vogel (1965) indicates increases in the frequency of mentation that the subjects experienced as involuntary in passing from relaxed wakefulness to stage II sleep. These increases from stage to stage closely paralleled – and were somewhat greater than – the observed increase in the frequency of frank hallucinosis (i.e., momentarily believing that the image was from the "outside"). The stage-to-stage statistical dominance of involuntary images compared to frankly nonself experienced images suggests that the former is a preliminary condition for the induction of the latter during normal cognitive states.

How do these "borderline" hallucinations in normals compare to the hallucinations of schizophrenia? An important clue is offered by a study by Sedman (1966a). He defined "pseudohallucinations" as images that were experienced as if they were perceptions from the outside but where the impression is recognized as being untrue; "true" hallucinations had exactly the same perceptual attributes as "pseudohallucinations" except that the patient had a sustained conviction that the perception had a nonself origin. These two imagery types were studied in a mixed population of psychiatric patients. About 50% of nonpsychotic and affective psychotic patients reported pseudohallucinations, but true hallucinations were reported by only $\frac{1}{14}$ of affective psychotics and by no nonpsychotic patients. On the other hand, $\frac{12}{16}$ of schizophrenics reported true hallucinations, with very few schizophrenics ($\frac{3}{16}$) reporting pseudohallucinations. The sensory modality of pseudohallucinations was an equal mixture of auditory and visual types (with a small number of tactile and olfactory experiences), whereas the predominant sensory modality of true hallucinations was clearly auditory. Sedman's study suggests that pseudohallucinations and true hallucinations are at least partially distinguishable, and that the latter alone are fairly (though not totally) specific to schizophrenic states. Pseudohallucinations – similar to the borderline hallucinations of Foulkes – were predictably nonspecific with respect to diagnosis.

The difference between "true" hallucinations and borderline and pseudohallucinations is suggested by an apparent paradox. The Sedman (1966a) study indicated that schizophrenics demonstrated a drop-off in the frequency of hallucinations as they passed from "clear" to "drowsy" consciousness. This is exactly opposite to the trend reported by Foulkes and colleagues for "borderline hallucinations" of normals. How can this be?

Reviewing the findings of Foulkes and colleagues suggests three facts. First, the absence of cognitive goals can produce unintended images. This is reasonable given that the absence of concordance between cognitive goals and cognitive outputs such as action and speech predicts the experience of unintendedess (see above discussion for nervous tics and slips of the tongue). In the absence of *any* cognitive goals during passive cognitive states (daydreaming, drowsiness, etc.), no goal-concordance is possible and imagery production will be experienced as unintended. Second, a more or less automatic expectation or inference in normals is that unintended images are nonself derived. This is plausible because the great abundance of unintended images experienced during the day are sensory impressions that actually derive from the outside world. Third, this nonself inference, if occurring during passive cognitive states, must somehow be "undone." Otherwise psychosis would quickly ensue. This self-corrective process reflects the normal emergence from a passive to an active (i.e., goal-directed) cognitive state; one can presumably learn that unintended or alien representations occur during prior passive states and thereby dismiss their veracity. In short, Foulkes's findings impose the conclusion that we frequently do not simply discount our daydreams as unreal, but rather momentarily enter into them as if they were objectively real only to disclaim them later when the salience of the outer world is increased. Though this three-step model of borderline hallucinations (imagery unintendedness, external misattribution, correction of external misattribution) is admittedly complex, something at least as complicated must be postulated in order to account for the momentary hallucinations of normal passive cognition and subsequent accurate "reality-testing," that is, correction of the external misattribution.

If this model of borderline hallucinations is correct then one would predict that subjects could suffer from "irreversibly" hallucinated images if they occur in the absence of passive conscious states. This prediction would be supported if it turned out that schizophrenics experience involuntary images concurrent with cognitive processes that derive from specific goals and tasks. Then an awareness of prior passive consciousness would not be present as a clue leading to the reversal of the otherness inference associated with unintended images; instead, the felt nonconcordance between verbal imagery and cognitive goals would reinforce the alien sense of the image and sustain the external misattribution. This would predict that reduced goal-directed cognition would actually protect the schizophrenic from hallucinations; under these conditions unintended imagery would not occur with cognitive goals that would make the otherness attribute "toxic" or "convincing." This would account for Sedman's (1966a) paradoxical observation that drowsy conscious states practically eliminated true hallucinations among schizophrenic subjects. This model also suggests, along lines that are consistent with the discussion of schizophrenic delusional inferences by Maher (1974), that the nonself inferences that underlie VHs are in themselves nonpathological. Why invent a pathological form of external misattribution when a normal variant of this inference seems so readily available given the observations of Foulkes and his colleagues?

A problem with this model of VHs is that the terms "unintended" and "involuntary" can have different meanings. To clarify the model, postulated relationships between different levels of "unintendedness," goal-directedness, and hallucinatory attributes are outlined in Table 1.

Strongly intended cognitive activities are those that are preceded by conscious decisions. *Weakly intended* cognitive productions are actions, speech, memories, or images that spontaneously occur during normal waking states but are still goal-directed. By definition, no conscious decisions are made to initiate events of this class. A simple example is walking to my car to drive to work. I do

Table 1. *Levels of intending and the otherness inference*

Type of cognitive production	Description	Otherness inference	Correction of otherness inference
Strongly intended	Consciously decided upon actions, speech, memory representations, etc.	absent	—
Weakly intended	Spontaneous actions, speech, memories, imagery consonant with consciously accessible goal or set of goals	absent	—
Weakly unintended	Passive, non–goal-directed cognitive states, e.g., daydreaming, free association, borderline hallucinations (Foulkes), pseudohallucinations (Stedman)	possible	yes, when subject emerges from passive cognitive state
Strongly unintended	Nonconcordant with concurrent cognitive goals, e.g., "true" hallucinations, "thought control," "speech automatisms," "loose associations," "delusions of passivity"	yes for internal representations; can be blocked by kinesthetic awareness of manifest motoric and speech activity	otherness attribute sustained by goal-nonconcordance

so without being conscious of deciding to drive to work, although such a goal is consciously accessible. The goal-directed nature of spontaneous internal images is highlighted by Schank's (1983) investigations of dynamic memory. He demonstrates that apparently spontaneous memory retrieval can be triggered by different stages of goal-driven problem-solving, pattern recognition, and categorization tasks; what one is aware of during this recall process is not "trying to recall memory X" but the relevance of X to current problems and tasks. Furthermore, Vygotsky (1962; 1978), Luria (1961), and Zivin (1979) have emphasized the importance of task performance and problem solving, that is, goal-directed cognitive processes, in triggering egocentric speech and verbal imagery.

Weakly intended cognitive outputs are distinct from mental representations that occur during passive, cognitive states – labeled here as *weakly unintended.* Here no cognitive goals – at either a conscious or a preconscious level – are accessible to lend to the representation a contextual meaning. The resulting unintended feeling is liable to be experienced as nonself derived. However, this feeling, under normal circumstances, can be accounted for and therefore accommodated upon emerging from a passive to an active cognitive state.

In contrast, *strongly unintended* cognitive productions co-occur with accessible cognitive goals but are nonconcordant with them. As just mentioned, verbal imagery can accompany goal-directed cognitive processes. If verbal imagery, as proposed, issues from a chain of ordinary language processes, and schizophrenics suffer from disruptions in the planning of messages that derive from cognitive goals, then their verbal imagery could potentially clash with these goals. The resulting experience of unintendedness could induce an external misattribution on the basis of inferential processes that parallel the induction of "borderline" hallucinations during normal passive cognitive states, with goal nonconcordance sustaining these inferences. Thus, unintended cognitive activity is nonpathological in the absence of goals but potentially pathological if nonconcordant with cognitive goals.

Further support for this model of schizophrenic VHs is provided by the fact that schizophrenic language productions are generally initiated in a goal-directed fashion that can then deviate – by virtue of planning disturbances – from the motivating goal. For instance, segments (B) and (C) indicate a willingness to answer particular questions and provide certain kinds of information, although such goals were not sustained. The goal-directedness of schizophrenic communication has also been affirmed by other workers (Chaika 1982; Harrow, Lanin-Kettering, Prosen & Miller 1983; Zarlock 1966). Goals concurrent with verbal imagery do not seem to be communication goals (unless we must for some reason communicate with ourselves); instead they are, as discussed above, frequently referrable to manifest tasks and problem solving. Thus language planning disruptions – when goal-nonconcordant – could potentially yield strongly unintended speech and verbal imagery. This, of course, raises the question of why overt speech is not more frequently experienced as nonself generated in schizophrenia. The answer seems quite simple: Kinesthetic sensations that derive from motor aspects of speech production are strong immediate evidence that the speech event is self-generated; thus the otherness attribute is blocked. It also seems that at times the otherness inference can leak through during overt speech (see again note 3 describing involuntary overt speech in schizophrenia), perhaps when goal deviation in speech is especially radical. On the other hand, sensory images – including verbal images – are much more vulnerable to ambiguities with regard to egocentric versus allocentric origin because both types of imagery commonly occur during everyday experience

and there are no kinesthetic clues as to origin. Kinesthetic cues also account for why nervous tics and slips of the tongue, though experienced as unintended, are not subject to external misattribution.

Further support for the above model of VHs derives from a study by Andreasen and Olsen (1982). They looked at correlations between "negative" symptoms of schizophrenia (affective flattening, anhedonia, avolition, etc.) and "positive" symptoms (hallucinations, delusions, "thought disorder," etc.) and found a robust negative correlation between hallucinations and avolition. This is precisely the relation predicted by our model: The less goal-directed schizophrenic patients are, the less vulnerable they are to experiencing strongly unintended (i.e., goal-nonconcordant) verbal imagery, hence the less likely they are to experience VHs.

5. Alternative theories of verbal hallucinations

There have been few attempts to link clearly specific types of cognitive pathology to hallucinatory phenomena in schizophrenia. The following is a summary of alternative explanatory models that might be proposed or have already been considered by other investigators.

5.1. Poor auditory attention. Studies based on subjective reports have indicated that schizophrenics are frequently unable to integrate visual stimuli into a meaningful whole and tend to get distracted by irrelevant stimuli (Chapman 1966; Freedman & Chapman 1973). Difficulties in selective attention have also been demonstrated during various experimental tasks (see reviews by Neale & Oltmanns 1980, and Schwartz 1982). Finally, at a psychophysiological level, it is now well established that schizophrenics demonstrate fairly consistent difficulties in producing pursuit eye movements that track moving stimuli (for review of this research see Holzman & Levy 1977). Though these findings may be of significance in understanding certain aspects of schizophrenic cognitive pathology, their relevance to the VHs problem is questionable. The predictable result of such input-processing pathology on self-generated imagery (assuming that sensory input and internal imagery processes are convergent – which is quite a large assumption – see Dennett 1978, and Pylyshyn 1973; 1981) is that the latter would be poorly perceived, fragmented, and difficult to "center" within the field of attention. However, these terms, at times, can be applied to normal imagery. For instance, attempting to recall a very distant memory may yield fleeting, poorly formed images, yet ordinarily one does not mistake such images to be of nonself origin. Thus it is difficult to invoke such sensory qualities for assigning the otherness attribute in the case of schizophrenic hallucinations. Also, a recent study by Schnieder and Wilson (1983) indicated that reaction times to auditory stimuli are significantly faster among hallucinating schizophrenics compared to nonhallucinating schizophrenics. This is the opposite of what would be predicted by a poor-auditory-attention explanation for auditory hallucinations.

5.2. Response set difficulties. Some workers have indicated that the attentional difficulties of schizohprenics include a pigeonholing defect whereby the response set for stimuli is pathologically altered (cf. Hemsley & Richardson 1980; Schwartz 1982). In his commentary on Schwartz's BBS target article, Hemsley (1982) proposes that such perceptual difficulties could account for schizophrenic hallucinations. Experimentally, pigeonholing expresses itself as a dedifferentiation of target and distractor stimuli; if a similar breakdown in the identification of inner- and outer-derived auditory imagery occurs in schizophrenia, a pathological mislabeling of these stimuli could result in the identification of auditory hallucinations. This explanation is not supported by other experimental data, however. An important study by Margo, Hemsley, and Slade (1981) considered the frequency of schizophrenic VHs under various conditions. They determined that listening to externally generated speech reduced hallucinatory experiences, whereas other conditions (listening to speech in a foreign language, electric blips, or white noise) either had no effect or enhanced VHs. The pigeonholing hypothesis predicts that external distractor stimuli that are closest in nature to internally generated verbal imagery result in the greatest tendency for false categorization. The observed result is opposite to that predicted by the hypothesis.

Hemsley (1982) discusses the results of the Margo et al. study in a different light: He suggests that the schizophrenic's inability to discern meaning from external sensory stimuli – secondary to a pigeonholing defect – would bring about a general preoccupation with internal stimuli. This model can be linked to an experimental study by Kay and Singh (1975) indicating a general increase in egocentricity in schizophrenics. Similarly, Slade (1976b) proposes that hallucinating schizophrenics withdraw from external stimuli with a secondary disinhibition of internal stimuli. This in turn could cause a misidentification of the source of internal imagery.

There are manifold difficulties with this model. First, it is not clear why a preoccupation with internal stimuli *per se* would cause them to be mislabeled as nonself derived; if one is working very hard on some mental problem such as complex arithmetic one does not generally hallucinate the answer. Second, this model generates predictions that are disconfirmed by experimental data. Like the poor-auditory-attention mode for VHs, the internal preoccupation model predicts that reaction time to auditory stimuli would be greater in hallucinating than nonhallucinating schizophrenics, that is, a result in the direction opposite to that determined by Schnieder and Wilson (1983). Also unaccounted for would be the observation by Sedman (1966a) that drowsy states of consciousness actually decreased the frequency of hallucinations in schizophrenics, and Andreasen and Olsen's (1982) report of a negative correlation between avolition and schizophrenic hallucinations. Once again the internal preoccupation model would predict the opposite effect, namely, increased hallucinatory experience with drowsiness and avolition. This model would also be unable to explain why volunatrily induced imagery is never experienced as hallucinatory by schizophrenics, or to differentiate borderline hallucinations in normals and "true" hallucinations in schizophrenics; nor can it account for why the predominant mode of schizophrenic hallucinations is verbal. Finally, the model is not easily reconciled with studies by Cegalis, Leen, and Solomon (1977), who found that acute schizophrenics – who frequently suffer from hallucinations – have a broader functional visual field

than normals, and by Collicut and Hemsley (1981), who found that there were no differences between auditory thresholds for hallucinating schizophrenics compared to controls. In short, many schizophrenics seem quite aware of their outside environment.

5.3. An information overload model. The above discussion suggests an alternative perceptual flooding model (Horowitz 1975). If one assumes that schizophrenics suffer from sensory overload due to difficulties in, for example, information filtering (see Venables 1964; Hemsley 1977), then the classification procedures for processing perceptual information could potentially be overburdened and disrupted. Disrupted classification procedures could cause misidentification of the origin of internal imagery. This model would be able to account for the fact that increased volitional behavior tends to increase VHs (Andreasen & Olsen 1982; Sedman 1966a): Increased goal-directedness presumably increases information input processing requirements. The reported observation of correlations between speech disorganization and VHs could be accounted for if information overload can be invoked to account for the former.

A drawback of this model is that the differential effects of auditory distractors cannot be accounted for (Margo et al. 1981): Presumably speech inputs require more information processing than meaningless stimuli and should therefore cause an increase in VHs rather than the reported decrease. Also, no one has yet demonstrated that there is a direct relationship between information overload or any other perceptual/input processing difficulty and speech disorganization in schizophrenia (Oltmanns 1982). Third, the relationship between borderline hallucinations in normals and true hallucinations in schizophrenics cannot be accounted for, nor can the relative predominance of verbal hallucinations (as opposed to nonverbal auditory hallucinations or hallucinations in other modalities) for these patients. Fourth, if information overload and misclassification of experience are so gross as to create a general confusion and loss of differentiation of internal imagery versus objectively derived imagery, then it is not clear how it is that schizophrenics are able readily to accomplish as much as they do, perceptually speaking. It is rare that schizophrenics are not able accurately to identify the objects in their environment even when they are actively hallucinating, and they can carry out tasks requiring precise visual coordination such as lighting cigarettes and feeding themselves. Finally, it is not at all clear why schizophrenics would not mislabel many objectively derived sensations as self-derived internal images as frequently as they experience hallucinations.

5.4. Schizophrenic hallucinations are psychophysiologically related to dreaming during sleep. This hypothesis was most clearly articulated by Hartmann (1975). However, given the similarities between day dreaming and night dreaming (Foulkes & Fleisher 1975; Foulkes & Scott 1973; Foulkes & Vogel 1965), it is difficult to translate this model into a well-delineated set of psychophysiological predictions. The simplest hypothesis would be that schizophrenics are overly prone to being in drowsy or presleep physiological states, even when they seem alert. This, however, seems unlikely. First, it is not uncommon to see schizophrenics hallucinating while in an agitated state (Hollender & Böszörményi-Nagi 1958). Second, studies of arousal level in schizophrenia on the basis of skin conductance have indicated a wide variability with underaroused and overaroused subgroups (Gruzelier & Venables 1972; Rubens & Lapidus 1978), and there are no reports of correlations with respect to the presence or intensity of hallucinations. Third, Shimazono, Katsumi, Sakamoto, Tanaka, Eguchi, and Nakamura (1965) reported that schizophrenics have a far lower incidence of slow eye movements during closed-eye wakefulness than normals. This slow ocular drift is a hallmark of drowsy conscious states, and its relative absence in schizophrenia suggests, if anything, a relatively overaroused state. Fourth, EEG study comparing schizophrenics and control groups indicates very little in the way of differences in the predominance of alpha frequency range electrical activity, though some trends toward decreased alpha have been reported; also alpha blockage with eye opening occurs with the usual robustness among schizophrenics (Shagass 1976; Spohn & Patterson 1979).

Hartmann (1975) proposed that hallucinations in general are caused by a combination of increased excitatory factors in combination with diminished inhibitory factors that correlate with changes in cortical norepinephrine systems noted during REM sleep. This proposal, however, rested solely on the phenomenological similarity of dreaming and hallucinations (loss of reality testing and feedback correction) rather than on empirical data.

5.5. VHs are perceptions of ordinarily subliminal cognitive processes. The subliminal hypothesis, proposed by Frith (1979), is based on the notion that our speech-processing capability automatially interprets all external sounds as hypothetical speech, which are then rejected for nonspeech inputs. Frith argues that an inappropriate awareness of these incorrect early interpretations is the basis for VHs in schizophrenia. This model can account for (1) so-called functional hallucinations (Fish 1962), that is, hallucinations that are triggered by actual sounds such as running water; (2) the blocking effect of external speech on VHs (Margo et al. 1981) – external speech cannot be misinterpreted as actual speech because it is such; (3) the fact that voluntarily induced imagery is never hallucinated – such imagery is always internally generated and therefore distinct from any misinterpretation of external sound. However, a major limitation of the model is that it forces the conclusion that all hallucinatory experiences derive from external sound; this seems untenable, for schizophrenics are frequently able to hallucinate quite actively in total silence. Frith attempts, somewhat speculatively, to explain this fact by proposing that the actual sound of breathing or heartbeat is transformed into VHs. Even if this explanation were accepted, the model, like others described above, is not able to differentiate borderline hallucinations in normals and true hallucinations in schizophrenics, nor can it easily account for the protective effects of drowsiness and avolitional states (Andreasen & Olsen 1982; Sedman 1966a).

5.6. Other models of VHs based on language output processes. The planning disruption model of schizophrenic speech disorganization predicts the occurrence

of unintended verbal images, which in turn provides the basis for developing an alternative understanding of VHs. The speech disorganization of schizophrenics has also been accounted for, in part, by other language-processing models. If these alternative models of speech disorganization can also account for unintended verbal imagery, then the correlational data linking language disorganization and VHs could be explained without needing to invoke pathology at an abstract language-planning level.

First, Rutter (1979) offered empirical evidence on the basis of the reconstructabilty of sentence order that sequential relationships between sentences were specifically disturbed in schizophrenia. However, disturbed sentence sequences would also be predicted if schizophrenics tended to generate poorly organized discourse plans with incomplete determination of topical dependencies; hierarchical structure determines, in part, the sequential ordering of sentences. Second, other workers have argued that schizophrenic difficulties arise from a failure in maintaining a generalized set (Cohen, Nachmani & Rosenberg 1974; Harrow et al. 1983; Shakow 1962; 1977). Along these lines, Vygotsky (1932) described associative chaining of schizophrenic discourse, and Kay (1982) discussed the overreliance on affective or phonological cues by schizophrenics (see, for instance, segment D) in organizing their discourse. However, these language features would be also predicted to occur in the absence of a well-formed, stable, goal-driven discourse plan that is organized according to transitive presuppositional dependencies; in the absence of a stable discourse plan the speaker may fall back on "lower order" organizational principles such as rhyming or alliteration in the determination of the text. Third, the loss of cohesion in terms of nominal references for schizophrenic speech has been described by Rochester, Martin, and Thurston (1977). Again, this finding can be understood as reflecting a more fundamental disturbance in multipropositional planning; Chaika (1982) has similarly noted the dependence of cohesive ties on discourse macrostructure in her discussion of the Rochester et al. study. Fourth, Chaika (1982) has described randomized sequencing of statements that deviate from initial communicative goals. This associative veering off target would also be predicted if schizophrenics did not have access to a stable discourse plan. Finally, the loss of a well-formed discourse plan would result in speech that is easily distracted or reflects poor attention; these two informational deficits have both been proposed as causes of schizophrenic language disorganization (Schwartz 1982).

In summary, the major distinguishing feature of the discourse-planning model compared to the large collection of language-processing deficit models just mentioned is that the former postulates a particular top-to-bottom disturbance at an abstract representational level that is a precursor to speech behavior, while the latter set of studies views schizophrenic language as a failure of the left-to-right sequencing of statements in the flow of speech itself. Thus the planning perspective predicts many of the encoding disturbances previously investigated for schizophrenia; however, these performance deficits would be hypothetically linked to higher level "intentional" cognitive structures (Hoffman et al. 1982).

This paper has argued that disturbances of higher level language-planning structures need to be invoked in order to account for the disturbed intentionality and the nonself inference of VHs. But models that predict speech disorganization *per se* are not able to make this link to VHs because the anticipated effect of the former on verbal imagery would simply be propositionally disorganized verbal imagery. This in no way explains how it is that instances of verbal imagery acquire the "otherness" attribute. Thus, for instance, a segmental set (Harrow et al. 1983; Shakow 1962; 1977), distractibility and defects in attention and information filtering (Neale & Oltmanns 1980; Schwartz 1982), sequencing defects (Rutter 1979), and associative veering off target (Chaika 1982) could each be invoked to account for certain subtypes of speech disorganization of schizophrenics. Yet these forms of cognitive pathology do not suggest how or why internal verbal imagery would be experienced as alien or of nonself origin *unless one hypothesizes that the speaker's expectations with regard to his own language productions were violated.* But as soon as one begins to consider the speaker's expectations with respect to his own behavior, then one is once again invoking cognitive plans that organize past, present, and future behavior. Thus the language-planning model of VHs seems to be required to relate conceptually schizophrenic language disorganization, disturbed intentionality, cognitive pathology, and hallucinatory phenomena.

5.7. Disturbances of associative memory. One interesting variant of the language-planning model of VHs can be proposed by positing a particular disturbance in long-term memory. Hopfield, Feinstein, and Palmer (1983), Crick and Mitchison (1983), and Hoffman (in press) have shown, using computer simulations of neuronal systems, that associative memory can demonstrate specific types of functional breakdown when storage capacities are overloaded. This can result in the creation of one or more "parasitic" memories. A parasitic memory trace transforms many distant or unrelated inputs into itself and thereby disrupts the flow of expectable associations. Recall that it is proposed that planning structures for language production are located in a working memory that interacts with a long-term associative memory. A simple model of tree construction would consist of the following: (1) a nodal propositional element belonging to working memory is loaded into associative memory; (2) associative memory generates one or more propositional outputs, (3) a subset of those outputs that presuppose the nodal element is loaded into working memory as dependent propositions, (4) this process is reiterated for the dependent propositions. The result would be the production of a propositional tree structure.[10]

If the long-term memory includes certain parasitic states, then, at times, inputs to long-term memory deriving from working memory could be transformed into a parasitic output that is then reentered in working memory as a component of the language plan. The result would be a disruption of working memory contents, a loss of congruence with current cognitive goals, and a strongly unintended language representation. No direct tests for parasitic memory states in schizophrenia have yet been undertaken. However, an early study by Miller, Johnson, and Richmond (1965) compared performance on a continuous word association test and a verbal fluency test with hallucinating and nonhallucinating schizophrenics. They

found that responses of the former were much more repetitive and stereotyped than those of the latter. This is precisely the response pattern that would be predicted if the associations of the hallucinators flowed into a parasitic memory pattern. Also, there is abundant evidence indicating disordered associations (Kelter, Cohen, Engel, List & Strohner 1977; Silverstein & Harrow 1982), associative interference (Hirsch & DeWolfe 1977), and disturbed mnemonic organization (Koh, Kayton & Berry 1973; Maher, Manschreck & Rucklos 1980) in schizophrenics, although the memory systems studied here were short-term. An appeal of the parasitic memory model is that if a VH or voice corresponds to a single parasitic memory representation that is triggered by widely dissimilar and distant associations, then the result would be expected to be highly repetitive in content. Though the variability of VHs has not yet been systematically studied, the impression of this author is that schizophrenic voices are not very creative or expressive and frequently consist of a small number of rigidly repeated expressions. This is precisely the pattern predicted if language-planning structures are systematically disrupted by parasitically generated associative memory outputs. Once again it needs to be emphasized that VHs cannot be accounted for solely on the basis of a parasitically organized associative memory. The predicted result in that case would simply be rigidly constrained speech and verbal images. The postulation of planning structures that are disrupted by memory dysfunction is required in order to account for the altered sense of intentionality that accompanies VHs.

6. Closing remarks

These final remarks flesh out the postulated relationship among verbal hallucinations, other symptoms, and neurocognitive disturbances in schizophrenia. Though some of what will be said is speculative, these remarks are included because of the potentially important and provocative issues they raise.

6.1. The specificity of language disorganization and VHs. How precise are we normally in generating hierarchically organized speech? It is clear that we frequently digress and move on to new topics during conversation. Our own studies of normal speech suggest that certain kinds of locutions are used to bridge such loci of incoherence; for instance, the speaker may say "Well, to get back to what I was saying before . . . " or "But anyhow guess what. . . " The shared feature of these *frame-shifters* is that they are not part of the flow of the narrative or discussion, but, in various ways, refer to the discourse itself, by talking about either the text or the speaker/listener interaction. These metadiscursive statements function something like paragraph indentations in written texts (Hoffman et al. 1982; see also discussion of preterminators by Davidson 1975). Another way to shift topics or to digress is simply through conversational turn-taking. Each new turn permits the assertion of a new topical statement.

Issues regarding the relative prevalence of language pathology and VHs among nonschizophrenic patient groups have not been addressed. For example, manics may report VHs, though this finding is rather uncommon. This is a potentially important observation insofar as manic patients frequently demonstrate language disorganization at least as profound as that of schizophrenics (Andreasen 1979b; Harrow et al. 1983; Harvey 1983). For the study described above (Andreasen, Hoffman & Grove 1984; Hoffman et al. 1986), 3 out of 24 manics reported VHs. If VHs are secondary to breakdowns in discourse planning, why is it that manics are, at least partially, protected from VHs? A possible answer is provided on the basis of a discourse analysis of speech segments randomly sampled from this patient group. It was found that manics as a group had well-formed subtrees embedded within overall deviant structures whereas schizophrenics, in general, demonstrated subtrees that were subnormal in size. This suggests that manics are quite competent in generating discourse plans; their problem is that they rapidly switch from one well-planned discourse structure to another while producing speech. If this is the case, then the manic will generally have in mind a well-formed goal-concordant language plan simultaneously with the occurrence of verbal images so that the latter generally are not experienced as unintended. Thus, in spite of the speech disorganization of manics, their vulnerability to VHs is much lower.

It should also be noted that VHs and receptive aphasia have been reported to co-occur in patients with demonstrable brain pathology involving the left temporal lobe (Bazhin, Wasserman & Tonkonogii 1975; Brown 1981). This obviously represents another link between VHs and language pathology, though in this case the mechanism of VHs cannot easily be linked to language-planning difficulties *per se*. A more likely explanation is the relative absence of any verbal imagery (see earlier discussion of sensory models of VHs). This type of hallucination may thus be related to so-called phantom-limb hallucinations, that is, proprioceptive sensations that persist following loss of a limb due to surgery, accident, and so forth.

6.2. Distractor effects on VHs. The language-planning model of VHs offers a good explanation for the various effects of auditory distractors on the frequency of VHs in schizophrenia (Margo et al. 1981). A recent report by Andreasen, Hoffman, and Grove (1984) presents experimental evidence on the basis of the "gist" test that schizophrenics do quite well in encoding multipropositional speech inputs. This presumably requires the generation of some sort of propositional structure in working memory that is not unlike the planning structures discussed above for language production. If these externally driven propositional structures are generated, then deviant language-planning structures may be eclipsed, with subsequent reduction of VHs. Also, it is plausible that nonspecific noise could disrupt language-planning processes (see the interference hypothesis proposed by Callaway 1970) with subsequent increased vulnerability to unintended imagery and hallucinatory experiences.

6.3. Other characteristics of VHs. How is it that schizophrenic VHs are often experienced in the voice of another person whose source is spatially located outside the patient's head? An answer to this question is suggested by a simple mental exercise: Imagine a striped animal. Ordinarily, you would not simply imagine any old animal (e.g., a cow) with stripes imposed on the image. You would imagine, say, a tiger or a zebra. Our imagery

processes are economical. We imagine to whatever degree possible what we already know and what ordinarily makes sense with respect to the requirements of the image. Our language-planning model postulates that an imagistic feature of the schizophrenic's VH is that it is experienced as unintended and nonconcordant with current cognitive goals. His experience, like ours, is that verbal images of this sort generally derive from speech produced by other agents; such images are thus more or less automatically inferred to be of nonself origin. And Dennett's (1978) formulation allows the possibility that inferences derived from imagery processes alter not only what the subject believes about the image but how the image feels and seems. Thus the nonself β-inference could, in principle, experientially cause the schizophrenic's unintended verbal image to "sound like" someone else's voice originating from outside of the head.

Another factor yet to be considered in the induction of VHs is the content of verbal imagery. Often schizophrenic VHs express ideas that are unacceptable or distasteful to the subject. This has led to a traditional psychoanalytical explanation of VHs as expressions of wishes and motivations that need to be disavowed or disowned by the subject. (See the multiple book review of Grünbaum's *Foundations of Psychoanalysis, BBS* 9: 2, 1986). It seems unlikely, however, that judgments of unacceptability of verbal imagery content could be the sole determinant of VHs. First, one can deliberately produce mental speech that is totally uncharacteristic of one's values, beliefs, and wishes, yet such verbal images are normally not experienced as VHs. Second, VHs reported by schizophrenics are at times concordant with their current values, wishes, and beliefs. On the other hand, it is plausible that verbal contents that clash with the subject's values, beliefs, and wishes would enhance the likelihood that a nonself inference would be generated on the basis of verbal imagery; for the reasons just stated, however, it still seems that unintended, goal-nonconcordant experience is necessary for this inference to be made. And if the expression of self-dissonant ideas, wishes, and so forth repetitively occurs as VHs, this suggests parasitic memory traces that secondarily disrupt language planning and cause unintended verbal imagery. These stereotyped VHs could then cause the not surprising inference that such experiences derive from a particular person or persons. This would in turn provide the foundation for further inferences about the intentions of these other agents and the development of a full-blown paranoid clinical picture.

6.4. Why are schizophrenic hallucinations predominantly verbal rather than, say, visual? The obvious reason VHs predominate would be that schizophrenics suffer from specific alterations in language processing. This perspective is supported by a number of clinical reports and experimental data (Brown 1977; Chaika 1974; 1977; 1982; Faber, Abrams, Taylor, Kasprison, Morris & Weisz 1983; Faber & Reichstein 1981; Herbert & Waltensperger 1980; Hoffman et al. 1982; Hoffman et al. 1985; Hoffman & Sledge 1984; Silverberg-Shalev, Gordon, Bentin & Aranson 1981). Complementing this perspective are a number of neurobiological studies indicating dominant-hemisphere dysfunction among many schizophrenics. This conclusion has been drawn on the basis of EEG spectral analysis (Flor-Henry 1976; Morihisa, Duffy & Wyatt 1983; Morstyn, Duffy & McCarley 1983b), lateralizing EEG abnormalities (Abrams & Taylor 1980), skin conductance studies (Gruzelier & Venables 1972), positron emission tomography (Buchsbaum et al. 1982), and P300-evoked potential mapping (Morstyn, Duffy & McCarley 1983a).

Although the precise anatomical locus for message planning has not been determined, a reasonable candidate is the dominant-hemisphere limbic system. Presumably the locus of verbal imagery representations is the dominant posterior temporal lobe (Lezak 1983). Limbic dysfunction might then uncouple imagery processes from readouts deriving from frontal and association cortex that are referrable to goal, belief, and associative memory representations. This is consistent with the idea that the dominant-hemisphere limbic system is a mediator linking generalized cortex with focal language-specific processing areas (Brown 1979; Flor-Henry 1976; Lezak 1983).

This neurocognitive model is consistent with other reports suggesting limbic system dysfunction in schizophrenia (Flor-Henry 1976; Torrey & Peterson 1974). It can also account for an interesting report by Alpert, Rubenstein, and Kesselman (1976) indicating that cross-dominance of language processes actually seems to protect schizophrenics from VHs. This finding would be expected if crossed hemispheric sharing of language functions protected schizophrenics from lateralized hemispheric disturbances; language pathology would be diminished and VHs would not occur.

6.5. Other clinical manifestations of schizophrenia. The relationship between a language-planning model of VHs and other clinical manifestations of schizophrenia needs to be considered. First, disrupted intendedness of other forms of action and thought is reflected in various Schneiderian symptoms often seen in schizophrenia (Schneider 1957). "Thought control" and "thought insertion" consist of the subject's believing that someone else is manipulating his thoughts or is interspersing the other's thoughts with his own; in both cases the experiential intendedness of mental representations is presumably disrupted for their selfhood to be thrown into question. "Thought withdrawal" refers to the experience of involuntarily losing all mental contents and momentarily being unable to produce another mental representation. All three symptoms would be predicted on the basis of disruptions in cognitive planning processes – with the secondary shifts, breakdown, or loss of cognitive plans – that organize strongly or weakly intended mental representations. "Delusions of passivity" refer to certain of the subject's actions that are experienced as being willed by another person. Once again, disruptions in planning – this time at a motor level, with an associated affect of unintendedness inducing an external misattribution – could account for this symptom; it seems that at times the kinesthetic sensation of motor activity is insufficient to block the inference of nonself origin (see note 3 for a description of automatic speech in schizophrenia).

Visual hallucinations are at times reported by schizophrenics, though not as frequently as VHs. Investigators of visual perception have posited higher order representations that synthesize different hypotheses about the form and nature of objects and operate in parallel with

lower order visual-input processing (Marr 1982). Disruptions in these higher order synthetic structures during visual imaging – similar to planning disruptions in speech generation – could potentially induce visual hallucinations.

Other perceptual abnormalities can be similarly accounted for. Schizophrenics frequently report an abnormal sensitivity to sound stimuli as well as factitious auditory perceptions (e.g., ringing or rushing sounds). Their frequency and relationship to frank VHs have not been studied. One possible explanation is that higher order, expectation-sensitive synthetic representations that categorize and organize external stimuli are disrupted (as in the pigeonholing deficit of Hemsley and Richardson 1980, and Schwartz 1982). This would induce excessive "opportunistic planning," that is, unstable shifting of higher level organizational schemata triggered by novel stimulus inputs (Hayes-Roth & Hayes-Roth 1979), which is analogous to the disrupted and unstable planning of language outputs.[11] The predictable result would be greater salience attached to irrelevant stimuli even though, for example, thresholds for stimulus detection seem to be relatively normal in schizophrenia (Collicut & Hemsley 1981).

Thus, the language-planning model of VHs, when considered in conjunction with Schneiderian symptoms and perceptual phenomena (Schneider 1957), suggest multiple vulnerabilities of higher level synthetic representations to pathological disruption. However, linking attentional difficulties in schizophrenia with higher level synthetic representations is quite speculative. It should be noted that the goal of this paper is to describe a locus of cognitive pathology that underlies speech disturbances and VHs and not to provide a general theory of schizophrenia. Thus there may also be other types of information-processing disturbances in schizophrenia responsible for the various perceptual abnormalities just mentioned.

Another set of clinical manifestations of schizophrenia that can be linked to the planning model of VHs consists of the negative symptoms of schizophrenia. These symptoms – anhedonia, social withdrawal, avolition, and so forth – have recently received increased attention (Andreasen & Olsen 1982; Angrist, Rotrosen & Gershon 1980; Crow 1980; Wise 1982). There has been an assumption that these symptoms are due to core defects in brain processes (Angrist, Rotrosen & Gershon 1980; Crow 1980); our "intentional" model of schizophrenic symptoms suggests another perspective, however. Most or all of these symptoms can be explained simply on the basis of diminished goal-directedness of cognitive processes. As just discussed, many positive schizophrenic symptoms are predicted to derive from the strong unintendedness of certain cognitive processes. If the resultant experience (generally dysphoric) can function as negative feedback, then the predicted result would be a diminution of goal-directedness during the more chronic stages of the illness. Subsequently, cognitive processes would tend to be experienced as weakly unintended (mental processes occurring in the absence of goal) as opposed to strongly unintended. This would in turn cause an overall reduction in many positive schizophrenic symptoms. This correction process would account for the negative correlations between positive and negative symptoms in schizophrenia when they are analyzed by principal components analysis (Andreasen & Olsen 1982).

At present we have a limited understanding of schizophrenic VHs. However, the model proposed here best accounts for the wide range of empirical findings about schizophrenic and normal hallucinations described in this paper. It also suggests conceptual links with dominant-hemisphere dysfunction and other clinical effects that have been associated with schizophrenia. Further validation of the model, or some future variant of it, of course awaits future experimental investigation.

NOTES

1. Although I rely on the conceptual apparatus of Dennett (1978) for distinguishing primary representational characteristics of images from inferentially generated attributes, the arguments that follow do not depend upon deciding the issue motivating Dennett's formulation. The debate concerns whether the analogue or pictorial nature of imagery reflects mental structures that are truly analogue or spatial in nature (cf. Kosslyn 1981; Kosslyn & Pomerantz 1977) or whether these properties derive from automatic inferential beliefs derived from propositional data structures (cf. Pylyshyn 1973; 1981). The first explanation, in Dennett's scheme, hypothesizes that the pictorial nature of visual imagery and the acoustic/aural nature of auditory imagery derive from an α representation, while the second explanation assumes that such properties are β-derivatives. Either explanation will do quite nicely for anything this paper has to say about verbal imagery or verbal hallucinations.

2. Thanks are due to Daniel Dennett for pointing out to me this very informative problem in his review of an earlier version of this paper.

3. Two schizophrenic patients who suffer from frequent VHs are known by the author to manifest this phenomenon. Both demonstrated instances of apparently involuntary or automatic utterances that intruded into their normal flow of speech. The first patient would completely disown such utterances. For example, he was once talking about his past school experiences and then abruptly said in a monotone voice, "My mother is gone." When I asked what brought this last utterance to mind, he denied ever saying it, thinking it, or hearing himself say it. The second patient also demonstrated apparently involuntary speech intrusions but would claim that they derived from one of his voices. For example, he was once discussing, in reasonably clear terms, a political topic when his speech was suddenly interrupted with, "Let go of me." When asked what this was referring to, he replied that it was not he who was speaking, but a voice (which he had heard in the past) talking to another voice.

4. A representative research definition of "loose associations" from Reilly, Harrow, Tucker, Quinlan & Seigel (1975) is "a lack of connection between ideas so that the reason for a shift in thought is questionable or incomprehensible to the listener." Besides Reilly et al. (1975), see Andreasen (1979a; 1979b) and Andreasen, Hoffman & Grove (1984) for studies of the prevalence and specificity of "loose associations" and other related forms of speech disorder with respect to schizophrenia.

5. A similar partial ordering of elements composing planning representations for nonverbal goal-directed actions has been presented in the artificial intelligence literature by Sacerdoti (1977).

6. See Aho, Hopcroft, and Ullman (1974) for a discussion of the efficiency of tree representations during serial computational processing, and Fahlman, Hinton, and Sejnowski (1983) for a discussion of how such data structures might be instantiated by massively parallel machine architectures with biological features.

7. One might propose to correct this deviance by turning the structure on its head and identifying saving/keeping money as

the topical statement. This, however, is not in keeping with the original question of the interviewer and would result in further problems: The statement, "I feeling like cashing my welfare check now," would need to assume a subordinate placement with respect to the saving/keeping money statement. This placement is blocked (i.e., the presupposition relationship is not fulfilled); this is because the two statements express contrary intentions. Therefore this reinterpretation of the communicative intention of the speaker still does not permit a complete partial ordering of the statements of this text.

8. A reinterpretation can be suggested that reorganizes the text into a single hierarchy. This can be accomplished by assuming that the accidental cutting occurred *because* the speaker was so nervous and upset by David's rejection. However, this violates the context of the entire statement, where the speaker is responding to questions about prior suicidal behavior. This compels the listener to look for suicidal references or an explicit remark that changes the topic, such as, "No I never *tried* to hurt myself but I once accidentally . . . "

9. This is obviously not always the case. Some schizophrenics, particularly those who are chronically isolated from others, will report that they "enjoy" their hallucinatory experiences.

10. This mapping of densely linked data sets in association memory into hierarchically organized data sets in working memory was suggested to me by Daniela Ioan.

11. The possible relationship between excessively opportunistic planning and attentional defects in schizophrenia was first suggested to me by Larry Birnbaum.

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Who may I say is calling?

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> The other day I was reading a rough draft of a paper when I came to an underlined section of the text. Now (in my mind's ear) the author's familiar voice changed, giving careful emphasis to this passage. Strangely, the point was not particularly illuminating but the underlining continued on and on, and I soon realized that this was surely the result of a print command error. Only the first sentence should have been italicized. But even seeing this (and much against my will), his voice continued – 'emphasis added' and in a rising, near-manic pitch – on to the end of the page. Here was the voice of the ignored academic shouting into the intellectual void.
>
> A. Tenlake, personal correspondence

For the normal subject, the phenomena of "talking to oneself" are indeed a wide variety of complex events. Above, the auditory image "heard" by the subject occurs in the course of a difficult cognitive task, matches the perceptions of another speaker's voice, and (irritatingly) does not seem subject to voluntary extinction. But it is no hallucination. The elegance of Hoffman's suggestion is that, amidst the jumble of strange but non-pathological phenomena, he offers a unitary explanation of several sorts of schizophrenic hallucinations and behavior. These pathologies can be blamed on a single sort of malfunction relatively deep within the organization of the cognitive system – an action – production disorder that is magnified into a cognitive illusion by the default assumptions of normal perception. Alas, such unity also proves the theory's undoing, for in order to say exactly where and how this disorder occurs, Hoffman must locate it within an elaborate and detailed story about all the *normal* phenomena, too tall an order at this time. Hoffman's sketchy story leaves enticing loose ends to lure our attention. What is Hoffman's understanding of "presupposition," "abstract representation," the difference between *involuntary* and *unintended* acts, *accessible* versus *inaccessible* goals? Instead of yielding to temptation, however, we choose to concentrate on what we take to be the central (good) idea of the paper and a relatively minor, simplifying variation on it that might save Hoffman from many of these perplexities, at least for the time being.

Hoffman's account is threatened by (inter alia) an infinite regress: If we identify "slips of the tongue" as misexecutions of communicative intentions, relative to what could there be "slips of thought"? Wittgenstein (1982) thought that "slips of thought" were impossible because a mistake presupposes an intention. Although we can intend to reach a particular (cognitive) conclusion – say, discovering a new way to drive from home to office – we cannot intend each of the individual thoughts that constitute our attempted derivation or discovery, on pain of generating a never-beginning regress of ulterior intentions to form thoughts. Some thoughts must just "come to mind," however apt, well-ordered, and useful they prove to be in the larger project.

If what Hoffman offers us is in effect the sketch of a theory of slips of thought, he takes on the burden of straightening out all these problems about goals and their relations to intentions, and the question of when, if ever, our thoughts are intended. All this is worth doing, but an easier path is missed when he dismisses the suggestion that verbal imagery (as distinct from "thoughts") is always the execution or misexecution of communicative intentions: intentions to communicate with oneself. "Goals concurrent with verbal imagery do not seem to be communication goals (unless we must for some reason communicate with ourselves); instead they are . . . frequently referrable to manifest tasks and problem solving" (sect. 4, para. 13).

There is in fact a lot to be said for the hypothesis that much of what is called thinking is a sort of verbal communicating to oneself, or, more provocatively, a form of communicating within oneself. Rather than argue for this view here, we will just point out that the assumption that all "verbal thought" has an internal communicative function allows a simplification of Hoffman's view, to wit:

When *normal* people have verbal imagery, they form (self-)communicative goals, which yield speech-act planning, which yields inwardly directed speech, and this speech is thereupon recognized as intended or at least not unintended in virtue of its lack of dissonance with those very communicative goals. The result: the familiar phenomenology of "talking to oneself." In particular, it is quite possible to make middle-level production errors – of word choice, for instance – and recognize and correct them. (Can one "mispronounce" a word in verbal thought? Yes – think of reading the surnames in Russian novels.)

When schizophrenics attempt to engage in this familiar practice, they form (self-)communicative goals, which yield disrupted speech-act planning (or perhaps performance), which yields inwardly directed speech that is dissonant or discordant; it fails to execute well the communicative goals just set. And if the discrepancy involves a high-level communicative goal, the verbal imagery is perceived as unintended-by-me, and subsequently as "other-produced." Although Hoffman does not say this, one way to think of this "inference to otherness" is as follows. Because the discordance is so gross, it cannot be

interpreted away as an accident or a slip, a low-level malfunction such as a mispronunciation or a spoonerism. Indeed, because the images are voices, they are interpreted as speech acts; they are irresistably interpreted as intended. And if I don't intend to say these things, then someone else must. The result: one "hears voices." (Compare: If I discover my hand drumming on the table, it is easy enough to interpret as mere fiddling – a nervous habit: if I discover my hand signing a contract or writing a death threat, I cannot interpret that as a mere verbal slip, but as some speech act or other gone awry.)

Postulating (only) self-communicative goals enables one to circumvent an infinite regress while eliminating some puzzling aspects of the original theory (Do dreams really occur in goalless states? Is the general nature of thought goal-directed?). Still, the above suggestions are made with trepidation; they can be regarded as just one more speculative gesture toward a complex story that Hoffman has begun trying to tell.

A three-component analysis of Hoffman's model of verbal hallucinations

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Hoffman's target article is interesting and welcome because it attempts to provide a detailed analysis of verbal hallucinations (VH) within a recently developed framework of language processing. However, the explanations offered by the model are problematic, as can be demonstrated by examining each of the three main components of VH:

(1) They are cognitions, presented as images by virtue of having acoustic properties for the subject.

(2) They are unintended cognitions in that they are not under the subject's conscious voluntary control at either the production or the removal level.

(3) They differ from other types of unintended cognitions in that they are disowned.

Hoffman's model addresses these components, but, taking each in turn, consider:

(1) The model takes it for granted that certain unintended cognitions should be presented as auditory images. They are, he asserts, a common occurrence. Yet auditory images are not presented as a common experience in the research concerning (a) the occurrence of unintended cognitions in normals (Neisser 1967; Underwood 1979), in obsessions (Rachman 1981), and in depression and anxiety states (Beck 1976), and (b) subvocal "self-talk" (which Hoffman equates with auditory images) in children and adults (Meichenbaum 1974). It seems, therefore, that the frequent occurrence of auditory imagery is rather specific to schizophrenia. This cannot be taken for granted but needs to be addressed.

(2) The unintended aspect of VH is seen as an epiphenomenon of a defect in discourse planning. The defect is inferred from discourse that consists of thematically unrelated ideas. Thus the validity of this hypothesis rests on the co-occurrence of speech marked by thematically unrelated ideas and VH. This, however, is contradicted by findings that (a) speech-disordered schizophrenics are able to produce thematically coherent discourse (Allen 1984) and (b) there is no necessary relationship between speech disorder and VH (for example only 4 out of 10 schizophrenics were found to have both; Allen & Allen 1985). Also, since it is presumed that VHs are the unintended byproduct of a discourse planning defect, it seems likely that they would vary randomly. This is not the case, however, for they tend to remain constant over time and across different situations, and to be restricted to a limited number of topics, usually of a punitive nature.

(3) The disowning feature of VH is presumed to derive from the experiential aspect of the occurrence of unintended images which are nonconcordant with currently operative cognitive goals. In contrast, auditory images are not disowned (except fleetingly, perhaps) when they occur in passive, goalless states of consciousness. In support of this hypothesis Hoffman argues that increases in goalless states would decrease the frequency of disowned auditory images (i.e., VH). This, however, is contrary to findings that goal-oriented task engagement reduces the frequency of VH (Kazdin 1977; Allen, Halperin & Friend 1985). The hypothesis is also inconsistent with the finding that VH can be deliberately produced and removed (Allen, Halperin & Friend 1985), thus violating Hoffman's necessary nonconcordance postulate, because there is in this case no nonconcordance between the current operative cognitive goal and the presence of VH.

To conclude, although the model does not adequately explain VH in schizophrenia, it does provide food for thought and should stimulate new approaches in this area.

Language process and hallucination phenomenology

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Hoffman shifts the locus of the VH from the stimulus error originally proposed by Esquirol (Kolb 1973) to a response error. However, except for the study with Andreasen and Grove (1984), Hoffman provides little empirical data for these suggestions. His discussion is based, largely, on reasoning and analogy. In the study with Andreasen and Grove a correlation between the tendency to hallucinate and the severity of disturbance in discourse planning was found in a group of 35 schizophrenics. Depending on sample characteristics, productive symptoms may intercorrelate, and it seems premature to develop a theory of hallucinogenesis based on such a scant data base. The suggested site for hallucinogenesis, in a discourse planning stage, seems unfortunate and likely to misdirect empirical work. These stages are best thought of as intervening variables, conceptual aides to help consider the flow of a cognitive process. This theory reifies them as hypothetical constructs and even locates the function in specific brain nuclei.

An argument is made based on the observation that normals feel that recordings of their own voice sound alien; and Hoffman seems to be suggesting that schizophrenics may fail to recognize their self-generated verbal imagery in a manner similar to the way that normals fail to recognize their own voice. Normals may fail to recognize their own voice for a number of reasons. What they hear of their voice while speaking has a large bone conduction component which has a low frequency bias. The recording is, in fact, very different spectrally from what they might hear while speaking. In addition, as Hoffman remarks regarding efferent copy, alluding to the large differences between exafferent and reafferent stimulation, the task for the nervous system while speaking is to *not* hear oneself (Alpert 1965). If we did hear, we would be shouting into our own ear as we talked to someone some distance away. The argument need not be labored except to point out the danger of reasoning from an analogy between nonself recognition of voice and nonself recognition of imagery. [*Ed. note:* This point was made by several other commentators but removed elsewhere in the interest of space.]

The failure of hallucinators to recognize the source of their VHs in their own imagery is crucial to the theory and, as we have indicated, the arguments offered to explain this failure are not compelling. Hoffman posits a disturbance in a discourse-planning stage but retains an important role for verbal imagery. He

does not indicate the role of imagery in discourse planning, and in fact the VH appears to be simply the product of the generation of and failure to recognize imagery. Hallucinators hear the voices of others; the imagery error seems more related to dialogue than to discourse planning.

Consistent with Hoffman's model, I found that suggestion could cause nonhallucinator schizophrenics to report hearing things, although what they reported were not VHs but rather things like footsteps. Suggestion led the hallucinating schizophrenics to report more frequent VHs but no nonverbal sounds (Alpert 1985). Two studies, however, found hallucinators to use syntactic organization more efficiently than nonhallucinating schizophrenics when performing a task using poorly intelligible verbal stimuli. This finding does not appear congruent with Hoffman's requirement of a defect in discourse planning among hallucinators. Rather, compared to nonhallucinators, they appear more likely to perceive auditory experiences verbally (Alpert, Rubinstein & Kesselman 1976; Mintz & Alpert 1972).

A survey of hallucinations in a series of sequentially admitted patients to Bellevue Hospital's acute services found that about half of the sample of schizophrenics reported VHs whereas 20% reported visual hallucinations. The visual hallucinations were not verbal. However, those reporting visual hallucinations were, without exception, among those with VHs. These data would suggest that something in addition to, and perhaps other than a defect in discourse planning is implicated in the genesis of VHs. It is interesting to note that a similar gradient of severity of hallucinated status exists for the alochol withdrawal psychoses where first auditory (largely verbal) and then combined auditory and visual hallucinations are seen as the addiction progresses (Alpert, Angrist, Diamond & Gershon 1970). In line with this, we found that the phenomenal characteristics of alcoholic VHs are different from those in schizophrenia (Alpert & Silvers 1970). Such differences might present an opportunity for study of the discourse planning hypothesis.

Hoffman cites the study of Miller, Johnson, and Richmond (1965) indicating that schizophrenics with VHs are less competent in language usage, but not the Johnson and Miller (1965) paper which suggests that this deficiency predated the onset of schizophrenia. There seems to be something about the schizophrenic condition that elicits VHs in vulnerable individuals and visual hallucinations in a subset of these. A defect in discourse planning does not seem central because the defect can be detected prior to the onset of the VHs and is also associated with nonlexical hallucinations. However, the lexical issue seems important. In a discussion of the commonalities in the cardinal signs of schizophrenia (Alpert 1985), I noted that all, including flat affect, involved some disturbance in language processing. In emphasizing their verbal content Hoffman has focused on an important aspect of schizophrenic hallucinations. Locating the lesion in left-hemisphere language areas is not consistent with my reading of the evidence (Alpert & Martz 1977; Mayer, Alpert, Stastney, Perlick & Empfield 1985).

Verbal hallucinations, unintendedness, and the validity of the schizophrenia diagnosis

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Despite the wealth of evidence collected by psychologists on normal human perception and cognition, the hallucinations of psychotic individuals have been a relatively neglected topic of empirical research. For example, with the exception of three volumes of collected papers (Keup 1970; Siegal & West 1975; West 1962) and a book by Johnson (1978) proposing a particular theory, a book shortly to be published by the present commentators (Slade & Bentall 1986) will be one of the first attempts to review systematically the research in this area. Because of this relative lack of research and theorising, Hoffman's bold attempt to draw together the literature on the verbal hallucinations of patients diagnosed as "schizophrenic" is to be particularly welcomed. However, a number of problems are apparent in Hoffman's account which, we believe, merit serious attention.

1. The association between verbal hallucinations and "schizophrenia." Central to Hoffman's theory would appear to be the assumption that there is a valid scientific entity called "schizophrenia," distinct in some way from other forms of mental disorder. The cognitive deficits presumed to underlie this disorder are hypothesised as causal in the determination of a range of schizophrenic symptoms. Thus, in Hoffman's account, speech disturbance and verbal hallucinations are assumed to be the result of the same deficit – a disorder of discourse planning. This is the kind of approach taken by traditional psychiatry and is sometimes called the "categorical model" (Blashfield 1983).

We know of no convincing evidence to support this model. Although the operational diagnostic criteria (e.g., DSM-III) developed by psychiatrists in recent years have led to improved levels of interrater reliability using particular criteria, different criteria tend to classify different patients as schizophrenic (Brockington, Kendell & Leff 1978). Studies using factor analysis or cluster analysis have so far failed to yield sufficient evidence of factors of schizophrenic traits or clusters of schizophrenic individuals (Bentall 1986; Blashfield 1983; Slade & Cooper 1979). The relationship between schizophrenia and the affective psychoses has proved particularly problematic, and research using discriminant function analysis has failed to identify clear borderlines between these conditions on the basis of symptoms (Brockington, Kendell, Wainwright, Hillier & Walker 1979; Kendell & Gourlay 1973) or outcome (Kendell & Brockington 1980).

Not surprisingly, given these problems, although verbal hallucinations would seem to be very common among patients diagnosed as schizophrenic (W.H.O. 1975), they are also often present in patients with other diagnoses, such as psychotic depression. It should also be noted that, in some cultures, hallucinatory experiences are fairly common among people not regarded as mentally ill (Bourguignon 1970) and that, even in our own society, they may be more prevalent among nonpsychotic individuals than is often realised (Bentall & Slade 1985b; McKellar 1968; Sidgewick 1894; West 1948). Given the absence of evidence for the categorical model, it seems likely that the cognitive mechanisms underlying verbal hallucinations are similar, whatever the diagnoses of the patients experiencing them.

2. The association between verbal hallucinations and disordered speech. Hoffman claims an association between verbal hallucinations and disordered speech. However, factor analytic studies of psychotic symptom data provide only marginal support for this association (Slade & Cooper 1979). Certainly clinical experience and quantatitive data both indicate that individuals with hallucinations but no recognisable speech disorder are relatively common among psychiatric populations. In Hoffman's own research, as he readily admits, his exclusion of manic hallucinators from his analysis is problematic. Among his manic subjects, speech disorder was relatively common but hallucinations rare. It is possible that, had he assessed psychotically depressed patients, he would have found the reverse to be the case.

3. The identification of the experience of unintendedness as the main cause of the hallucinator's inference that his inner speech originates from a source external to himself. Central to the later philosophy of Wittgenstein (1953) was the observation that humans can only describe their own mental states inferentially. Consistent with the later Wittgenstein and with Hoffman's own hypothesis, there is evidence from research on memory monitoring that indicates that internal or mental events are

more likely to be mistaken for experiences originating from an external source when they are unintended and under the control of external stimuli (Johnson, Raye, Foley & Foley 1981). It seems unlikely, however, that the experience of unintendedness is the only variable that influences a hallucinator's decision that an experienced event originates from an external source.

For example, it is clear that a person's judgment about whether an experienced event is "real" or "imaginary" is influenced by contextual information. As Perky (1910) and Segal (1970) have been able to demonstrate, given appropriate information, individuals may misclassify "real" events as products of their imagination (the reverse of the inferential error implicated in hallucinations). A number of studies have shown that hallucinators are more likely to report hallucinations when given appropriate suggestions or expectations that a stimulus is about to be presented (Alpert 1985; Mintz & Alpert 1972; Young, Bentall, Slade & Dewey, in press).

Other variables that are likely to be important in determining the onset of hallucinations are internal arousal, external stimulation, and the reinforcing consequences of hallucination (Slade 1976).

4. The failure to account for nonverbal hallucinations. It may be unfair to criticise Hoffman for failing to account for nonverbal hallucinations. However, it should be noted that although patients diagnosed as schizophrenic usually experience hallucinations in the auditory modality in the West, visual or tactile hallucinations are not unknown, and there is evidence to suggest that these kinds of hallucinations are much more prevalent among patients in Africa and the Middle East (Al-Issa 1978). Although such symptoms may perhaps result from false inferences made about visual or tactile imagery, it is difficult to see how these symptoms can be related to a disorder of discourse planning.

5. The lack of implications for therapy. Finally, Hoffman's theory has few implications for therapy, as an effective psychological treatment for discourse planning does not exist. Yet, despite the relative lack of interest shown in hallucinations by clinical psychologists, there is evidence that they respond to a variety of psychological treatments including operant procedures, systematic desensitisation, thought stopping and response competition, and satiation (Slade & Bentall 1986).

Despite these criticisms, it is important to emphasise that there are many aspects of Hoffman's approach with which we are in agreement. We particularly welcome his identification of hallucinations with inferential processes; we have recently published a study of our own, using signal detection theory, which provides evidence supporting this hypothesis (Bentall & Slade 1985a). We also feel that it is likely that the experience of unintendedness is one of the properties of inner speech that can lead predisposed individuals to attribute such speech to an external source. We feel that it is unlikely, however, that this is the only factor involved.

Intended versus intentional action

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Schizophrenics typically experience auditory images, or verbal hallucinations (VHs), that have the appearance of being generated by another person. Ralph Hoffman poses the problem: Given that there are no sensory features that differentiate VHs from normal covert speech, why do VHs appear alien? And in essence his answer is this. Imaging is actional. Thus, VHs are actions. Actions are generated by cognitive processes that involve representational schemata of a pattern of goal-directed activity. For speech, these schemata are discourse plans. VHs are bits of covert speech that are nonconcordant with concurrent discourse plans. A feeling of being acted upon, of being a passive recipient, accompanies actions, including VHs, that are nonconcordant with an activated representational schema of goal-directed activity. This answer is highly plausible, more plausible than the alternatives Hoffman considers. At least I do not want to debate it. Rather, I want to complement this answer by clarifying the action theoretic base on which it is built.

Some time ago Wittgenstein (1953, para. 621) raised the conceptual issue about the difference between mere reflex behavior and action by asking, "What is left over if I subtract the fact that my arm goes up from the fact that I raise my arm?" The best answer to Wittgenstein's question is "nothing." The bodily activities of raising one's arm and one's arm rising are identical; photographically, there is no difference. Rather, they differ with respect to their causal antecedents. The processes generating actions are distinct from those generating mere reflex movements. The same point can be made about nonbodily, or mental, actions such as problem solving, covert speech, and imaging. This is a functional view of action: Actions are those events that have a characteristic etiology.

The classical defense of this theory of action was provided by Davidson (1963). He identified the causal antecedent with a complex of beliefs and desires. This theory of action is correct, but Davidson's defense of it was wrong, and that for two related reasons. First, it misidentified the causal antecedents. The representational content of belief is too coarse-grained to reflect the cognitive state preceding action. Some of these processes, for instance, are rapid and not accessible to the subject. They are informationally encapsulated. And desires, understood in terms of preferences, are sometimes absent prior to action. Persons sometimes act without regard to, or even in spite of, their preferences. Second, this defense was couched in commonsense or folk psychological terms. A description of the causal antecedents to action must rather be stated in the proprietary vocabulary of the sciences of the mental.

The causal antecedent to action must have both cognitive and motivational components (Brand 1984). In the simplest cases, the cognitive component includes the monitoring and guidance mechanisms for on-going activity. In more complicated cases, it also includes a representation of the goal-directed pattern of activity into which the action fits. A motivational factor is required to explain why the action was initiated. Simply having a representation of a pattern of activity and well-working motor control mechanisms is not sufficient for action. If it were, there would be no difference between idle planning and acting on one's plan. This motivational factor has dropped out of recent discussions of action generation, and Hoffman is no exception to this trend. An adequate account of the etiology of action must make reference to noncognitive factors. But this is a story to be told at another time. For now, let us borrow the term "intending" from common-sense psychology to name the causal antecedent to action, but only so long as we understand it as shorthand for the characteristic processes described in the proprietary vocabulary. Hoffman too seems to have adopted this usage. On this basis, the functional theory says that something is an action only if it is directly caused by an intending.

Most actions are performed within the context of an overall pattern of activity. Changing a flat tire is such a pattern, and cranking the jack is an action falling within this pattern. The cognitive antecedent of such an action includes a representation that locates this action within the entire pattern of activity. Schank's script theory is one way to articulate these actional representations (Schank & Abelson 1977; Schank 1980). Thus, for example, cranking the jack is partially generated by a schema for changing a flat tire. An action whose cognitive antecedents include a representation of the pattern of activity into which it fits is intentional. Put another way, intentional action is planned action (Brand, in press). In summary, then, all actions are caused by intendings. All planned actions are intentional. There

are unintentional actions (i.e., unplanned actions); but there are no unintended actions.

Slips present an interesting case. It would appear that they cannot be uniformly treated. Some slips are intentional actions, such as an embarrassing *faux pas*. In these cases there is a schema into which the action fits, though for various reasons the subject is not attending to that schema at the time. Other slips are unintentional actions. For instance, there are certain characteristic errors made by expert typists, such as letter reversal and letter doubling, which result from the structure of the monitoring and guidance mechanisms (Rumelhart & Norman 1982). In these cases, the motor control mechanisms cause the action, but it does not fit into the representational schema.

Armed with this sketch of an action theory, let us turn back to Hoffman's explanation of VHs in schizophrenics. Hoffman distinguishes between strongly intended and weakly intended actions, where the former are "consciously decided upon actions" and the latter "spontaneous actions." This is really a distinction between those actions whose cognitive antecedents include representations of the pattern of activity into which the action fits and those that do not. That is, it is a distinction between intentional and unintentional actions. Hoffman also distinguishes between weakly unintended and strongly unintended actions. Taking "intending" as shorthand for the cognitive and motivational antecedent causal processes, no actions are unintended. Daydreams and free associations, Hoffman's so-called weakly unintended occurrences, are not actions at all. A strongly unintended action, moreover, is better described as an unintentional action performed in the context of a pattern of activity whose contained goals are nonconcordant with the action. An action that would fall within this category is my suddenly thrusting my arms upward for no apparent reason while in the midst of changing a flat tire. Note that something in this category can *mock* an intentional action. Suppose that in addition to thrusting my arms suddenly upward I started to clap, all with no apparent reason, and that afterward I returned to changing the tire. There is mock intentionality here because putting my arms upward and clapping are a sequence of actions requiring some representational schema; but this sequence is nonconcordant with the goals embedded in the controlling representational schema of changing the tire.

Overt speech is intentional; it requires cognitive schemata – discourse plans – that are part of the causal antecedents for each segment of the speech. If we assume with Hoffman that covert speech is relevantly similar to overt speech (an assumption about which I am somewhat uneasy), covert speech is also intentional. VHs are then unintentional actions that are nonconcordant with the goals embedded in the cognitive schema for the concurrent covert speech. Better, VHs are sequences of actions that exhibit mock intentionality similar to thrusting one's arms upward and clapping in the midst of changing a tire. VHs can be well-formed, internally consistent sentences; but they are not intentional, because they do not fall within the overriding activated schema for the concurrent activity.

Suppose again my arms suddenly moved upward when I was changing the tire. That experience, I imagine, would feel alien; it would be as if something had happened to me. That action would have interjected itself into an ongoing pattern of goal-directed activity. Similarly, when a VH interjects itself in an ongoing pattern of covert speech, or indeed into a pattern of any covert activity, a feeling of alienation from the VH might be expected. The predicted activity pattern is broken for no apparent reason, and the subject feels victimized, as if something happened to him.

Cases in which one's arms suddenly thrust upward or cases of VHs are different from slips. They are different from accidental slips in which there is no motor control breakdown, because VHs are genuine actions. They are also apparently different from certain types of verbal slips. In those cases there is an activated representational schema to which one can attend, though sometimes only with difficulty. In the case of VHs, I would hypothesize, the schizophrenic is not able to attend to the schema controlling the VH, but only to the overriding one. It would be interesting to test this hypothesis.

Reality and control

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It is one of those ironic twists in the history of ideas that Sigmund Freud invented (and that is the correct word – as opposed to discovered) the modern notion of the unconscious. The twist is ironic because the identification of Freud's ideas with dynamic processes and the origins of neuroses rendered the intellectual world blind to the ubiquity of unconscious processes. Freud's contemporaries, the psychologists at the University of Würzburg, discovered the pervasiveness of unconscious or preconscious processes in a series of "experiments" (misguided term). They found in the most mundane and trivial situations that introspection was not a reliable guide to our mental processes. They discovered in the most elementary problem (What is the sum of two and two?) that the answer comes with *no conscious awareness of the method of solution.* In short, *intended* (to use Hoffman's term) mental activities are prepared for us in a way that is not available to our conscious experience.

Hoffman, in his seminal paper, puts this fact together with a method for discovering the structure of discourse (Deese 1984) to tell us that the hearing of voices in schizophrenic patients is a result of the failure of the *unconscious planning mechanism* for the production of discourse. From an earlier paper (Hoffman, Kirstein, Stopek & Cicchetti 1982) we learned that schizophrenic patients do not form the strong hierarchies in discourse that are the natural lot of most of us when we talk, write, or even just muse. Psychotic persons do not order discourse the way most of us tend to do (even the best of us slips from time to time), by making a hierarchy of important and subsidiary ideas. The failure of schizophrenics in this respect makes it difficult to know what schizophrenics are talking about.

Hoffman is right in telling us (1) that schizophrenics do not organize hierarchically and (2) that such organization is unconscious for all of us. His conclusion is that the verbal hallucinations of schizophrenics are the result of the failure of the unconscious planning machinery. The hapless schizophrenic has not directed what he hears, and so he hears the hallucinations as external voices. Verbal imagery, for most of us, is planned and thus not perceived as hallucinations. I merely mention the remarkable similarity between this conclusion and the counterintuitive conclusion reached by Julian Jaynes (1977) about the origin of consciousness. Jayne's conclusion was pure conjecture; Hoffman, however, provides us with an original and testable notion about the nature of schizophrenic thought.

Problems and questions nevertheless remain. The biggest problem is that of accounting for nonverbal hallucinations (having visions as opposed to hearing voices or having visions *and* hearing voices). Hoffman deals with this problem, but he is not altogether convincing. Then there are questions. Hoffman does not deal with the problem of dreams. Are dreams intended or unintended? If they are not, then the similarity between dreams and the mental processes of schizophrenia squarely lands us on Hoffman's side. If they are intended, then there is a problem, for dreams do have strange and irrational structures.

Another question untouched by Hoffman is that of the biology of schizophrenia. Most of us who have an interest in the biology of schizophrenia (or a more general interest in the relation between mentality and the brain) suppose that so bizarre a set of symptoms as those identified with schizophrenia have some

basis in biochemical disturbances in the brain. Furthermore, most of us suppose that such disturbances are diffuse (though there may be an affinity of certain substances for particular sites).

What Hoffman's thesis does is to cause us to wonder whether or not there is some *specific*, more localized failure in the central nervous system. We need to ask ourselves what is the neural substrate of the unconscious planning process that lets us and not the schizophrenic know that something has been organized for us. If Hoffman is right that intendedness is essential for not hearing verbal imagery as an external voice, then a search for the neural origin of intendedness becomes of central importance. [See also Libet: "Unconscious Cerebral Initiative and the Role of Conscious Will in Voluntary Action," *BBS* 8(4) 1985; and Goldberg: "Supplementary Motor Area Structure and Function," *BBS* 8(4) 1985.]

The diversity of the schizophrenias

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Hoffman presents an interesting thesis linking schizophrenic language disorders and auditory (verbal) hallucinations to an underlying planning disturbance. He considers auditory hallucinations to be unintended verbal images, or "nonself"-experienced inner speech. These are the converse of outwardly directed speech. Thus, Hoffman suggests that a formal symmetry between inner and outer speech is reflected by the association of formal thought disorder and verbal hallucinations (VHs) in schizophrenics.

The target article is valuable in several respects, including stimulating discussion of the phenomenology of psychotic symptoms, offering a testable hypothesis to understand better psychotic symptoms, and considering other theories of schizophrenic VHs.

Any other discussion of phenomenology must acknowledge the seminal contributions of Karl Jaspers (1963) in his *General Psychopathology*. It is remarkable how little the field has progressed since the first edition was published in 1913. Hamilton (1985) has provided the most accessible current distillation of psychopathology. VHs are but one category of auditory hallucinations. Other categories include elementary, functional, incomplete, and complete auditory hallucinations and thought echo. Many otherwise astute clinicians are unfamiliar with these distinctions, and systematic studies examining auditory hallucination subtype prevalence and associations are lacking. It would be highly desirable for future studies to subdivide and quantify the phenomena of auditory hallucinations. Unfortunately, I am finding in an on-going study that some patients are surprisingly unable to elaborate on the phenomenology of their "voices." The situation is much more settled regarding descriptions of formal thought disorders, especially with the definitions provided by Andreasen (1979a). Satisfactory descriptions of affect are also available (Abrams & Taylor 1978; Andreasen & Olsen 1982). The form and development of delusions (apophanous phenomena) is another topic needing refinement. I would be interested in knowing whether Hoffman has considered narrowing his theory by specifying the types of VHs and formal thought disorders linked by a planning disturbance. Perhaps his data can be accordingly reviewed and more robust associations might be revealed.

This leads to my second general point regarding the testability of Hoffman's hypothesis. The decline of dogmatism in psychiatry is most welcome albeit overdue. Hoffman's model can be tested directly by studying the association of VHs and formal thought disorder in schizophrenic populations. Hoffman provides empirical support by summarizing a study he conducted that found a highly significant positive association between severity of discourse disorganization and VHs. This summary in the target article raises some questions, however. How were these symptoms rated? One of Hoffman's coauthor's rating forms for positive and negative schizophrenic symptoms (Andreasen & Olsen 1982) rates hallucinations over a period of time and not only in acute cross-section, but language disturbance ratings are based on current objective observations. Thus, on that instrument, present and past symptoms can be intermixed. Also, in the target article summary VHs are noted but not their nature, frequency, and intensity. Similarly, the quantification of discourse disorganization is not described. A more significant question is whether any of the subjects were free of significant discourse disorganization, yet displayed VHs. Such subjects would tend to refute Hoffman's hypothesis that discourse disorganization in schizophrenics is a prerequisite for VHs. Finally, the association might simply reflect more severely ill patients having more symptoms.

Data from recent work (Eubanks, Faber, Spangher & Mumford, unpublished manuscript) do not support Hoffman's hypothesis. We examined 59 schizophrenics for the presence of neuropsychological dysfunction and head CT (computerized tomographic scan) abnormalities. Patients were assessed clinically by Andreasen's positive and negative symptom scale. We categorized 25 patients as positive (equivalent to Type I), 14 as negative (Type II), and 20 patients as mixed, with marked positive and negative symptoms. In the positive and mixed groups there was a *negative* association between VHs and positive formal thought disorder. This is in direct contrast with Hoffman's findings. Many patients had VHs and were coherent, logical, and relevant in their speech. In my clinical experience I have been more impressed by the diversity of psychotic symptom clusters than by any regular association of symptoms. Thus my impression has been that hallucinations, delusions, formal thought disorder, and blunted affect tend to be independent of each other, and patients may have one or more of these symptoms in any combination. This line of thinking runs contrary to the currently popular Type I and II classification.

In my opinion, the term schizophrenia now obfuscates more than it clarifies. In essence it is shorthand for any nonorganic, nonaffective, enduring psychotic process. Have we come very far since Kraepelin? How strong is the evidence that patients with a formal thought disorder and blunted affect have the same disorder as patients without those symptoms but having hallucinations or delusions? What is the likelihood of a schizophrenic patient with a given symptom having any other symptom?

My final comments concern an alternative theory and an extension of Hoffman's hypothesis. My own work exploring similarities between schizophrenic language and aphasia (Faber & Reichstein 1981; Faber, Abrams, Taylor, Kasprison, Morris & Weisz 1983) suggest a comprehension disturbance might be involved in both disordered discourse and VIIs. Patients with disordered discourse are unaware of their language being aberrant and may speak at great length, oblivious to their listeners' difficulties. Likewise, the nonself, unintended nature of verbal images deemed VHs are not understood by patients so afflicted as being originating in themselves. A dominant posterior temporal lobe dysfunction might underlie both phenomena.

Finally, mention should be made of the association between obsessions – involuntary, recurrent ego-dystonic thoughts, images, or impulses – and extrapyramidal movement disorders (Cummings 1985). Obsessions and VHs share unintendedness as a property and thus might have similar pathophysiological mechanisms.

Auditory hallucinations, inner speech, and the dominant hemisphere

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Baillarger (1846) distinguished between psychosensory and psychic hallucinations, the former perceived through the ears as coming from outside, the latter "produced in the interior of the soul"; he concluded that such patients "hear not voices but thoughts." Maudsley (1886) pointed out that the insane "do not always hear the voices as distinct, articulated utterances . . . they are in his head and are interior voices, thoughts which he hears rather than words actually heard with his ears. They are distinctly apprehended and clearly understood even when they come . . . mysteriously from great distances." Parish (1897) concluded that "auditory hallucinations consist merely in the unnoticed articulation of one's thoughts, which become audible and take the form of an auditory hallucination . . . it would appear that the greater number of the 'voices' if not all, are caused by automatic speech on the part of the participant." Modell (1958; 1960; 1962) emphasised that the most essential feature of hallucinatory experiences is the process by which one's own thoughts are attributed to voices; he considered verbal hallucinations to be in fact *hallucinations of inner speech.* Drawing from his profound knowledge of the phenomenology of schizophrenic mentation, Bleuler (1911; 1934) viewed their acoustic hallucinations in the following way: "The voices are unlike spoken voices but are as if thoughts." Similar were the opinions of Ey (1934), who considered verbal hallucinations a disturbance of internal speech; of Janet (1906; 1936), who discussed "hallucinations psychomotrices verbales"; and of Lhermitte (1949; 1951) who stated that hallucinations were disorders of thought and of inner language. Thus, as Johnson (1978) concludes, "the clinical evidence [is] that hallucinations of inner speech are the most important feature of auditory hallucinations."

Confirming these detailed and perceptive clinical and phenomenological observations of the last 100 years are the numerous empirical investigations, initiated by Gould (1948; 1949; 1950), that demonstrate by amplifying the laryngeal musculature that during hallucinations there is activation of the vocal apparatus: in essence, subliminal vocalization which is perceived by the subject as externally projected and nonself-derived. The pioneering studies of Gould have been confirmed by Cerny (1964; 1965), McGuigan (1966), Inouye and Shimizu (1970), Lindsley (1956; 1960; 1961; 1962; 1963a; 1963b), and Johnson (1958; 1967). It is therefore well established that during verbal hallucinosis there is myogenic activation of the vocal system triggered by disorganized inner speech. Conversely, it has been shown that silent thinking and silent reading in normal subjects are associated with subvocalizations and laryngeal electromyographic activation (Faaborg-Anderson 1957; Faaborg-Anderson & Edfeldt 1958; Jacobson 1932; Luria 1960; Max 1937). At the neurophysiological level pathological dysregulation of inner speech with consequent subliminal activation of the laryngeal musculature implies a disorganization in the neural networks mediating language, that is, of the dominant fronto-temporal network.

I have reviewed elsewhere (Flor-Henry 1969; 1983a; 1983b) the evidence derived from extremely varied experimental approaches, which shows that the fundamental defect in schizophrenia relates to impaired dominant-hemispheric functions. If this is true, schizophrenia should be associated with formal abnormalities in the phonological or linguistic system because these functions are dependent on the integrity of neural systems in the dominant hemisphere. This too has been confirmed. The study of language abnormality in schizophrenia in the last 20 years has shown that there is, in this syndrome, a defect in formal linguistic organization at the semantic and lexical level of discourse, a defect in speech comprehension, and a correspondence between thought disorder, statistical abnormalities in the relative frequency of certain linguistic elements, and movement abnormalities. In view of the fundamental importance of motor system abnormality in psychopathology, the demonstration by Manschreck, Maher, and Ader (1981) that language deviance and abnormal motor behavior in thought-disordered schizophrenia are significantly correlated is theoretically important. In addition, the so-called nonaphasic disturbances of language, neologisms, echolalia, and paucity of speech are identical in chronic schizophrenia, in certain stages of dementia, and in neurological syndromes where the language regions of the dominant hemisphere are partially disconnected from the rest of the left hemisphere: It seems improbable that these relationships are chance events (see Flor-Henry 1983a, pp. 85–89 for review).

There is also direct neuroanatomical and neurophysiological evidence of disturbed dominant temporal functions directly correlated with the presence of auditory hallucinations in schizophrenia. Southard (1914), who was director of the psychopathic department of Boston State Hospital and professor of neuropathology at Harvard University, studied the topography of cortical lesions in 25 cases of dementia praecox and found that the lesions were unilateral on the left side in 25% of cases and diffuse in all the others, except for a single one which was unilateral, right sided. Further, in 12 cases with hallucinations, 6 had temporal lesions whereas in the 13 cases without hallucinations the lesions were diffuse or the temporal lobes were intact. Takahashi et al. (1981), in the CT scan investigation of 257 DSM-III-diagnosed schizophrenics, found that left temporal cortical atrophy alone was associated with hallucinations. Uchino et al. (1984), examining 40 schizophrenics with CT scan and correlating neuroradiological features with mental state as determined by the Present State Examination (Wing, Cooper & Sartorius 1974), observed that auditory hallucinations were related to enlargement of the left Sylvian fissure and enlargement of the left anterior horn of the lateral ventricle. Studies of regional cerebral blood flow in schizophrenia reveal increased circulation in the left hemisphere in the resting state. Whereas in normals during a verbal task the left hemisphere flow is increased above base line, this is exaggerated in schizophrenia (Gur et al. 1985). Kubachi et al. (1985) compared 16 schizophrenics without and 8 with auditory hallucinations and found that auditory hallucinations were associated with increased left temporal flow but reduced frontal flow bilaterally (disturbance of inner speech perceived as nonself?). Bazhin, Wasserman, and Tonkonogii (1975) reported in the analysis of 30 dextral paranoid schizophrenics that during verbal hallucinosis there was an increase in the acoustic threshold of the right ear (i.e., a contralateral left temporal deficit). Stevens, Bigelow, and Denney (1979) and Stevens and Livermore (1982) in a telemetric-EEG study of schizophrenic patients note a significant correlation between hallucinations and suppression of left temporal alpha power (i.e., regional left temporal activation). In the general context of hallucinations in schizophrenia it is noteworthy that Braccha, Bigelow, Cabrera, and Wyatt (1984) showed that a left-hemisphere lateralization was also present for visual hallucinations, significantly more often perceived in the right visual field (i.e., a left posterior temporo-parietal locus).

In summary, clinical and phenomelological, neuroanatomical and neurophysiological evidence indicates that auditory hallucinations in schizophrenia are reflections of altered neural structures responsible for verbal–linguistic expression. Abnormal activation of these neural sets produces subliminal subvocalization, "hallucinations of inner speech," which because unintended are perceived subjectively as foreign to the self. The intensity of thought-disorder, the frequency of paraphasic, dys-

phasic, formal linguistic anomalies and motor control pathology are all interrelated and increase the probability of verbal hallucinosis – this is empirically verified. Hoffman's elegant essay, attributing the experience of verbal auditory hallucinations to disruptions in language-planning processes evoking unintended verbal intrusions whose sensory characteristics are similar to those of ordinary mental imagery – but which are perceived as hallucinatory because of the *unintendedness* – is a perfectly adequate model at the level of cognitive pathology description and is in keeping with the now massive documentation that relates the schizophrenic syndrome to disturbance of dominant hemispheric functions.

Arousal and the disruption of language production processes in schizophrenia

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Hoffman's target article represents an interesting attempt to explain verbal hallucinations within an information processing framework. Although my reaction is primarily positive, I would like to make a few points, focusing in particular on Hoffman's failure to consider the possible role of physiological arousal in defining the characteristics of schizophrenic cognition. I will then comment briefly on his conjecture that the experience of unintendedness provides the basis for verbal images (when nonconcordant with concurrent cognitive goals) to be experienced as hallucinatory, that is, as having a "nonself" origin.

As I have noted elsewhere (Gjerde 1983), recent attempts to use information-processing models to account for cognitive deficits in schizophrenia have typically proceeded with a framework of "cold cognition" – a theoretical emphasis which parallels the pervasive tendency of contemporary cognitive psychology to ignore affect-related phenomena (cf. Zajonc 1980). This approach may be useful in delineating regularities among essentially normal subjects. Nonetheless, problems arise when it is applied to populations that are known to deviate in their affective and arousal-related characteristics, such as schizophrenics. In particular, we do not know the extent to which observed differences between schizophrenics and normal controls on information-processing tasks derive from differences in arousal levels or from differences in cognitive characteristics per se. Until this issue has been settled, we cannot say whether schizophrenia is an arousal-related or an information-processing-related disorder (e.g., see Cromwell 1978).

A closer consideration of the relationships between arousal and cognition in schizophrenia would, in my view, strengthen Hoffman's argument considerably. In particular, it may help us understand further why language-planning processes appear so disorganized in schizophrenia. Empirical evidence in the area of arousal and cognition suggests that the effects of arousal on information processing in schizophrenia are particularly salient when effortful, short-term memory processes are involved (cf. Gjerde 1983). As Hoffman notes, it is likely that the discourse-planning structures are located in short-term, small capacity memory – the location at which the disruptive effects of arousal are most likely to be felt. (Note that the controversy over whether schizophrenics are habitually over- or underaroused [or both] may be relatively unimportant for some cognitive processes because deviation from optimal arousal in either direction may disrupt performance. This position is implied by the Yerkes-Dodson inverted *U* relationship between arousal and performance.)

Space limitations prevent me from reviewing in detail the effects of arousal on the processing of information. Briefly stated, deviant arousal levels appear to bias the subject's search toward readily available information: reduce the speed of retrieval, especially from semantic memory [see also multiple book review of Tulving, *Elements of episodic memory*, *BBS* 7(2) 1984]; reduce the depth of processing; limit the range of cue utilization; and, perhaps most important in this context, decrease the processing of the *semantic* properties of stimuli (cf. Easterbrook 1959; Eysenck 1977; Gjerde 1983; Korchin 1964; Schwartz 1974; 1975). Given this set of findings, it follows that arousal is likely to increase the observed incoherence of thought and speech processes, including language-production processes – the condition, according to Hoffman, that leads verbal images to be experienced as nonintended and, therefore, as hallucinatory. In addition, arousal may also increase the probability of creating "parasitic" memories – a functional breakdown in associative memory occurring when storage capacities are overloaded. It is likely that arousal affects a person's available storage capacity. Hyperarousal, for example, may directly reduce task-available capacity, but it may also reduce capacity more indirectly, by, for example, increasing the attention given to task-irrelevant activities. Whichever of these possibilities is correct, arousal increases the probability of capacity overload – the situation that occurs when task requirements exceed available information-processing capacity. Capacity overload, if I understand Hoffman correctly, is an important precondition for the generation of parasitic memories. Arousal may therefore enhance the probability of parasitic memories. In conclusion, Hoffman's model may well benefit from a closer consideration of the various ways in which arousal affects information processing in schizophrenia.

Although Hoffman gives a cogent analysis of how it is that disruptions in language processes associated with schizophrenia cause verbal images to be experienced as unintended, I am less convinced by his argument that the experience of unintendedness itself provides a sufficient basis for attributing a nonself origin to these phenomena, even when they are nonconcordant with self-defined cognitive goals. On a more fundamental level, one may also question whether verbal hallucinations, by definition, need to be experienced as having a "nonself" origin. Under certain circumstances, verbal hallucinations may be experienced as ego alien – as a perversion or an extension of oneself – but not necessarily as external. Perhaps a continuum of clinical disturbance is involved here. On one extreme of this continuum one would have those who experience verbal hallucinations as ego alien but also as being part of oneself – as "inner voices," perhaps not too unlike the normal experience sometimes referred to as "the voice of consciousness." In the middle range, one would have those who experience their verbal hallucinations as external but controllable. Finally, on the other extreme of this continuum, we would have those who experience hallucinations as both external and uncontrollable. However, even when verbal images are experienced as external, nonconcordance with cognitive goals and the experience of unintendedness do not seem to constitute a sufficient basis for attributing them to nonself sources. In my view, this is the least convincing part of Hoffman's argument. Perhaps a more careful empirical analysis of the sensory properties of verbal hallucinations could provide additional clues. Previous studies on this topic have not, I think, provided conclusive evidence that properties of verbal hallucinations are not distinct from ordinary verbal imagery.

These critical comments aside, Hoffman is to complimented for having made a useful contribution to our understanding of verbal hallucinations in schizophrenia. The theory set forth in his target article should provide a framework likely to generate further empirical progress on this elusive topic.

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Teleology and agency in speech production

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Hoffman invokes a cognitive theory to explain why schizophrenics hallucinate verbal utterances, and particularly why they hallucinate them as utterances of another person. I understand him to be arguing, first, that the verbal imagery seems unintended because it is not the product of a high-level "cognitive goal" of the sort that is posited as underlying the organization of normal speech production; and second, that it seems to be from another person because in addition there are concurrent cognitive goals with which the seemingly unintended imagery is inconsistent.

One problem with this account is that it appears to assume that teleology coincides with (seeming) agency. This is a false assumption: Goal-directed systems that perform the homeostatic functions of the brain do not as a rule have an output that seems to be of our own intending. And our intentional actions seem no less our own, however inconsistent they may be with the goals of such regulatory systems. More to the point, the "planning" of speech behavior, in a "subpersonal" sense now common in cognitive psychology and artificial intelligence, does not of itself explain why the subject would attribute the behavior to himself (as an intended utterance) rather than to some distinct planning system – a system as "alien" as the one that regulates body temperature.

Hoffman occasionally speaks of "conscious accessibility" and perhaps means to suggest that where a high-level cognitive goal is (in the relevant sense) consciously accessible, the "product" is perceived as being of one's own intending. This may or may not be a necessary condition of agency; it is certainly not sufficient. For one may be conscious of the goals of a teleological system without being conscious of them as one's own goals.

Thus Hoffman's teleological theory as it stands fails to account for the difference between (inner or outer) speech that seems to be the expression of one's own thoughts and speech that seems to be the expression of another's thoughts. This is certainly not to suggest that we must supplement the teleology by positing a self that does the planning. The attribution to self belongs to the *explanandum*, not the *explanans*. One possibility – which might require only a "friendly amendment" to Hoffman's theory – is that one attributes inner or outer speech to oneself only if the planning process guiding the speech production is in certain respects responsive to reason. For example, a crude counterfactual indicator of agency might be as follows: Would the speech production cease if one were certain of being amply rewarded for its cessation (or punished for its failure to cease)? More subtle tests would concern the way the content of the speech production responded to argumentation. Again, I present this only as one possibility among others.[1]

The general point, I suppose, is that talk of "goals" and "plans" in cognitive psychology is dangerous: One is too readily tempted to explain folk-psychological discriminations, for example, of intention and agency, in terms of a theory that has quite a different aim – to explain some capacity or function of the brain such as speech production.

NOTE

1. See Gordon (1986) for relevant remarks on the seemingly passive character of *emotions*.

Speech errors and hallucinations in schizophrenia – no difference?

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Freud once said something to the effect that pathological behaviour isn't really very different in quality from normal behaviour, there's just more of it – especially the mistakes. (See, e.g., Freud 1891.) Certainly, if one compares the speech errors made by normal speakers with the speech output of aphasics, this conjecture receives some support. Now the same seems to be true of schziophrenics.

In particular, I have shown (Harley 1984) that in normal speakers fragments of conversational plans can intrude into the intended output speech with the result being a speech error. There are a number of ways in which conversational plans can interfere. Hence, errors can arise from competition between alternative ways of saying the same thing, from what has been said in the past, or from plans for something else the speaker might have been planning to say. Errors can even arise from other thoughts that intrude, and these thoughts can be both relevant and irrelevant. As an example, consider the following schizophrenic-sounding statement uttered by a normal speaker:

Target:	I want to cut out the elephant on the back of that.
Utterance:	I want to *cook* the elephant on the back of that.
Context:	The speaker was in a kitchen with a number of other people and wanted to make general conversation with those other people. However, he was not sure what to say. He thought about making a general remark about cooking, but instead intended to talk about cutting out a picture on the back of a cereal packet that was in view.

In this speech error a fragment of a conversational plan intrudes into another utterance. The verbal hallucinations of schizophrenics seem to be remarkably similar to these fragments, as Hoffman makes clear. But whereas normal speakers often confuse these planning fragments with what they intend to say, schizophrenics do not appear to have this difficulty. Indeed, they attribute a "feeling of otherness" to them. It would be interesting to know the extent to which schizophrenics make these non-plan-internal errors, as I have described them.

A major difficulty with using speakers' reports as data when interpreting speech errors is their highly phenomenological nature. A similar problem applies when analyzing the imagery of schizophrenics and its attribution. We must rely upon what speakers say they "intend." As with all research on speech production, defining "planned" and "intended" is a difficult problem. Hoffman has provided some clarification, but some problems still remain. There are two major difficulties. The first is that there appear to be no formal criteria for assigning any behaviour to the four categories, only intuitive appeal. To rely upon a definition of "consciously intended" rather begs the question, as (naive) speakers often equate a conscious decision to carry out an action with an intention to do that action. In addition, unless there is a methodology for describing the speaker's conscious or preconscious goals, assigning an item to a particular category on the basis of these phenomena can be semantically empty. More serious is the observation that Hoffman appears to predicate a great deal on the assumption that conversations, planning, and indeed even thoughts are hierarchically organized. This need not be the case. Internal representations cannot be segmented in this orderly fashion. At the highest level at least plans must be heterarchical, if only to

account for contingencies. People have alternative higher level plans in the event of a subgoal failure. Furthermore, as Hoffman notes, discourse situations are dynamic, in that topics are frequently changing (see, e.g., Schank 1977). Even for a normal speaker, conversational management is quite a complex task.

In conclusion, Hoffman provides an attractive hypothesis which finds corroboration in other data. In an ideal world we would want to know why some people assign an "otherness attribute" in situations when they should not. Perhaps there is still life in some attentional theory, in a variant where the locus of deficit is at a much higher level.

Verbal hallucinations and speech disorganization in schizophrenia: A further look at the evidence

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Hoffman has contributed valuable ideas in his hypothesis that unintended verbal imagery is responsible for the "nonself" experience of verbal hallucinations (VHs). In addition, he has presented a broad cognitive-processing model that relates speech disorganization to VHs. His overall model may help to explain key aspects of VHs. However, it provides only a partial explanation for VHs and falls short in several specific areas discussed below.

Because of these limitations a multifactor model is needed, with several different factors accounting for VHs and other cognitive aberrations in schizophrenia. The hypothesized mechanism of unintended imagery is at best only a part of a larger picture and does not fully explain a number of major phenomena associated with VHs. One of these is the systematic and persistent quality of certain messages experienced over time in VHs.

Nonconcordance between VHs and concurrent cognitive goals is also proposed as involved in patients' convictions as to the nonself origin of VHs. However, the nonself experience of "voices" is more complex. Thus, VHs describe the phenomenology of events that schizophrenics (sometimes) can control (Breier & Strauss 1983), events they seem to "hear" through their ears (implying an auditory component).

Furthermore, schizophrenics often believe in the reality of their VHs and delusions, and their behavior is influenced by them, despite the obvious unreality to nonpsychotic people. Hoffman's model does not explain why schizophrenics do not recognize that their VHs, their disorganized speech, and their delusions are grossly deviant in terms of consensual norms. This lack of recognition of prominent social norms has been labeled "impaired perspective" (Harrow & Quinlan 1985).

Hoffman proposes that disordered cognitive phenomena are involuntary. He suggests that there is a mismatching of cognitive intentions and verbal output in schizophrenics. However, in recent studies in which patients judged their disorganized speech, schizophrenics showed impaired perspective, rating their disorganized speech as adequate (Harrow & Miller 1980). These disorganized verbalizations *were what the schizophrenics intended,* and they were satisfied with them. This research suggests that discourse planning is disordered, but that schizophrenics say what they "intend" to say according to their original plan (Harrow, Lanin-Kettering, Prosen & Miller 1983; Harrow & Miller 1980; Harrow & Quinlan 1985).

In addition, data from current research support continuum models of cognitive aberrations, rather than all-or-none models (Chapman & Chapman 1980; Harrow & Silverstein 1977; Strauss 1969). Hoffman discusses VHs in a present–absent fashion, although he notes literature on "borderline" hallucinations. His model does view speech disorganization as lying on a continuum of "severity."

Caution is also mandated by several recent empirical findings. First, much of Hoffman's thesis is based on research supporting his claim of a close link between VHs and the severity of speech disorganization. Yet, recent research indicates that speech disorganization is more closely related to delusions and only shows modest correlation with hallucinations (e.g., Andreasen & Olsen 1982; Marengo & Harrow 1985).

A second problem concerns manic patients, who show speech disorganization but infrequent VHs. Hoffman proposes that manics generate competent discourse plans but switch rapidly from "one well-planned discourse structure to another while producing speech." However, a series of studies have failed to find differences between schizophrenic and manic speech disorganization (Andreasen 1979b; Harrow et al. 1983; Harvey 1983; Marengo & Harrow 1985). Other research suggests that there may be differences between speech disorganization in schizophrenics and manics (Ragin & Oltmanns, in press), but the evidence in this area is mixed.

Finally, Hoffman's model leans for support on Andreasen and Olsen's (1982) finding that in schizophrenia "the correlations between positive and negative symptoms were negative," and "positive and negative syndromes are at opposite ends of a continuum" (p. 793). Recent research by a number of investigators has not supported the existence of this negative relationship (e.g., Lewine, Fogg & Meltzer 1983; Pogue-Geile & Harrow 1985).

Overall, Hoffman's hypothesis may help advance knowledge about VHs. However, a multifactor model is needed for a complete understanding of the varied aspects of disordered schizophrenic cognition.

Hearing voices and the bicameral mind

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Auditory verbal hallucinations exist in varying percentages in every population in the world where they have been studied. They are of course most notable nowadays in severely stressed individuals that we label schizophrenic. But, contrary to what many an ardent biological psychiatrist wishes to think, they occur in normal individuals also, and they are not always indicative of pathology. This has been known for over a century (see Johnson 1978). The most recent study shows that 71% of college students have had at least brief verbal hallucinations at some time (Posey & Losch 1983).

Present cases. I have in my files letters from about a hundred correspondents who have had hallucinations, all the way from a transsexual who as a boy suffered considerable sexual molestation and then as an adult after a spell of Scientology became "overwhelmed" with voices until his sex change operation when they "abated" (her word), to milder cases, such as torpedoed sailors during the war who conversed with an audible God for hours in the water.

Most of my correspondents are men, but some are women, one of whom had a single experience:

> I remember looking to the left car window to see if someone was speaking to me from there. The voice told me to write my funeral (of all things!) and when I got out a piece of paper and pen, the words poured visually into my head and I was hardpressed to keep up. I lost parts. It was an intense experience after which I ended up weeping.

This mixture of auditory and Belshazzar-like visual verbal hallucination is unique in my data.

The variety of auditory hallucinations is remarkable. Another case with whom I have had much correspondence and many telephone conversations is a professor in a technical school on the West Coast. A deeply religious man, he gradually began to

hallucinate divine voices a few summers ago after becoming interested in spiritualism. The voices included a god of another universe, Yahweh as a false god, Lucifer, and a variety of lesser divinities and saints, "at least 20 in all . . . each with a particular mood, character, history and personality." It is the most similar case to the famous case of Schreber (1955) I have ever heard of.

On the other hand, some who have had continuing long-term hallucinated voices hear only one. An example I have come to know personally is an extremely successful and happy business man who is sometimes teased by his wife and children for spending so much time in the evening with "Richard," a superior being who "dictates" to him reams of what I consider to be boring pseudoprofundities.

Some of these cases were at sometime diagnosed as schizophrenic, but others never. These letters, unsolicited, are extremely articulate, even those from individuals who are continuing to hear their voices. This is not what would be expected on the basis of Hoffman's theory.

The evidence in history. Other important evidence to be taken into account by any theory of hallucinations comes from various historical personages: William Blake who insisted he could teach anyone to listen to and see angels as he did, angels from whom he heard his poetry (see Jaynes 1981); or his teacher, the astonishing polymath Emanuel Swedenborg, whose multiple hallucinations were written down into whole shelves of books that founded a new religion; or Joseph Smith and the Book of Mormon; or Muhammad hearing the Koran; or many other examples dating back to all the prophets and oracles and *aoidoi* of history. Or in our own era, Colonel Qaddafi of Libya, born a Beduin, who according to numerous reports hears voices from time to time and periodically goes into the desert to communicate with them.

The evidence in children. The spectrum of incidence of auditory hallucinations has to include not only normal nonschizophrenic adults but also children. Those who have studied the phenomena of "imaginary playmates" (which should read hallucinated playmates) are convinced that such children hear the "voices" of their (by us unseen) friends in their conversations with them (Harvey 1918; Pines 1978; Singer & Singer 1984). In my own studies, I have found that about half of the women students at a religious college had had hallucinated playmates, half of these clearly remembering the pitch and quality of the voices. One of these women still has her hallucinated playmates, now grown up like her, who appear in times of stress, their voices clearly "heard" and not imagined. She is not psychotic.

Verbal hallucinations in a nonverbal population. A further group that must be considered in any theory of verbal hallucinations has been discovered only recently (Hamilton 1985). These are cerebral palsied spastic-athetoid nonverbal congenital quadriplegics who have never spoken in their lives. They must be fed, bathed, toileted, and moved by others, and they are often regarded – tragically – as "vegetables." Surprisingly, some of them are fully capable of understanding speech at a normal level. Using finger, lip, or eye movements, communication can be established with a known technique, something like the game of "twenty questions," in which the patient can indicate yes or no (see Moore 1972).

When asked privately through this technique about the possibility of hearing voices, most of these patients "gave startled expressions followed by excited 'yes' signals." The voices were usually the same sex as the patient, sounding like a relative but identified as God. They spoke as from outside the patient, usually from the upper left (when hearing the voice the patient's eyes shifted to the left as if involuntarily), told the patient what to do and what was right, and made the patient miserable when disobeyed. Usually the voices were helpful, supporting any training program that was initiated. But in some patients the voice was unwanted, saying things opposite to their thoughts. The patients felt they could not communicate with the voices.

The data were checked for possible Clever Hans effects by having a second questioner who did not know the earlier results. Hamilton's pioneering and emotionally moving data are extremely rich, and I hope the research can be extended. I regard these findings as support for the hypothesis of the bicameral mind.

The bicameral mind. It is to be noted that throughout Hoffman's substantial, thickly referenced paper on auditory hallucinations, there is not a single description of an example, except for mention of speech-intrusions in a note. Had the author been more interested in what the hallucinations said, he might have noticed the larger questions. Why are hallucinations so often admonitory, 73% commands in men and more often criticisms in women? Why are they often religious in nature? Why do criminal psychotics feel they must obey their voices – much the way Abraham did in taking his son up the mountain?

In the theory of the bicameral mind I attempt to give a much fuller explanation of these phenomena (Jaynes 1977). Verbal hallucinations are so prevalent in various cultures today because they were once the basis of a mentality different from the one we have now. There is evidence suggesting that this ability to hallucinate evolved along with the evolution of language during the late Pleistocene (Jaynes 1976) as the response part of a brain register of all admonitory information. Its survival value was in directing individuals in various long-term tasks that cued their occurrence. By 9000 BC, such voices were called what we call gods, and they produced a new kind of social control that allowed agricultural civilizations to begin. These suggestions are speculative, but they make contact with and sense of data points in archeological evidence all along the way. All early civilizations we know of seem to have been ruled by such hallucinations or gods. Space does not permit me to go into all the reasons why this would have worked then and would not work now in the conscious era. Skeptics need go no further than the Bible. It is very hard to imagine what was going on in the early books if not auditory hallucinations.

Hoffman has selected one small corner of a profound and profoundly important phenomenon, neglecting all of its history, content, variety, and ubiquity. His theory is apparently based on a correlation among distressed and certainly medicated patients between hallucinations and language disorganization (I had thought that paranoid schizophrenics were the most likely to have auditory hallucinations and the least likely to have speech distortions). These patients, however, were admitted to the hospital on the basis of a set of symptoms, the two most prominent being just these. Of course they will correlate in such a selected sample. The point of my commentary is that if the true range of auditory verbal hallucinations had been considered, that correlation would have gone to zero. And that would dissolve Hoffman's hypothesis or any similar one.

Distinctiveness, unintendedness, location, and nonself attribution of verbal hallucinations

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How is it that many schizophrenics identify certain instances of verbal imagery as hallucinatory? The intuitive answer is that the sensory properties of hallucinations are more distinct, more "true-to-life" than normal cognitive events. Unfortunately, and as noted by Hoffman, this intuitive notion generally has not been supported by research. In one study (Junginger & Frame 1985), for example, we found that although patients reliably report that they perceived their verbal hallucinations (VHs) very clearly, the "voices" were not very loud and the reality of the experience was difficult to judge. We recently

have also found that patients reliably report that a headphone "voice" presented at a level approximating normal speech is louder, clearer, and more outside the head than their most recent VHs. Thus, it appears that hearing a hallucinated voice is not that different a sensory experience from normal verbal imagery, but it does differ from normal auditory perception.

Hoffman's emphasis on the unintendedness of VHs in the patient's attribution of "nonself" is intriguing. Unintendedness may help explain the seemingly puzzling report by a small number of subjects in our research who recognize a hallucinated voice as their own but still make attributions of nonself. I'm a bit puzzled, however, by Hoffman's speculation that kinesthetic cues prevent schizophrenics from making nonself attributions of unintended overt speech. Several researchers (e.g., Gould 1948; Inouye & Shimizu 1970; McGuigan 1966) have found covert speech muscle activity coincident with reports of VHs. How is it that this covert speech does not prevent misattribution? Is it that the kinesthetic cues provided by so-called subvocal speech are of insufficient intensity to prevent misattribution? Or, more likely, are other unknown factors influencing the patient's attributions?

Hoffman seems to recognize that his emphasis on unintendedness invites comparisons with other psychiatric symptomatology. Obsessional patients, for example, report a variety of thoughts, images, and impulses that are clearly perceived as unintended but not as nonself. Assuming that these patients experience these intrusive cognitive events during active consciousness, how is it that psychosis does not "quickly ensue"?

Obsessions are not typically perceived as voices of course, which raises a question not addressed by the proposed model. That is, without reference to the frequency of verbal imagery during normal cognition, the frequency with which some schizophrenics hallucinate seems to suggest that verbal imagery is a more prominent part of their thinking. The alternative is that VHs are unrelated, or only partly related to the occurrence of verbal imagery. The question of whether it is the patient's verbal imagery or his thoughts (a distinction clearly made by Hoffman) that become "audible" is important. If verbal imagery is not integral to the perception of VHs, then phenomena such as obsessions and thought insertion are not distinguishable from VHs in the proposed model.

A final comment is directed at Hoffman's statements about the presumed relationship between the perception of external VHs and the attribution of nonself. Research has shown that schizophrenics perceive VHs coming from both outside and inside their bodies (Judkins & Slade 1981; Junginger & Frame 1985; Mott, Small & Anderson 1965). Although still given some importance in clinical diagnosis (see, e.g., DSM-III's (APA 1980) description of perceptual disturbance in schizophrenia, p. 182), the perceived location of VHs is apparently unrelated to attributions that they are alien. It is interesting to speculate, and it is not necessarily damaging to the proposed model of VHs, what role parameters such as clarity (Junginger & Frame 1985), direction of hostility (Judkins & Slade 1981), and attributions of nonself play in the patient's perception of location. Currently, however, location appears to have no clinical significance, at least within the psychoses. Why schizophrenics locate their VHs where they do is still unresolved.

Lexical access and discourse planning: Bottom-up interference or top-down control troubles?

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Hoffman's interest in verbal hallucination and language production is undeniably ambitious but nevertheless grounded on a reasonable base of scientific inquiry. Hoffman has made an effort to incorporate results from diverse areas of research, including cognitive psychology, neurology, artificial intelligence, psychiatry, and psycholinguistics. He posits a model for language generation based on discourse-planning mechanisms. He argues that schizophrenics are prone to discourse planning disturbances, and that severe discourse planning disturbances correlate with verbal hallucinations (VHs). Although it is difficult to verify any clearcut cause and effect here, Hoffman introduces the notion of borderline hallucinations in order to argue that "the absence of cognitive goals can produce unintended images," and from this he concludes that disturbances of higher level language-planning structures predict VHs with the sense of otherness experienced by schizophrenics. Moreover, this model of high-level language disturbance accounts for low-level encoding disturbances typically associated with language-processing deficit models that operate in a more bottom-up fashion.

I do not profess to be an expert on linguistic disorders in schizophrenia, but I do have some familiarity with experiments on lexical access and word-sense ambiguities which makes me wonder whether Hoffman's preference for top-down processing disturbances tells the whole story. In one set of experiments, David Swinney devised an innovative experimental design that allowed him to study lexical access during sentence comprehension in a manner that minimized interference effects from the experimental probes (Swinney, Onifer, Prather & Hirschkowitz 1979). The point of the experiments was to tease apart two competing hypotheses about lexical access, the Prior Decision Hypothesis and the Post Decision Hypothesis. Both hypotheses address the problem of how one handles words that carry multiple word senses during sentence comprehension. Prior Decision states that an understander will retrieve from memory only those word senses that are syntactically and semantically "favored" by previous context. Post Decision states that all possible word senses are retrieved at the time an ambiguous word is encountered, and then the "favored" word sense is retained and all other competing word senses are discarded.

The results of Swinney's experiment support the Post Decision Hypothesis. It appears that in normal language processing, people activate all possible word senses associated with an ambiguous word, regardless of the contraints present in the previous context. However, these multiple word senses do not remain active for very long. Within a few hundred milliseconds of their activation only one word sense (the contextually appropriate one) will continue to remain active.

When the same experiments were run with schizophrenic subjects a very different picture emerged (Swinney 1984). All possible word senses were activated in response to ambiguous target items, but the schizophrenic subjects were distinguished by their apparent inability to sift through the multiple word senses in order to discard inappropriate senses. After 200 milliseconds the schizophrenic subjects retained only the most frequent interpretation for the ambiguous target item. This selection would be made even when contextual information in the sentence dictated that a less frequent interpretation was correct.

At this point it is necessary to point out that these lexical-access experiments are aimed at language-processing capabilities during comprehension. There is no guarantee that the same mechanisms that work during comprehension are necessarily operating during generation, although it seems likely that underlying memory mechanisms are shared to some extent.

Schizophrenics appear to have a normal facility for word-sense retrieval insofar as they manage to activate all possible word senses just as normal subjects do. But the schizophrenic's ability to sort through the competing word senses seems to be impaired. They do not seem to be able to choose which word sense is intended.

Is it possible to connect this result with Hoffman's discourse-planning model for generation? If Hoffman is right about gener-

ation, then we should expect to find an analogous model to account for the lexical access experiments. Perhaps the schizophrenic subjects are missing a high-level goal normally associated with comprehension which allows them to manufacture VHs during comprehension as well as generation. In that case, we must still explain the lexical access data. Are VHs somehow connected to a memory overload of too many word senses? Can the notion of "parasitic" memories be drawn into the picture to make this connection?

I suspect that it is possible to pull these fragments together into a coherent picture, but I am not convinced that the source of the difficulties is fundamentally top-down. It seems quite plausible that the lexical access disturbance found during comprehension could also be coming into play during generation. If multiple word-sense selection can interfere with high-level comprehension goals, why not high-level generation goals as well?

Suppose we have a well-structured discourse plan at hand, and we begin by generating an initial sentence. If the processes that access lexical items during sentence generation share any of the lexical-retrieval mechanisms used for comprehension, then our schizophrenic speaker may inadvertently trigger a plethora of unnecessary word senses whenever a potentially ambiguous word is generated. If it is then impossible to discard these useless associations from active memory, there may very well be a low-level disturbance responsible for interference with high-level discourse goals.

Although we cannot be sure that a defective word-sense controller is operating during sentence generation, it is striking to see how often schizophrenic speech patterns involve topic shifts based on word ambiguities (see, e.g., segment D from Hoffman's article). Such topic shifts could very well be the result of low-level interference from a lexical-retrieval mechanism. Because I do not see how Hoffman's model can explain such topic shifts, I would be inclined to support a model of low-level interference originating with mechanisms for lexical retrieval.

Intentionality and autonomy of verbal imagery in altered states of consciousness

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When stated in its most general form, Hoffman's thesis that unintendedness provides the basis for external misattributions in schizophrenic verbal hallucinations can be supported on several grounds. One line of support is drawn from studies of the normal transitions in lucidity accompanying changes in consciousness between alert wakefulness and sleep (Foulkes & Vogel 1965). In a recent article, signal detection theory was applied to the problem of imagery and states of consciousness (Marks 1983). Two distributions of neural activation corresponding to imagery (or "noise") and sensory input (or "signal plus noise") were assumed along with two criteria. The first criterion (C) corresponds to a mobile threshold or limen and determines which experiences reach consciousness and which remain preconscious or subliminal. In the waking state most of the signal distribution and some imagery is potentially conscious. The second criterion (labelled R for 'Reality-testing') is to the right of C, and this is the demarcation between that which is assessed "real" and that which is assessed "unreal." In the state of alert wakefulness, all of the sensory signal distribution is judged real, and none of the imagery world is judged real.

States of consciousness are represented by altering the positions of the two distributions along the horizontal axis, and also by shifting the C and R criteria. As alertness changes into drowsiness the theory assumes that the two distributions of imagery and sensory activity move closer together and so more

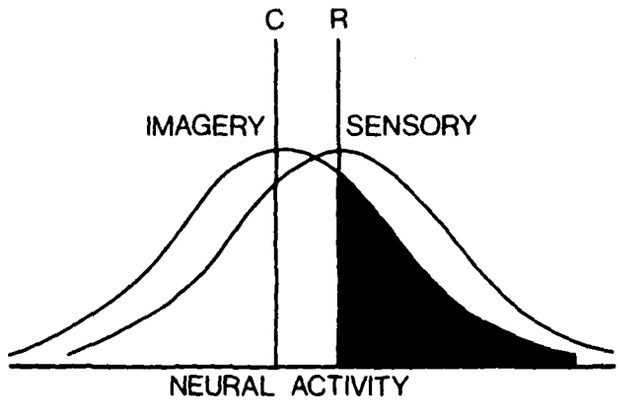

Figure 1 (Marks). Hypnagogic images and verbal hallucinations as represented in the signal detection model of consciousness (Marks 1983).

of the sensory world becomes unreal and more of the imagery world becomes conscious. In the hypnagogic state, between waking and sleep, the sensory and imagery worlds become mixed up, with approximately half of both being conscious and seemingly real and half being unconscious and seemingly unreal (Figure 1).

Auditory confusions may occur; for example, if the telephone rings, one may hear it as music, or if music sounds, one may imagine people talking, walking, or even dancing, or we may awaken to the sound of an imagined but seemingly real telephone (McKellar & Simpson 1954). Freud (1955) referred to dreams as "something alien, arising from another world." Hypnagogic imagery is also autonomous rather than deliberately controlled or intended. To use Prince's (1909) analogy, "It is like putting your hand into someone else's pocket, and taking out something not your own." The imagery seems to erupt into consciousness from a dissociated subsystem of cognitive control (McKellar 1979).

The ability to judge correctly experiences as perceptual or imaginal is represented conceptually in the signal detection model as a receiver operating characteristic (ROC). The Hit Rate is the proportion of sensory events judged as "real" and the False Alarm Rate is the proportion of imagery events judged as "real" (Figure 2).

For both the schizophrenic's "voices" and hypnagogic images, there is a high false-alarm rate relative to the hit rate, and the ROC approaches the diagonal shown in Figure 2. So there is at least a family resemblance between the two phenomena. But

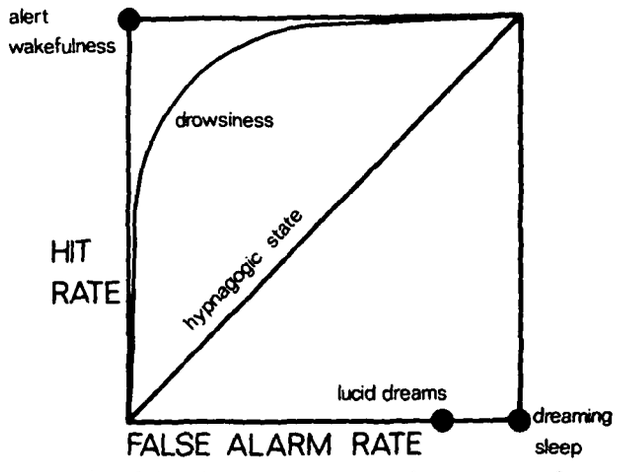

Figure 2 (Marks). Receiver operating characteristics for various states of consciousness (Marks 1983).

it is also necessary to differentiate between the normal, and probably universal, hypnagogic phenomenon and the abnormal, and rather rare, VH observed in some schizophrenics.

Hoffman attempts to solve this problem by differentiating between strongly and weakly unintended cognitive productions, and so the passive, weakly unintended images of the hypnagogic state would create a reversible misattribution while the active, strongly unintended images of the schizophrenic would create an irreversible misattribution. A less arbitrary and simpler explanation would be that our usual experience of sleep-related imagery in the form of dreams allows the invalidity of "nonself" inferences about images to be learned. Dreams prepare us for the subjectivity of images in the waking state. Horowitz (1983) describes three ways in which reality testing can occur in the waking state: (1) automatically, (2) through a process of checking, and (3) through logical appraisal and learned counterweights. The progressive loss of reality testing seems to result either from an intensification of images or from perceptual aberrations (Horowitz 1983, 124–26).

Hoffman relates the unintendedness of verbal images in schizophrenics to the unintendedness and disorganization of schizophrenic discourse. Here lies the rub. Hoffman argues (if I understand him correctly) that the latter *causes* the former. Nobody would wish to deny that these two phenomena frequently co-occur, but is there any convincing evidence that unintendedness of imagery is caused by disordered discourse planning? This seems unlikely for two important reasons. First, imagery is developmentally prior to lexical processes (Bruner 1964; Horowitz 1983; Marks 1986; Piaget 1930), and so intentionality (and unintentionality) develops in the context of actions and images and only later takes control of verbal discourse. This fact is reinforced by the not uncommon occurrence of visual, and not verbal, hallucinations in schizophrenics, especially in the more disoriented and confused patients (Horowitz 1983, p. 39). Second, hallucinations are decoupled from discourse disturbances in a number of nonschizophrenic states of mind such as sensory deprivation, hypnosis, hypnagogic reverie, and drug intoxication, during all of which many subjects continue to talk sensibly and fluently.

It appears that a breakdown of some kind in intentionality is a cornerstone of schizophrenic disorders, including intentionality in action, imagery, discourse, and thinking. Intentionality and its development (and possible disturbance) have been sorely neglected in the behavioral and brain sciences. Although Hoffman's theory seems wrong, at least in its present formulation, it is certainly a step in the right direction and warrants further exploration.

Verbal hallucinations also occur in normals

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Hoffman offers a cognitive processing model in which an aspect of pathologically disordered speech planning by schizophrenics leads to experiencing verbal imagery as verbal hallucinations (VHs). He emphasizes a mechanism of "unintendedness" of imagery that may, in schizophrenics, produce the experience of hearing VHs as vocal and alien, that is, as if someone else was speaking. Hoffman has apparently assumed that VHs are due to some aspect of schizophrenia. This may not be the case.

While it is certainly well established that for some (although not all) schizophrenics auditory hallucinations are a major feature of their symptomatology, a recent study has suggested that auditory hallucinations of hearing voices are relatively common in the normal population. Posey & Losch (1983), in a study of 375 college students, found that 71% of their subjects reported some experience with at least brief, occasional auditory hallucinations of voices during wakeful situations. That study suggested the existence of five types of auditory hallucinations in normals, at least three of which are of the sort referred to by Hoffman as VHs in schizophrenics. In the Posey & Losch study, subjects were directed to describe events of "hearing voices" fully aloud "as if someone had spoken." Thirty-nine percent of the sample reported hearing their own thoughts aloud either as if in their own voice or in an alien voice. For example, one subject described hearing "That one is wrong" as he took a math exam. (Cf. remark in Hoffman, sec. 5.2, para. 1.) Approximately 10% reported having heard a comforting or advising voice perceived as alien. An example was a subject who showed no evidence of pathology on the MMPI but often heard voices, including her dead grandfather advising her on the selection of the dress to wear to his funeral. Five percent reported holding conversations with alien vocal hallucinations.

Hoffman may or may not be right that the alien/otherness attribute arises because of some "unintendedness" inference, but it may be incorrect that a language-production disorder characteristic of some schizophrenics is a necessary condition for the inferential mechanism. It may be more parsimonious to hypothesize that VHs are a normal cognitive process in at least some individuals. Jaynes (1977) has suggested that VHs may once have been essentially universal. In fact, much of the neurological discussion in Hoffman's paper can be interpreted as supportive of Jaynes's view that VHs could arise from non-dominant (right)-hemisphere-mediated language processes being perceived as external (alien) voices by the conscious, dominant (left) hemisphere. Likewise, one would presume that Hoffman's "intendedness/unintendedness" mechanism would be left-hemisphere mediated and that the probability of occurrence of "unintendedness" could be related to the degree of language function laterality.

To some extent, both theories conjecture that VHs are possible because of the lateralization of language processes. This could be investigated by further research on relationships between hallucination rates (in both normals and schizophrenics) and measures of laterality. The present commentator would agree with Hoffman that the report by Alpert, Rubenstein, and Kesselman (1976) is interesting in this regard.

In summary, however, Hoffman's point that "disturbances of higher level language-planning structures" are required to account for the "nonself inference of VHs" should be evaluated in light of the findings of VHs in normals by Posey and Losch (1983).

When is an image hallucinatory?

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Hoffman's argument is thought-provoking but, ironically, much of its intellectual appeal is probably due to its counterintuitive nature. At first sight, the assertion that the form of a subject's verbal expression should be capable of persuading him that the utterance is not his own comes as a surprise. It would seem more plausible to argue the exact opposite – that the phenomenological flavour associated with an utterance determines its form. But Hoffman presents us with an elegant and well-documented account, suggesting that in schizophrenia disturbed discourse planning is manifested in speech disorganization which can cause verbal imagery to be experienced as unintended. In turn, this unintendedness is responsible for the "nonself" quality that, we are told, is characteristic of schizophrenic verbal hallucinations.

This last point immediately raises an objection that may be crucial to the focus of Hoffman's argument, for the nonself

quality – the attribution of images to sources outside the imager – is *not* a characteristic that defines or is specific to hallucinations. It is common to several relatively common and benign experiences, such as afterimages, eidetic imagery, and hypnopompic and hypnagogic experiences. In all of these, the individual ascribes his imagery to some external source or locus (for an interesting account of "impersonal imagery" see McKellar 1972). But in these cases, the subject is readily persuaded that his initial impression of the objective reality of his images was incorrect. This is not so with hallucinators, who are notoriously resistant to any modification of belief in this regard. Indeed, the present commentator has long maintained that the only crucial criterial attribute of hallucinations is conviction, not simply in regard to the nonself quality of the hallucination, but to the objective validity of the whole experience (Reed 1972).

Further reservations about the value of Hoffman's theory as an explanation of hallucination must be expressed in view of its severely restricted applicability. Probably the majority of schizophrenic auditory hallucinatory experiences are not in fact verbal. First, there are *acoasmas* – primitive sounds such as whistles, bangs, and rustles which are meaningless in themselves. Second, many schizophrenic voices cannot be classed as linguistic utterances. They consist of single words that are often inaudible (being mumbled, whispered, or distant) or incomprehensible (being neologisms or distortions). It is difficult to see how such experiences could be amenable to analysis in terms of faulty discourse planning.

On the other hand, Hoffman's approach would seem very apposite for the study of such classical schizophrenic "thought disorders" as "thought penetration" and "thought broadcasting" or *Gedankenlautwerden*, where the patient hears his own thoughts spoken aloud as he thinks them. Indeed, it is in the study of schizophrenic cognition rather than in that of VHs. specifically that this approach may prove to be most valuable. As Hoffman points out, his approach can account for attenuated intentionality and nonself inferences, which other models of schizophrenic speech disturbance are less able to do.

In short, Hoffman has made a substantial and elegant contribution to the study of language and thought in schizophrenia. His thesis – that the experience of unintendedness can reflect planning disruptions – may provide illumination for the study of formal schizophrenic "thought disorders." But its relevance to hallucinations is at best tenuous.

Verbal hallucinations and information processing

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When viewed in relation to existing theoretical approaches to hallucinations expressed in terms of "loss of ego boundaries," "active concretization," and so forth, Hoffman's position clearly represents a step in the right direction. Dealing with the phenomenon from a cognitive frame of reference enables us to relate verbal hallucinations to other cognitive disturbances displayed by schizophrenics.

Hoffman fails, however, to address several important issues concerning the nature of verbal hallucinations. Furthermore, the central hypothesis regarding the causal connection between verbal hallucinations and language-production processes lacks convincing empirical support in his presentation. In my opinion, however, the weakest link in Hoffman's approach is his attempt to explain how it is possible to perceive nonexistent outside stimuli (another person's voice). In the following I will develop these ideas further and will suggest the outline of an alternative approach to the understanding of the perception of nonexistent stimuli.

Hoffman devotes little attention to the nature of verbal hallucinations, thereby weakening the foundation for his speculations concerning the causes of the phenomenon. A central issue in connection with the proposed causal link between language-planning processes and verbal hallucinations is whether the voices heard by the hallucinating individual are speaking in a coherent or incoherent manner. I assume a consequence of Hoffman's position is that such voices would be speaking in an incoherent manner. There is no evidence of this, however. Moreover, any attempt to uncover the "true nature" of such hallucinated voices is made even more difficult by the fact that the schizophrenic is the only source of information; it is entirely possible that the voices are speaking coherently, but that the schizophrenic is reporting incoherently. Conversely, it is also possible that the voices are incoherent but are reproduced in a coherent manner by the individual doing the reporting.

Hoffman seems to assume that there is no sharp distinction between self-generated voices inside one's head and "true" hallucinations (voices originating from the outside). I am of the opinion that the latter phenomenon includes cognitive components that make it qualitatively different from the former, namely, the perception of nonexistent external stimuli, a point I shall return to. Voices inside the head ("borderline" hallucinations), on the other hand, are a phenomenon that is closely related phenomenologically and cognitively to delusions and compulsive thoughts in the sense that all three usually imply that unintended, ego-alien "elements" intrude into one's mind.

The empirical evidence referred to by Hoffman to support the claim that disruptions in discourse planning cause disorganized speech as well as experientially unintended verbal imagery (which he postulates as a necessary precursor to generation of hallucinations) is meager. The finding that severity of discourse disorganization to some degree correlates with the occurrence of verbal hallucinations in schizophrenics reveals nothing concerning causal direction. Furthermore, in the same study referred to by Hoffman (Andreasen, Hoffman & Grove 1984; Hoffman, Stopek & Andreasen, 1986) it was found that $\frac{3}{4}$ of the manic subjects demonstrated deviant discourse and only $\frac{1}{8}$ of them demonstrated verbal hallucinations. (Hoffman's attempt to explain this finding by claiming that manic patients are competent in generating discourse plans, but rapidly switch from one well-planned discourse structure to another while producing speech, is also poorly documented.) The claim that there is a connection between speech disorganization and verbal hallucinations is further weakened by findings that certain nonschizophrenic psychiatric conditions such as alcoholic hallucinosis and several organic disorders are characterized by the presence of verbal hallucinations *without* accompanying speech disturbances.

The central question in Hoffman's target article – how is it possible to experience certain instances of verbal imagery as if they were actually coming from another person? – remains unanswered. Hoffman refers to Dennett's (1978) theory postulating the existence of a set of inferences about the nature of unintended verbal imagery events made by the individual, some of these being perceptual attributes. As I understand it, Hoffman believes that these perceptual attributes cause the verbal image to "sound like" someone else's voice originating outside the head.

I think Hoffman/Dennett's proposed explanation can account for how certain psychological qualities, including the imagery of how a voice sounds, can be attributed to an external source (another subject). Thus, Hoffman's theory can offer a plausible explanation of how obsessional thoughts and delusions originate; for example, a schizophrenic attributes to another person the belief that he (the schizophrenic) is a homosexual and that he can also imagine the sound of the other person's voice. The theory cannot, however, explain the fact that the person actually does hear someone speaking who is not present and not speak-

ing. Such "true" hallucinations imply that nonexistent stimuli must somehow be constructed by the schizophrenic. The model that may best account for this process is derived from information-processing theory.

Current models of information processing assume that such processes are multileveled, the first level being sensory storage and the final "box" in the sequence (flow-chart) long-term storage. Conscious experience, that is, focal attention (also referred to as controlled processing) is located at some stage between these points in the information-processing sequence. Phenomena such as subliminal perception illustrate that information can somehow proceed directly from sensory storage to long-term storage, bypassing conscious processing (focal attention). Such phenomena suggest the possibility that the process may also work in reverse, that is, information may pass directly from long-term memory to sensory storage. This notion has certain similarities to ideas proposed by Tanzi as early as 1909 (see Arieti 1974) to explain hallucinations from a neurophysiological perspective.

Various researchers have expressed the belief that schizophrenics to a greater extent than others disregard or exclude stimuli originating outside themselves and are therefore more immersed in internally generated events; namely, thoughts and fantasies (cf. sections 5.1 & 5.2 in Hoffman's article). In accordance with this view, Magaro (1980) has proposed that certain schizophrenics (notably, paranoid schizophrenics) utilize an information-processing strategy characterized by consistently working backward from the schemata (long-term memory) to the icon (sensory storage). It may therefore be the case that schizophrenics, possibly because of a sensory overload (cf. Hoffman, section 5.3) or an extremely slow processing (Yates 1966) are more susceptible than nonschizophrenics to such a direct flow between long-term storage and the sensory storage level. Because further processing of information that has flowed back from long-term storage will proceed *from* the sensory level, misidentification of its source may occur (see Hoffman, section 5.2). In this manner stimuli originating *within* the schizophrenic (stored information) may be experienced as originating outside the individual (for example, outside voices). Various other central characteristics of schizophrenia, such as language disturbances and difficulties associated with the selection of relevant stimuli and focal attention, may also be viewed from the perspective of information processing (Rund 1983; 1985).

Hallucination, rationalization, and response set

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Hoffman's theory of auditory hallucinations in schizophrenia ties together several formerly separate strands of clinical and experimental data. As I find the theory plausible, at least in its general thrust, my comments are not critical of Hoffman's basic premises. Instead, I will attempt to place his hypothesis in a wider context while expanding on one or two secondary issues.

Rationalization and personality-preservation. A 30-year-old housewife described by Gazzaniga (1970) had her corpus callosum surgically sectioned in an attempt to treat her severe seizures. Following the operation, she was tested in a variety of situations, including one that required her to report the content of pictures flashed to either the right or left visual field. As might be expected, she could only report pictures in the right visual field because these were projected to the left ("speaking") cerebral hemisphere; she denied seeing anything in the left visual field. Nevertheless, when a picture of a nude pin-up was presented on the left, she produced a "hearty grin and chuckle." When asked why she was amused, the patient first said she didn't know, and then explained that "the machine was funny, or something" (Gazzaniga 1970, 106).

The patient became aware that she was behaving as if something was funny, but she did not know why; eventually, she came up with a rationalization (albeit a weak one) for her behavior. As Freud and his disciples have said (Freud 1901), such rationalizations serve an important psychological function: They maintain the integrity of the personality by giving meaning to what would otherwise appear to be inexplicable behavior. Rationalization need not be conscious, nor need it always be successful. There are times, in fact, when it can actually contribute to pathology. For example, some anorexic patients, suffering from an appetite disturbance secondary to a hypothalamic lesion (see Wakeling 1985) may rationalize their weight and appetite loss as an intense desire to lose weight. Dieting and disturbances in body image soon follow.

Hoffman's theory of verbal hallucinations may also be viewed as a type of rationalization. Some, but not all, schizophrenic patients have language-planning disturbances that produce unintended verbal images. These unintended images are perceived as coming from external sources because "the great abundance of unintended images experienced during the day are sensory impressions that actually derive from the outside world." Put simply, they rationalize their unintended verbal images as "voices" derived from sources outside themselves. Such rationalizations may serve to "explain" the unintended images, but at the cost of displaying a schizophrenic symptom.

Although Hoffman's theory can be viewed this way, he sees things slightly differently. To him, the "nonself" attribute of schizophrenic verbal images is the result of altered perceptual data. Because they are unintended, verbal images are altered so that they appear to be coming from external sources. However, Hoffman himself suggests that such perceptual alterations occur *after* the initial perception. (He says that among drowsy nonschizophrenics, images that initially appear hallucinatory may later be corrected.) For this reason, I prefer to look upon Hoffman's theory as another instance of rationalization in, as the Freudians say, "the service of the ego."

The importance of context. Hallucinatory experiences are not exclusive to schizophrenics; other patients have them (Zigler & Phillips 1961), and even "normal" people sometimes report hearing voices when no one is around (see Bentall & Slade 1985a). As Hoffman points out, however, nonschizophrenics appear to confine their hallucinatory experiences to special contexts (when drowsy, and so on). Hallucinations are not reported by nonpatients when some other, plausible rationale for their experience is available. Thus, the split-brain patient did not attribute her feeling of amusement to thought insertion, hallucinations, or anything similar. Instead, she reasoned that her laughter must have been due to something presented in the experiment. Contextual constraints are also likely to be the reason that aphasic patients whose language may be even more disturbed than schizophrenics' typically do not hallucinate.

The importance of the social context is underlined by anthropological and clinical studies (Al-Issa 1977) indicating that the frequency and type of hallucinations schizophrenics produce vary across cultures. In different cultures, different attitudes toward hearing voices and seeing visions encourage some types of hallucinations rather than others. There has even been variation among Western patients' hallucinations over time. Visual hallucinations have been decreasing over the past century while auditory hallucinations have been increasing (see Al-Issa 1977, for a review). One explanation for cultural and temporal differences is that the social context at least in part determines how unusual sensory experiences are interpreted. Schizophrenic patients are not insensitive to context, but they are less able to use it than nonschizophrenics. Schizophrenics' relative disregard for context, for conversational pragmatics,

and for testing their rationalizations against reality may, in fact, be a basic schizophrenic deficit.

What constitutes evidence? Hoffman states that the correlation between discourse-planning errors and verbal hallucinations (see Andreasen, Hoffman & Grove 1984, for example) is "consistent with the hypothesis that disruptions in discourse planning *cause* disorganized speech as well as experientially unintended verbal imagery" (emphasis added). Unfortunately, it is not sufficient to find that patients whose discourse is confusing also hallucinate more because this correlation may simply mean that "sicker" patients have more symptoms of every kind. Hoffman's theory is also not likely to find much of a foundation in the shifting sands of laterality research. Studies of group differences in lateral asymmetry are subject to so many qualifications that they are unlikely to answer any questions at all (Schwartz & Kirsner 1984). Although some of the evidence reviewed by Hoffman is not subject to these criticisms (Andreasen & Olsen 1982, for example), it is nevertheless true that the theory is more speculative than substantive.

One way to add some substance to the theory is to tie it to other work on cognitive deficits in schizophrenia. Hoffman seems to reject the notion that a pigeonholing deficit as described in Schwartz (1982) has much to do with hallucinations, but it may yet have a role to play. A recent study by Bentall and Slade (1985a) compared hallucinating and nonhallucinating schizophrenic patients in their ability to detect an auditory signal (the word "who") in a background of noise. The two groups were found not to differ in their "sensitivity" (defined as area under the receiver operating characteristic curve) but they did differ in a measure of "bias." The hallucinating patients were more likely than the nonhallucinating patients to classify any stimulus as a signal. The finding that hallucinating patients are no worse (or better) than the nonhallucinating patients in distinguishing a true signal from simple noise is in agreement with the position taken earlier in regard to sensory images. That is, schizophrenics do not appear to have altered perceptions. The difference in response bias, on the other hand, suggests that the hallucinating patients are prone to classify any event they are not sure of as a signal. Such a bias could easily lead them to mistake verbal images (or inner speech) for external voices.

Hallucinations and contextually generated interpretations

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Individuals are labeled as hallucinating when their verbalizations or other behaviors lead observers to infer that they are experiencing sense perceptions in the absence of the stimulus conditions usually associated with such perceptions. Perhaps the criteria most commonly used by observers to make such inferences are counterfactual statements by persons indicating that they "see" or "hear" events that are not, in fact, present. The judgment that another is hallucinating involves a stock of implicit assumptions and expectations concerning both the hallucinator and the social context in which the labeling occurs. For example, a seemingly simple statement such as "I can see him [a deceased person] standing in front of me as clearly as I see you" is likely to be interpreted by observers in very different lights depending upon the background of the speaker, the social context in which the statement was embedded, and the assumptions of the observer. Thus, if the speaker is a hospitalized schizophrenic, or a hypnotic subject who has been given a hallucination suggestion, observers are likely to assume that the counterfactual statement reflects a "false perception." If the counterfactual statement is instead made by an otherwise "normal" adult in the context of reminiscing about a deceased mutual friend, it is likely to be interpreted as a metaphorical expression of the vivid, emotionally toned memories called up by thoughts of the deceased.

The term "hallucination" is frequently applied to a range of quite different phenomena. Hoffman limits its application to internally generated experiences that possess sensory qualities ("hearing voices"), have an unintended quality, and are inferred to have a "nonself" (usually an external) origin. Hoffman hypothesizes that these characteristics occur (i.e., the person hallucinates) when auditory images are discordant with ongoing goal-directed cognitive activity. The nonconcordance produces the feeling of unintendedness that, in turn, forms the basis for an inference of nonself origin. Hoffman's hypothesis is, I believe, an important contribution to our understanding of how some people sometimes come to define their imaginings as having an external, nonself origin. It is worth noting, however, that a great many experiences that meet Hoffman's criteria for hallucination cannot be accounted for in terms of this hypothesis.

Hoffman cites Foulkes and Fleisher's (1975) findings that many normal subjects attribute a nonself quality to their daydreams at the time they are daydreaming. However, when the daydream ends and subjects again become cognizant of their surroundings, they retrospectively interpret their daydreams as having been imaginings. This retrospective reinterpretation as "only imagined" differentiates daydreams from hallucinations. According to Hoffman, normal daydreams may be temporarily experienced as real (i.e., external) because they occur during passive (i.e., nongoal-directed) states. When the person emerges from a passive to a goal-directed state the veridicality of the earlier imaginings is "undone." If such undoing did not occur and the person continued to treat imaginings as unintended, external occurrences, "psychosis would quickly ensue."

I suggest that the above sequence of events is highly context-bound. Concordant goal-directed events can be experienced either as purposeful or as unintended and of nonself origin depending upon the context in which they are embedded. Similarly, contextual factors can greatly influence whether the imaginings that occur in so-called passive states are defined retrospectively as daydreams or as external happenings.

Subjects given direct instructions to make a limb movement (e.g., raise an arm) typically describe their movement as an intended, goal-directed action. When direct instructions are replaced by suggestions that are worded to imply nonvolition (e.g., your arm is rising), the same subjects tend to describe their ensuing movements as unintended events (Spanos & Gorassini 1984). Lifting one's arm is a goal-directed activity whether it is done in response to an instruction or a suggestion. In either case the response requires the appropriate processing of the verbal communication, the development of an intention, and the carrying out of an action that is concordant with the requirements of the intention. Nevertheless, subjects' interpretation of this action as either intended or unintended can be substantially influenced by the expectations implicit in the wording of simple verbal requests (Spanos, in press).

When given the suggestion to see a nonexistent object, a few normal subjects generate the appropriate images and report believing that the suggested object is really present. As with the arm movements described above, these suggested images are obviously goal-directed. Nevertheless, these goal-concurrent images are sometimes temporarily experienced as having a nonself (i.e., external) origin. In experimental settings subjects who report that they saw a suggested object usually mean that they then believed that the suggested object was real at the time but now realize that they had only imagined the object (Spanos & Radtke 1981). In other words, these subjects behave like Foulkes and Fleisher's (1975) daydreamers and retrospectively reinterpret their experiences as "only imagined." However, such retrospective undoing probably has less to do with an

alteration from a passive to an active state than with the implicit social norms that govern what constitutes appropriate interpretations of experience during different stages of an experimental sequence. While responding to a hallucination suggestion, subjects are operating on the basis of normative expectations that encourage the interpretation of imaginings as "real events." However, when the suggestion is terminated a new set of expectations comes into play. Both the experimenter and the subject know that it is appropriate for the subject now to acknowlege that the suggested object was never really there. On the other hand, when implicit norms encourage (rather than discourage) continued belief in the nonself, unintended origin of imaginings then retrospective undoing need not occur.

A relatively common example of believed-in-imaginings that are not retrospectively undone following termination of the suggestion occurs in the phenomenon of past-life age-regression (Kampman 1976). Subjects given past-life suggestions, like those given hallucination suggestions, are tacitly encouraged to treat their imaginings as nonself-generated events. However, for subjects in the past-life situation a belief in reincarnation legitimates the continuance of a nonself-origins interpretation following termination of the suggestion period. In a related way, Western European history is replete with examples of nonpsychotic visionaries who continued to ascribe a nonself origin to their imaginings long after termination of the visionary episode (Cohn 1970; Spanos 1983); the anthropological literature on shamanism provides numerous cross-cultural examples of the same phenomenon (Al-Issa 1977).

Interpretations of imaginings as having a nonself origin are influenced by a host of factors. Hoffman's hypothesis of disturbance of discourse planning provides an ingenious account of how nonself interpretations sometimes arise in some people. [See also Spanos: "Hypnotic Behavior," *BBS* 9(3) 1986.]

Image or neural coding of inner speech and agency?

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Hoffman has suggested an extremely interesting and plausible hypothesis. However, he has misread his cited account of inner speech data by Luria (1961) and Sokolov (1972), data on which a key feature of the other inner speech work he cites also rests (Vygotsky 1962; 1978; Zivin 1979).

Hoffman finds it useful to characterize the internal stimulus that the schizophrenic misinterprets as a "verbal image." (He sometimes implies that the misreading is of the speech plan and sometimes that it is of the verbal image.) However, no investigator of the classic inner speech phenomenon has produced evidence that verbal *imagery* is involved. The concept behind this work is the materialist neuromotor theory of mind: that inner speech, the vehicle of problem-solving thought, is a *motor* phenomenon, whose content is read out through "analyzing" (decoding) the speech motor impulses that underlie nonvoiced inner speech. There are neither data nor claims for "verbal images" of inner speech, and all of the Sokolov book as well as particular Luria experiments reflect only this orientation by presenting *motor* impulse data as the controlling impulses of (the thought that comes from) inner speech. Hoffman has two options: (1) to drop the reference to this inner speech or (2) to retain the reference while recognizing that there is no evidence that it is neurally processed or experienced as imagery.

If Hoffman chose the second option, he could, on the one hand, simply hope that the classic inner speech phenomenon will ultimately be shown to be accompanied by images. On the other hand, he could examine whether his argument loses anything by replacing the concept of image with that of read-out of neural coding of inner speech plans or productions.

The concept of image is invoked in connection with four points, but it makes a substantive difference only with one. The first three points reduce to a preference for the casual face validity that arises from verbal images seeming to be similar to ordinary external perceptions. Nevertheless, the logic of each of these four points of argument can be retained without the concept of imagery. The concept need only be replaced with a concept of neural coding of the plan or the inner speech that is decoded to yield the speech content and intent. This could be experienced as equivalent to verbal imagery. If this replacement is accepted as plausible for experience and as equally reflecting our scant knowledge of the neurology of inner speech, then the logical force of the first three points can be retained without invoking "imagery."

The three points for which Hoffman indirectly appeals to face validity through the concept of imagery are the following. (1) He invokes attribution theory, which is usually applied to externally originating perceptions. Images seem more immediately analogous to such perceptions than does the readout of neural codings. (2) "'Parasitic' memories" are hypothesized as the mechanism that disorders the readout of the speech plan. It is congenial to an image concept because in lay thought, memory is filled with images. (3) Imagery facilitates the argument's contrast between hallucinations and borderline and pseudohallucinations, all of which are easily conceived in terms of images. [These contrasts, in turn, help define the pivotal dimension of weak–strong intentions. The issue of neural coding for intentions is addressed at the end of this commentary.]

Point (4) defends against the following objection: If the speech plan or image is misread, why do schizophrenics not experience their own overt speech as hallucinations? Hoffman counters that sensory (image) readings characterize inner speech and motor impulses characterize overt speech: "kinethestic sensations . . . from motor aspects of speech production are strong immediate evidence that the [overt] speech is self-generated; thus the otherness attribute is blocked." There seem to be problems with this argument. It is one thing to assume inadvertently, because one is part of a culture that usually casts internal representations in terms of images, that verbal images must accompany the cited behavioral and motor data for inner speech. It is quite different to deny motor impulses to inner speech. The latter denial suggests that Hoffman either does not know or does not take seriously the Sokolov and Luria data he cites.

Setting aside the issue of scholarship, however, it is clear that the fourth point can have the same impact, with greater accuracy, if one proposes instead that, for example, it is the *multiplied* sensory and motor output of overt speech, in contrast to the *fewer* inputs and outputs of inner speech, that insure against interpreting overt speech as hallucination. Thus, while continuing to cite the classical inner speech references, Hoffman could change his characterization of the readout from image to nonvoiced speech impulses (afferent, efferent, and reafferent) without disturbing his underlying concept of the disordered reading of the speech plan, and without compromising these four points of his argument.

Can Hoffman's key idea, the misreading of intention, fit with this more neuromotor description of inner speech? Without this description, what might Hoffman mean by an error in interpreting that one is the agent of one's inner speech or its plan? Hoffman cites computer simulations showing that storage overload can result in a "parasitic memory trace that transforms many associations." This is plausible as a general processing disruption, but I do not see that it sheds light on Hoffman's key idea. By contrast, there are several neuromotor concepts that might. (1) Particular motor impulses have been shown to interfere with the readout of inner speech motor impulses (Sokolov 1972). This could also affect the readout of the inner speech

plan. There are three other concepts that more directly concern the control of voluntary motor action (Kelso 1983), each of which might be read not only as a control check on the quality of motor action but also as an internal signal that the action is one's own. (2) "Corollary discharge" is a feedforward signal from motor to sensory systems that supposedly prepares the sensory system for the proprioceptive "reafferent" consequences of the movement. [See also Berkenblit et al.: "Adaptability of Innate Motor Patterns and Motor Control Mechanisms," *BBS* 9(3) 1986.] (3) "Efference copy" is a neurological copy of a motor command that is sent to a hypothetical central control center to check whether the intended movement matches the executed movement's "reafferent" feedback. (4) "Central efferent monitoring" resembles the efference copy idea but uses sets of previously stored efference copies so that a movement can be monitored while it is being executed, that is, before it can provide reafferent feedback. Hoffman's interesting hypothesis deserves to stimulate the search for such specific agency-conveying neural mechanisms of inner (and overt) speech and their underlying plans.

Author's Response

What can schizophrenic "voices" tell us?

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The diverse disciplines and orientations of the commentators have predictably led to a wide range of reactions to practically all aspects of my model of schizophrenic verbal hallucinations (VHs). I will respond according to five general themes that appear to have emerged.

1. Specificity of psychopathology

1.1. Hallucinations in normals. Many commentators (**Allen, Alpert, Bentall & Slade, Jaynes, Marks, Posey, Reed, Schwartz, Spanos**) note that normal individuals sometimes report hallucinatory experiences. This is consistent with the model, which predicts that hallucinations can occur under both normal and pathological conditions. The former is linked to "passive," goalless cognition (e.g., daydreaming or hypnagogic states), whereas the latter is predicted to occur when images clash with goals. In both cases, hallucinatory "nonself" sensory modifications of images are inferred from nonconcordance with consciously accessible goals.

Bentall & Slade and **Spanos** remark that hallucinatory experiences in normals depend on context (e.g., positive reinforcement, social and cultural norms, etc.). This makes sense if these qualities are based on inferences that can be influenced by supporting or contradictory information. Along these lines, Spanos notes that activities such as arm-raising and imaging can be experienced as unintended – and in the latter case, as hallucinations – when they occur as a result of hypnotic suggestion. An effect of hypnotic suggestion is to block the conscious accessibility of goals ("I did not decide to raise my arm, he did . . . "). Because the model predicts that actions will be experienced as unintended in the absence of consciously accessible goals, hypnotically suggested actions should be experienced as unintended, and hypnotic imaging should be hallucinatory.

Reed discusses the hallucinatory quality of certain eidetic imagery. This phenomenon is experimentally studied with afterimages (Haber 1979). Morris and Hampson (1983) argued that such effects are induced by a form of hypnotic suggestic ; if so, their hallucinatory qualities could be accounted for along the lines just discussed. However, this does not account for the hallucinatory attributes of *spontaneous* eidetic imagery. The best known study of this phenomenon is by Luria (1968), who reported the case of a man with remarkable mnemonic abilities arising from his excessive capacity to store and access complex visual imagery. It is relevant to this discussion that this man was so preoccupied with his own eidetic-like imagery that his goal-directed behavior and speech were markedly impaired. This suggests that spontaneous eidetic imagery may distract subjects from concurrent goals. Our model predicts that the resulting goal-inaccessibility would impart hallucinatory features to the image. [See also Haber: "Twenty years of haunting eidetic imagery," *BBS* 2(4) 1979; and Libet: "Unconscious cerebral initiative and the role of conscious will in voluntary action," *BBS* 8(4) 1985.]

More puzzling are instances of VHs in normal individuals described by both **Posey** and **Jaynes** that seem to occur during ordinary goal-directed activity such as talking or writing. Perhaps these VHs occur during momentary goalless or autosuggestive states. On the other hand, there is good evidence that many individuals have a biological predisposition toward schizophrenia but may never actually enter a sustained psychotic state (cf. Nuechterlein & Dawson 1984). Perhaps those "normal" individuals who hallucinate during ordinary goal-directed activity have this vulnerability. Along these lines, Chapman, Edell, and Chapman (1980) studied college students and identified individuals who were psychosis-prone on the basis of self-report ratings. These individuals often reported verbal hallucinatory experience – though not of the intensity reported by schizophrenics – as well as making deviant verbalizations that were odd, poorly organized, and at times incoherent. This is consistent with a VH model based on language planning deviance. A third possibility is that extremes in arousal may alter normal discourse-planning abilities (see **Gjerde's** commentary) to the degree that VHs are produced.

Jaynes notes that VHs are reported by children. This is consistent with the VH model when considered in the light of work in developmental linguistics. Language research reported by Bates (1976) suggest that coherent multipropositional discourse planning is not fully achieved until ages 7–8. My model predicts that nonpathological VHs could occur prior to this linguistic achievement, providing that the verbal imagery of inner speech had been "internalized."

1.2. Visual hallucinations. It has been noted by **Alpert, Bentall & Slade,** and **Schwartz** that some schizophrenics report visual hallucinations as well as VHs and that nonverbal hallucinations are especially prominent among schizophrenics in non-Western cultures (Al-Issa 1978).

The implications of such phenomena for my model are not clear. Alpert notes that all schizophrenic patients in a New York City study who experienced visual hallucinations also experienced VHs. Murphy, Whitkover, Fried, and Ellenberger (1963) note that auditory hallucinations are still frequent among non-Western schizophrenics. Thus it may be that discourse planning disruptions do cause VHs in schizophrenics, but that there may still be other causes of nonverbal hallucinations. For example, certain cultures and ethnic groups may positively reinforce "passive" hallucinatory experience (such as daydreams, hypnosis, and hypnagogic states) that seem to have religious or inspirational content (see commentaries by **Jaynes, Spanos,** and **Schwartz** regarding culture-specific contextual effects on the occurrence of hallucinations). These hallucinatory experiences need not be verbal but could co-occur with VHs. This explanation could be tested by determining whether the prevalence of nonverbal hallucinations correlates positively with the degree that such experiences were viewed as positive (i.e., as divine or inspirational) in different schizophrenic groups across cultures.

1.3. VHs versus other auditory phenomena. It is noted by **Faber, Gjerde, Junginger,** and **Reed** that there is a wide range of abnormal verbal imagery apart from the VHs reported by schizophrenics, including functional and incomplete auditory hallucinations, and thought echo. The target article describes a model of functional hallucinations (i.e., the transformation of external sounds such as running water into a heard voice) that is based on opportunistic planning. Thought echo is equivalent to audible thoughts or *Gedankenlautwerden* (Hamilton 1979). Incomplete auditory hallucinations, alien imagery, and audible thoughts refer to specific sensory attributes that may be present to varying degrees: (i) the "voice" may be heard rather than felt, (ii) the origin of a "voice" may be experienced as located in an external, "nonself" space, (iii) the verbal image may have accoustic features distinct from those of the subject's own voice. I propose that these changes are caused by the auditory image processor in order to "make sense" of the unintendedness and goal-discordance of verbal representations. The usefulness of Dennett's (1978) discussion is that these changes can be thought of as secondary, optional modifications of the imagery experience that are based on inference but still experienced as sensory. Thus, VHs, as noted by **Harrow, Marengo & Ragin** and by **Rund,** can be "heard" through the ears even though nothing is happening in the ears and can seem, as noted by **Junginger,** to be sometimes outside the body and at other times not. Because I am proposing that these sensory qualities result from inferences rather than from "hard-wired" processes, they can vary in degree (see Harrow et al.).

1.4. The specificity of schizophrenic symptoms and unintended cognitive processes. The serious difficulties involved in assuming that schizophrenia represents a well-defined category of signs and symptoms reflecting a single etiology are emphasized by **Bentall & Slade** and by **Faber.** Perhaps workers should be less inclined to study schizophrenic VHs per se and more inclined to study VHs in subjects with well-delineated speech disturbances of various sorts. I believe that the latter approach will be more useful and will provide further evidence that our current diagnostic procedures are, at best, only partially sensitive to specific neurocognitive pathologies.

Junginger and **Rund** indicate that obsessions are another example of unintended thought. Junginger asks why such ideation is not generally psychotogenic. Although it is true that obsessions cannot be controlled, obsessive thoughts and compulsive actions are not unintended in the sense in which I have defined the term. Obsessives generally have ready conscious access to the goal of their obsessive-compulsiveness. Someone who ritualistically washes his hands 50 times per day generally knows the goal – however irrational – namely, to cleanse his hands. Though the obsessive is dominated by one or more maladaptive goals, his actions and thoughts are quite concordant with them. The prediction is that those obsessives who become psychotic are the ones who cannot access the goals that organize their behavior and therefore fear being controlled by outside forces. Thus I would disagree with Rund, who believes that obsessions and pseudohallucinations are closely related; the former are goal-driven, whereas the latter are goalless, though both are experienced as "ego-alien."

2. "Intending" and cognitive planning

2.1. Subpersonal goals and planning. According to the VH model, nonconcordance with consciously accessible goals causes actions and images to be experienced as unintended. **Gordon** questions this because there are a myriad of homeostatic functions of the brain (for example, body temperature regulation) with biologically programmed, "subpersonal" goals that we can somehow think about and that are nonconcordant with overt actions. He suggests that the VH model would predict that well-planned actions would be experienced as unintended with respect to these subpersonal goals.

Perhaps the best way to improve the model is to say that unintended actions are those that are nonconcordant with *relevant*, consciously accessible goals. For example, if I mused about the fact that my hypothalamus is concerned with temperature regulation while I was changing the flat tire of my car, I would not suddenly experience this motor activity as unintended; temperature regulation, a goal of my hypothalamus, though nonconcordant with tire-changing activities, is also not relevant to this activity. Indeed, if our activities were relevant and accountable to the myriad of autonomic and automatic goals of our brains, then we would be permanently catatonic. However, as discussed by **Brand,** if I noticed that my hands were clapping while I was attempting to change the tire of my car, I would ordinarily experience this behavior as involuntary, because such hand clapping is discordant with the goal of tire changing; hand clapping is relevant to the tire-changing goal because it interferes with the pursuit of that goal. On the other hand, suppose I could consciously access the goal of trying to keep warm because I was cold while changing the tire. The hand clapping may then not be experienced as unintended because a current, *relevant*, concordant goal (namely, keeping warm) is consciously accessible.

2.2. Self-reference and intending. The limitations of consciously accessible beliefs and desires in models of the intention are also discussed by **Brand.** He suggests invoking cognitive processes to model causes of action. This however, raises the dilemma outlined by **Gordon,** namely, if intentions are simply composed of the causal antecedents of actions, how do I experience my actions as deriving from a self, in particular myself, rather than from some autonomous subpersonal cognitive "planner?" I do not have a solution to the dilemma posed by **Brand** and by **Gordon,** but it is important to note that the VH model does not require a solution. It does not need a theory of intention, or even a theory of the experience of "intending" since it is only predicting when this experience is absent or altered. I actually believe that we never really have the experience of intending; we only experience failures of intention, that is, slip-ups of actions or images that cause goal-mismatches. In other words, it is the alien sensation of unintendedness that defines the borders of self-derived intendedness rather than intendedness being, somehow, a primary sensation in itself.

This is consistent with **Brand's** reference to Wittgenstein (1953), who noted that there is not much difference between my arm being raised and my raising my arm. I believe that if we were absolutely perfect in our execution of plans in pursuing particular goals, and if no goal conflicted with any other, then we would never be aware that we intended to do anything. Thus **Gordon's** attempt to determine the "intendedness" of an action on the basis of penetrability by reason goes beyond the objectives of the model (and is not, in my opinion, a good problem to attempt to solve). The reason we do not assign our actions to some autonomous cognitive planner rather than to ourselves is that we do not routinely experience our actions as deriving from either ourselves or from subpersonal planners. In general, all we experience is the action itself. Paraphrasing Wittgenstein (1953, p. 219): To know one's intention is to be able to predict what one does. But such predicting is not directly experienced unless it is directly represented, for example, as inner speech [saying to myself that I will do X], which is another form of action.

2.3. On nomenclature. The suggestion is made by **Brand** that all actions are intended insofar as they derive from cognitive antecedents. In contrast, the VH model identifies certain actions as unintended. However, as described above, I do not use the term "intended" the same way Brand does. Instead of referring to causal antecedents, my usage is experiential. An action (or image) is intended if it is not experienced as unintended (the latter experience accompanying nonconcordance with consciously accessible goals). As Brand states, his distinction between intentional and unintentional actions corresponds to my distinction between strongly and weakly intended actions. Daydreams and other weakly unintended (to use my terminology) actions are intended in Brand's terminology because they must have causal antecedents even when they have no consciously accessible goals.

Brand's discussion of "mock intentionality" captures elegantly what I was clumsily trying to describe as external misattributions because of reprocessing of unintended images. Brand argues that if my hands start to clap when I am changing the tire, I will be more likely to attribute alien intentionality to them than if they flail randomly (assuming that I am not cold!), since only the former seems goal-directed. Similarly, schizophrenic VHs caused by discourse-planning disruptions are not random phonetic strings; they express intelligible propositions to which mock intentionality can be credited. **Harrow et al.** and **Reed** point out the importance of the sustained conviction of nonself origin in differentiating between schizophrenic VHs and normal pseudohallucinations. This "impaired perspective" (Harrow & Quinlan 1985) may be forced by the unique goal-discordance and mock intentionality of schizophrenic VHs.

Harley asks for more reliable criteria for determining the kinds of intending outlined in Table 1 of the target article. He stresses the highly phenomenological nature of such determinations. Subjective accounts of goals and intentions are highly unreliable; thus one can sympathize with the difficulties Harley must encounter in assessing the intentions that underlie the speech errors he studies. **Schwartz** illustrates this point by reminding us of Gazzaniga's (1970; 1985) split-brain patients who routinely confabulate explanations that make sense of odd, irrational behavior deriving from the nondominant hemisphere. It is not surprising that (as noted by Harrow et al.) schizophrenics will claim that their disorganized speech is what they intended to say, particularly because the discourse disturbance model predicts that they were never sure of their speech intentions to begin with.

The purpose of distinguishing between strongly and weakly intended actions in Table 1 of the target article was to highlight the fact that we do not consciously decide to do most of what we do. The reason for distinguishing between weakly and strongly unintended imagery was to provide a framework for understanding differences between normal and pathological hallucinosis. The usefulness of the scheme in Table 1 is not in predicting subjective reports of goal concordance on the basis of experiential (un)intendedness; these reports are just too vulnerable to post hoc modifications. Rather, the scheme is invoked to map out theoretical relationships between different kinds of unintended action, imagery production, and the planning of communicative intentions in schizophrenia. Further verification of the scheme awaits other methods for objectively identifying goal-directed cognitive processes. One approach may be to use pupillary dilation to measure cognitive effort and goal-directedness. Schizophrenic VHs are predicted to occur with effortful, goal-directed cognition and should therefore be accompanied by pupillary dilation. On the other hand, visual hallucinosis, deriving from drug ingestion for example, may derive from passive goalless states and hence not be accompanied by pupillary changes.

2.4. Nonself features of exafferent versus reafferent voices. It is noted by **Alpert** [and several other commentators, although the repetition was removed by the editor] that bone conduction induces a low frequency bias in listening to one's own voice, thus offering a ready explanation for why one's own tape-recorded voice (which is not modified by this low frequency bias) frequently sounds alien and not like one's own. This explanation sounds very plausible. However, it needs to be restated

that, in discussing the tape-recorder problem, I was not committed to the inferential model of nonself attributes of the auditory image. This problem was presented simply to illustrate how hypotheses that parallel those being discussed in connection with the VH problem can be proposed for a relatively commonplace experience.

3. Goals, volition, and hallucinosis

3.1. Unintended thought. Although they generally endorse the VHs model, **Akins & Dennett** are concerned about the implications of positing "unintended thought" as the central feature of hallucinations, because the converse, "intended thought," risks recursive cycles of intentions of intentions. The model is not really vulnerable to this criticism, however, for it does not posit unintended thoughts but rather unintended images, where imaging is considered to be a special kind of *cognitive output*, like an action. Moreover, the model is not a cognitive theory of intentions per se, but an attempt to delineate a class of cognitive processes whose outputs are experienced as unintended, the latter being a more limited problem.

3.2. Controlling hallucinations. In light of two studies indicating that schizophrenics can at times control their hallucinations, **Alpert, Allen,** and **Harrow et al.** questioned the degree to which hallucinations are involuntary.

For some patients, Breier, and Strauss (1983) found that a decrease in activity diminished the frequency of hallucinations and other psychotic symptoms, whereas for other patients an increase in activity helped. Allen, Halperin, and Friend (1985) report that participation in certain activities such as typing caused their patient to experience fewer hallucinations. My own clinical impression is that schizophrenics benefit from repetitive, structured activity (like typing) but experience more symptoms when tasks require rapid planning shifts or frequent novel planning strategies. The VH model predicts these different effects because repetitive activity may help to stabilize cognitive planning and therefore reduce goal-discordant actions and images whereas novel or high contingency planning may increase the vulnerability to planning breakdowns, thus inducing more psychotic symptoms.

The Allen et al. (1985) case report also indicates that the patient is able to induce hallucinations voluntarily. My attempts to get patients to do the same have generally been unsuccessful, which is consistent with Kass (1968) and Horowitz (1975). Perhaps the voluntary production of VHs in the Allen et al. case was actually a simple reproduction of the image of a VH, which patients can do quite readily.

The Allen et al. (1985) case report indicated that the frequency of later hallucinations decreased when behaviorally associated with the voiced image, "stop." Perhaps the evocative connotations of "stop" as a verbal image could actually act as an end-of-plan punctuation mark akin to a sentence period or a "clear" statement. Then if "stop" is behaviorally associated with VHs, disruptive, goal-nonconcordant planning fragments could be interrupted by this representation.

It should be noted that shifting activity levels or verbal self-instruction do not indicate voluntary control of VHs but are maneuvers that diminish the frequency of future VHs. These techniques, in volitional terms, are equivalent to controlling involuntary jerks of the hand by sitting on it, rather than willing the hand to stop.

Bentall & Slade criticize the VH model because it has no implications for therapy. Although the above remarks are speculative, they do illustrate that the model may have therapeutic implications.

3.3. The goal of dreams. Quoting Freud (1955), **Marks** agrees that dreams are experienced as "alien, from another world." **Akins & Dennett** and **Deese** question whether this quality of dreams can be attributed to the model, insofar as it predicts that the nonself, hallucinatory attributes of the dream derive from its "goallessness." Are there goals of dreaming? At times psychoanalysis can help a person to access wish expressions hidden in the dream that may qualify as goals. But the reconstruction of wish expressions are best thought of as mock intendings (see **Brand**), because they are retrospective and do not alter the external misattribution of the dream as dreamt. Crick and Mitchison (1983), Jouvet (1978), and others have postulated neurocognitive goals for dreams related to learning and the upkeep of memories. But an awareness of these goals does nothing to make sense of the dream, hence the goals are subpersonal (see **Gordon**). Thus dreams indeed seem to lack relevant, consciously accessible goals that enhance our ability to make sense of them at the time of dreaming.

4. The relationship between verbal hallucinations and language difficulties

4.1. VHs can occur in the absence of language difficulties. It is noted by **Marks** that hallucinations secondary to sensory deprivation, hypnosis, hypnagogic states, and drug intoxication occur in the absence of discourse disturbances; this is consistent with the model because all of these states may induce goallessness and unintended cognitive outputs. **Alpert, Bentall & Slade,** and **Schwartz** state that VHs can occur among psychiatric patients who are not schizophrenic and have no recognizable speech difficulties. But Alpert and Silvers (1970) indicated that the VHs of schizophrenia, compared to the VHs of, for example, alcoholic hallucinosis, more frequently express intelligible propositions. This is predictable from the hypothesis that discourse-planning disturbances underlying schizophrenic VHs affect the relationship between multiple propositions while leaving the expression of individual propositions intact. Alcoholic VHs may derive from a mechanism other than discourse-planning disruptions and could be secondary to drug-induced cognitive goallessness. Similarly, the VHs of psychotically depressed persons (see **Bentall & Slade**) are qualitatively different from schizophrenic VHs: The former more frequently consist in a single word or name being called and they generally do not express a whole proposition (Hamilton 1979); moreover, depressive VHs are frequently hypnogogic (Slater & Roth 1969). Thus the VHs of depressives may derive from normal speech errors (cf. Harley 1985) or the goallessness of hypnagogic states.

4.2. Coherence of schizophrenic speech. Speech-disordered schizophrenics can at times produce thematically coherent discourse, **Faber** and **Allen** note. This certainly reflects the findings of our own recent study (Hoffman, Stopek & Andreasen, in press), in which multiple speech segments produced by a particular schizophrenic vary in their degree of coherence. However, as discussed in that report, the overall coherence of a schizophrenic speaker's utterance is expected to reflect a complex combination of factors that include the ability of the speaker to construct discourse-planning hierarchies, the complexity of the subject matter that the schizophrenic wishes to talk about, and the degree that the schizophrenic minds or is bothered by his own incoherent speech. Frequently, shorter utterances, utterances with many repeated elements, utterances with simpler expressive goals, and utterances that have been rehearsed (such as delusional ones) can be coherently produced by schizophrenics. Also, the incidence of VHs for schizophrenics during the day can be very sporadic, suggesting that their discourse-planning difficulties can be sporadic.

Finally, the commentary by **Gjerde** regarding the potentially disruptive effects of very high or very low arousal levels on working memory predicts that fluctuating arousal levels will induce variability of discourse-planning abilities. Thus it is not surprising that some schizophrenics with VHs were able to produce coherent discourse in our cross-sectional study, and that the discourse-planning deviance of speech samples correlated only partially with VHs.

4.3. Different types of disordered speech. It is also not surprising that studies referred to by **Allen** (Allen 1984; Allen & Allen 1985), **Bentall & Slade** (Slade & Cooper 1979), **Faber** (Eubanks, Faber, Spangher & Munford, unpublished manuscript) and **Harrow et al.** (Marengo & Harrow 1985) showed only a weakly positive or negative association between VHs and disordered speech. Disordered speech, although potentially a result of discourse-planning disturbances, can also be the result of ideational deviance, lexical access and semantic problems, dysgrammatisms, phonological disorganization, and loss of referential cohesion. The latter problems have all been observed among schizophrenics (Allen 1984; Allen & Allen 1985; Chaika 1974; 1977; Faber, Abrams, Taylor, Kasprison, Morris & Weisz 1983; Herbert & Waltensperger 1980; Hoffman & Sledge 1984; Morice & Ingram 1982; Rochester, Martin & Thurston 1977), but they are not linked, according to my model, to VHs.

Manics, who shift from one coherent discourse structure to another during a single utterance, are also not predicted to have VHs even though their speech is disordered. **Rund** states that the target article did not document this finding in sufficient detail. The "shift" hypothesis was supported by the fact that manics had coherent hierarchical subtrees equivalent in size to discourse structures generated by normals, though these were embedded in discourse structures that were non-hierarchical overall (Hoffman, Stopek & Andreasen, in press). Shift-induced incoherence is distinct from the schizophrenic case where the ability to generate *any* discourse hierarchy is deficient. **Harrow et al.** question whether there are actual differences between schizophrenic and manic speech disorganization because earlier workers failed to find such differences (Andreasen 1979b; Harrow, Grossman, Silverstein & Meltzer 1982; Harvey 1983; Marengo & Harrow 1985). The reason they did not find these diagnostic differences is that they were not using measures that were sensitive to such discourse disturbances.

The suggestion by **Faber** that an optimal association between VHs and formal thought disorder may be arrived at by restricting the range of these two phenomena is therefore a very good one. As just discussed, the model would predict that VHs expressing whole propositions (as opposed to names or single words) would most frequently co-occur with thought disorder involving a deficient hierarchical organization of multiple propositions (as opposed to speech problems involving syntactic difficulties, semantic disorganization, ideational deviance, planning shifts, dysfluency, or cohesion problems).

Alpert questioned the relationship between language-processing defects and VHs. He referred to earlier studies (Alpert, Rubenstein & Kesselman 1976; Mintz & Alpert 1972) indicating that hallucinators use syntactic organization more efficiently than nonhallucinating schizophrenics – with both groups being subnormal – when processing poorly intelligible verbal stimuli. Once again, these findings are not inconsistent with the language-planning model of VHs. During syntactic processing, the formative elements are words or their semantic precursors, which are hierarchicallly organized into a syntactic "frame" (Garrett 1975; Hoffman & Sledge 1984). The cognitive disturbance postulated to underlie the discourse disturbance and VHs of schizophrenics can be attributed to a processing level where whole propositions or statements are hierarchically organized into a coherent message. Thus the cognitive pathology of VHs is hypothesized to occur at a level distinct from syntactic processing.

Recent indications that task performance can induce a *flexible* allocation of cognitive resources (cf. Kahneman 1973) suggest that the enhanced syntactic processing capabilities of hallucinating schizophrenics noted by **Alpert** and colleagues could be a compensatory reaction to higher-order failures in message construction. This approach could also account for the very interesting findings of Swinney (1984) discussed by **Lehnert.** Swinney found that compared to normals schizophrenics remember the multiple meanings of ambiguous words longer during sentence comprehension. Excessive dwelling on semantic correlates of single words could again be a compensatory response to disruptions of higher-level message representations involving multiple propositions. Similarly, compensatory increases in the "gain" of accoustic sensitivity could be a response to higher-level speech-processing disturbances. This may account for the subjective hyperacusis of many schizophrenics, and for the acoasmas (hallucinated meaningless sounds) mentioned by **Reed.**

4.4. Bottom-up models of discourse planning difficulties. On the other hand, **Lehnert** proposes that this change in lower-level lexical access generates outflow interference that could reflexively disrupt discourse planning; **Alpert** also proposes that some lexical difficulty underlies the production of VHs. This bottom-up model is appealing because it incorporates the Swinney (1984) findings and is

supported by another study (Hoffman, Hogben, Smith & Calhoun 1985) where complex, lower-level syntactic processing was shown to predispose schizophrenics to higher-level message disruptions. Whether a top-down or a bottom-up model of discourse-planning disturbances holds for schizophrenia remains an extremely important issue to explore. Whatever the "direction" of pathology, it needs to be stressed that a discourse planning disturbance is necessary in order to link VHs with langauge processing difficulties in schizophrenia. For example, schizophrenic lexical access problems hypothesized by Swinney (1984), if they occur in the absence of discourse-planning disturbances, would cause a general diminution in verbal imagery, or poorly organized verbal imagery, but not hallucinated verbal imagery.

4.5. Language-planning disturbances in normals. Discussing his own work (Harley 1984), **Harley** indicates that fragments of conversational plans can intrude into an intended speech output in normals and cause speech errors. How do these normal speech planning errors relate to those of schizophrenics? Harley's speech errors involved single word substitutions while schizophrenic planning disturbances implicate whole propositions that are discordant with the discourse plan. The latter is predicted to induce VHs involving whole propositions; this is consistent with Alpert and Silvers (1970), who note that schizophrenic VHs generally express intelligible propositions. If a VH occurred on the basis of a Harley's variety of speech error, it would involve one or two words. This suggests an alternative mechanism for VHs in normals (see section 1.1) and depressives (cf. Hamilton 1979) that express one or two words.

4.6. Are VHs linguistically incoherent themselves? The VH model, according to **Rund,** predicts that VHs should be incoherent; incoherence is actually infrequent for schizophrenic VHs. However, as discussed above, the model in fact predicts that schizophrenic VHs are composed of coherent propositions (which are discordant with the overriding multipropositional discourse plan). If, as noted by **Reed,** schizophrenic VHs are dyssyntactic, incoherent, or neologistic, these phenomena could be due to lower-order language-processing difficulties that involve lexical access, syntax, and semantics.

4.7. Longitudinal considerations. On the basis of Johnson and Miller (1965) **Alpert** also questions the association of language disorganization and VHs; he summarizes this paper by saying that the authors demonstrated that language deficiencies predated the onset of hallucinations. Actually, the antecedent test used by Johnson and Miller that statistically distinguished inductees who later developed schizophrenia with hallucinations from those who contracted schizophrenia without hallucinations was overall performance on the "Army Classification Battery," with verbal subscores yielding no statistical differences. This study, therefore, does not demonstrate evidence that conflicts with my model.

4.8. Hemispheric laterality. It is reported by **Alpert** that there is little evidence indicating an association between VHs and dominant hemisphere disturbances; he refers to an early study (Alpert & Martz 1977) that examined alpha suppression in response to verbal and nonverbal tasks. However, **Flor-Henry** outlines many other reports describing neuropathological findings (Southard 1914), CT data (Takahashi et al. 1981; Uchino et al. 1984), studies of cerebral blood flow (Gur et al. 1985; Kurachi et al. 1985), acoustic threshold studies (Bazhin, Wasserman & Tonkonogii 1975), and telemetric EEG data (Stevens et al. 1979; Stevens & Livermore 1982) that indicate an association between dominant hemisphere disturbances and VHs. Thus, contrary to the assumption of **Deese,** there are many workers who believe that schizophrenics' cognitive deficit(s) are focally located rather than diffusely distributed.

Deese also asks about the neural origin of intendedness. I wonder whether there is only one location. For example, the planning locus for organizing speech intentions may be distinct from the planning locus that organizes motoric sequences. [See Ojemann: "Brain Organization for Language," *BBS* 6(2) 1983; Libet: "Unconscious Cerebral Initiative," *BBS* 8(4) 1985; and Goldberg: "Supplementary Motor Area Structure and Function," *BBS* 8(4) 1985.]

4.9. Discourse planning disruptions and the constancy of VHs. Schizophrenic VHs, write **Allen** and **Harrow et al.,** are often redundant over time and restricted to a few, mostly punitive topics. Although this clinical impression may have validity, it has not been systematically assessed. In the target article, however, a mechanism is proposed that could account for such invariance of schizophrenic VHs, namely, that planning disruptions are secondary to parasitic representations in associative memory (see also Crick & Mitchison 1983; Hoffman, in press.

4.10. Methodological issues. The rating of VHs in the language study described in the target article is called into question by **Faber.** VHs were rated as simply present or absent as part of an admissions diagnostic evaluation using a standardized Schedule for Affective Disorders and Schizophrenia (SADS) format. Speech samples were generated a few days later. Without a doubt, this was not an optimal design. Ensuring that speech samples and assessment of VHs occurred on the same day, as well as undertaking a more careful determination of the nature, frequency, and intensity of VHs, may enhance the results of such a correlational study.

Faber notes that quantification of discourse disorganization is not described. This is detailed in the Hoffman et al. (in press) report. An overall deviance score was determined by assigning a numerical weight to each of the ways a hierarchical structure can deviate from a strict partial ordering. For example, a loss of presuppositional transitivity over chains of propositions (see Segment C and Figure 3 in target article) was scored as 2 and a statement that had no discernible relation to the other statements of the text was scored as 4. In this way all instances of structural deviance were noted, weighted and summed for two speech samples that were analyzed for each patient. The total number of statements (corresponding to the total number of tensed verbs) was also determined, and this score was divided into the total deviance score to generate an incoherence rating that was used to test the statistical hypothesis described in the study. The incoherence rating thus corresponds to the average severity of discourse-planning disturbance corrected for utterance length.

Faber and **Schwartz** suggest that the association between VHs and discourse disturbance described in the target article may simply reflect the fact that more severely ill patients have more symptoms. I accordingly examined the relationship between severity of discourse-planning disturbances and the severity of delusions. Besides hallucinations, delusions are the other class of positive symptoms that are prominently featured in schizophrenia. If the counterhypothesis of Faber and Schwartz is correct, there should be a positive correlation between these two measures for the patients described in the target article. These measures turned out to be completely independent of each other ($r = .02$), thus suggesting that overall severity of illness was not the key factor linking discourse-planning disturbances and VHs.

4.11. Heterarchical versus hierarchical planning. On the basis of his speech error research **Harley** notes that at some level conversational planning must be heterarchical in order to be sensitive to various contingencies. It is fundamental to the VH model that discourse planning is disrupted when it becomes nonhierarchical. We may both be right – that conversational planning starts out heterarchically in order to sort out various contingencies, but that for a coherent message to be attained, a hierarchical plan must finally "precipitate out." The term "precipitate" is used specifically to reflect the fact that tree structures are most efficient for storing and accessing information and therefore, from a representational point of view, are optimally stable structures for lending coherence to speech activity (Deese 1978). The nonhierarchical or heterarchical structure of schizophrenic speech may therefore correspond to a microgenetic regression to a "nonpathological" antecedent representational level that is ordinarily unexpressed; this perspective has been developed in detail in a recent paper (Hoffman & Sledge 1984; see also Brown 1977).

4.12. Goals and positive symptoms. There is an objection by **Harrow et al.** to invoking the negative correlation between negative and positive symptoms reported by Andreasen & Olsen (1982) as support for the prediction that symptoms generating by planning disturbances will tend to reduce goal-directed activity. They refer to two other studies that did not find this correlation. The first study (Lewine, Fogg & Meltzer 1983) is difficult to interpret because it includes speech disorganization as a negative symptom. The second study (Pogue-Geile & Harrow 1985) reported only an overall correlation of a negative symptom index and a positive symptom index; the most critical relationship, based on the VH model, is that of amotivation and VHs, which was not specifically assessed.

4.13. VHs in mute, cerebral palsy patients. An interesting group of mute, spastic-athetoid cerebral palsy patients who hallucinate godlike voices is discussed by **Jaynes**, who suggests that this constitutes further evidence for his bicameral model of VHs. The findings certainly support the idea that VHs tend to be linked in people's minds with godlike powers, but this association is not surprising, since the "mock intentionality" of involuntary inner speech is likely to be credited to a divine origin when these voices are "heard" in the absence of an actual speaker. It is not clear, however, how this supports the bicameral localization hypothesis, namely, that VHs derive from latent, right hemisphere cognitive processes.

An athetoid component to cerebral palsy is a strong indication of pathology involving subcortical structures, especially the corpus striatum (Kaplan 1983). Damage to these structures produces disruptions of motor functioning that may include speech articulation. Extreme articulatory disturbances may result in functional muteness. This suggests an alternative explanation for VHs in these patients. Though speech articulation is totally blocked, a capacity for inner speech could perhaps still be developed. Such patients would be unaccustomed to perceiving aurally perceived speech as self-originating, including their own inner speech. Any instance of inner speech would acquire nonself attributes by inference and would be experienced as an external voice. That these voices admonish and encourage accords with the fact that people often do that to themselves. That these voices sometimes also express thoughts that are opposite to the patient's own is again found with ordinary inner speech, in which forbidden, unacceptable ideas are represented and kept hidden from others.

5. Other theories of hallucinations

5.1. Neural activation. An interesting model of transitional states of consciousness that accommodates borderline hallucinosis of hypnogogic states is presented by **Marks.** The model considers the interactions between internal and externally derived imagistic events and their attributed reality. How these factors are regulated is explained in terms of "neural activation." However, it is not at all clear how neural activation, as a concept, can account for conscious awareness and attributed reality. This term has many meanings, and it may refer to increased neural firing frequency, turning on a neural module, increasing the salience of a neural or mental representation, and so forth; a much more detailed model is required to differentiate the neural activation of a regular image and the neural activation of a hallucination.

5.2. The bicameral model. As noted by **Deese** and by **Posey,** the VH model is at least partially compatable with the bicameral model of verbal hallucinations described by Jaynes (1977). If the left hemisphere of the bicameral mind is assumed to maintain overriding, consciousness-determining cognitive schemata, and if right hemispheric events intruded on left hemispheric processes, then my model would predict that the resulting instances of inner speech would be experienced as unintended and potentially hallucinatory. Jaynes (1977) argues that schizophrenic VHs are a reactivation of the bicameral mind. However, an advantage of my model over the bicameral model is that only the former relates hallucinatory phenomena to normal cognitive processes; the bicameral model, though it can account for hallucinatory phenomena, offers no adequate description of the later (postbicameral) integration of the two cerebral hemispheres that produced normal (i.e., nonhallucinatory) consciousness. Are we now *less* conscious of nondominant hemispheric processes? If so, what neurocognitive account can be given for this shift? If not, are our nondominant hemispheric "voices" now ordinary images or feelings? If this is the case, what has induced this experiential

shift? These questions require clear answers before the bicameral model can be assessed as an account of schizophrenic hallucinosis.

5.3. Poor inner speech comprehension. The language difficulties of schizophrenia might be etiologically linked to VHs, **Faber** agrees. However, instead of endorsing a discourse-planning model, he proposes that a receptive aphasia-like condition, perhaps referrable to dominant posterior temporal lobe dysfunction, causes verbal images to be unrecognizable as self-derived. Although there is some supporting evidence that dominant temporal hemisphere lesions can induce VHs (Brown 1981), it was argued in the target article that these hallucinations are more akin to "phantom limb" phenomena. To take Faber's hypothesis more seriously, one would like to see some way of understanding how this aphasic condition, which diminishes the person's ability to recognize the meaning of words, would induce the alien, nonself misattribution of VHs. There is no evidence that the schizophrenic cannot readily understand the words composing his VHs; the difficulty seems to be with some other quality of the experience.

5.4. Arousal models. The possible relevance of arousal in causing schizophrenic VHs is mentioned by **Bentall & Slade. Gjerde** summarizes arousal studies of normals and schizophrenics. He states that both under- and overarousal could have significant disruptive effects on linguistic information in working memory due to alterations in retrieval efficiency and sensitivity to semantic information. He also notes that overarousal may overload memory capacity and induce parasitic states of the type discussed in the target article. Disruptions in language planning could result. It should be noted that VHs were hypothesized to be secondary to discourse-planning disruptions and could easily cause pathological increases in arousal due to the subjective distress they generally induce (cf. Hollender & Böszörményi-Nagi 1958); these increases in arousal could cause further disruptions in discourse planning and VHs. Thus, causality may be circular and difficult to tease apart.

5.5. Unbuffered long-term memory outputs. It is suggested by **Rund** that schizophrenic VHs derive from long-term memory outputs that are unbuffered by attentional control and flow directly to sensory registers. This model is actually not too different from the VH model, except that in the latter attentional control is represented as language-specific propositional hierarchies. Discourse-planning breakdowns would also cause the contents of long-term memory contents to be functionally "dumped" into language output programs. The difficulty with Rund's approach is that it does not account for a variety of clinical observations and research findings: (i) the predominance of VHs and language disturbances in schizophrenia, (ii) the relationship between normal and pathological hallucinations, (iii) the fact that schizophrenic VHs most often express whole propositions, (iv) the faster reaction times of hallucinating schizophrenics reported by Schneider and Wilson (1983) (a focal attentional deficit would predict slower reaction times), (v) the fact that drowsiness and avolition are negatively correlated with VHs in schizophrenia (Andreasen & Olsen 1982; Sedman 1966a) (attention deficits would predict, if anything, a positive correlation), (vi) the effects of external speech on diminishing VHs (Margo, Hemsley & Slade 1981) (an attentional deficit that is not specific to language processing would not be expected to be preferentially improved by external speech).

5.6. The pigeon-holing model. Attention is drawn by **Schwartz** to a recent study by Bentall and Slade (1985a) indicating that hallucinating schizophrenics are more prone than nonhallucinating schizophrenics to classify noise as a meaningful signal. Schwartz suggests that this finding supports the hypothesis that a pigeon-holing deficit may lead to VHs. This finding would easily account for functional hallucinations in schizophrenia where voices are "heard" on the basis of nonverbal stimuli. However, the problem in VHs is not a proneness to make sense out of nonsense, but misidentifying, as externally derived, inner speech that is already meaningful insofar as it is composed of syntactically organized lexical strings.

5.7. An alternative model of "normal" hallucinations. It is suggested by **Marks** that we ordinarily adjust to "normal" or "borderline" hallucinations (cf. Foulkes & Fleisher 1975) because nighttime dreaming conditions us to accommodate to the invalidity of these nonself experiences and therefore allows us to correct the hallucinosis of our daydreams. This may be true, but this formulation does not indicate why schizophrenics are unable to correct the false external attribution of their hallucinations; schizophrenics have been shown to do as much dreaming as the rest of us (Benson, Zarcone & Mezzich 1979).

6. Inner speech and verbal imagery

6.2. The goals of inner speech. It is argued by **Akins & Dennett** that positing communication goals for inner speech circumvents some of the current difficulties of the VH model. What are these (self) communication goals? One possibility is that verbal imagery, if conscious, is a stabilizing mental representation in working memory, "fixing" response sets. Another is that conscious verbal imagery is particularly evocative in terms of associative memory and the elaboration of rich mental representations. Nonetheless, there is still the problem that the goal of talking to myself is a subpersonal goal: I do not make sense of talking to myself by realizing that I am attempting to talk to myself, or that I am stabilizing my working memory, or that I am gaining privileged access to my associative memory. All this relates to cognitive theory that may or may not be correct. Rather, the goal-orientation whereby I make sense of talking to myself is in terms of a particular problem I am trying to solve, a memory I am reaching for, a set of actions I am trying to organize, or a manifest utterance I am practicing. Thus, inner speech communication goals remain on a subpersonal level and thereby incur all the difficulties of subpersonal goals in determining the intendedness of actions that were described by **Gordon.**

6.2. Developmental considerations. In reference to the writings of Piaget (1930) and Bruner (1964), **Marks** states that imagery develops before spoken language. On this

basis he questions how a language-planning disturbance related to outward speech can cause pathology of internal imagery. However, the image-to-language developmental progression discussed by these authors concerns iconic images of externally derived visual/sensory information rather than self-generated verbal imagery. Thus the antecedent development of iconic imagery does not affect the argument that inner speech derives from outer speech, and that defects in the planning of the latter could induce difficulties in the former.

6.3. Subvocal speech and verbal imagery. I hypothesize that the nonself inference of unintended external speech is blocked by the kinesthetic sensation of speech production. **Junginger** and **Zivin** ask why the covert speech muscle activity of VHs does not block the nonself inference. The term "kinesthetic" refers quite literally to perception of movement. Whereas many researchers (Cerny 1965; Gould 1948; Inouye & Shimizu 1970) have demonstrated that VHs are accompanied by EMG activity of speech muscles, in general this muscle activity does not result in actual tissue movement. We do not see the schizophrenic, in general, mouthing his VHs as they occur. It is this conscious perception of movement that VHs lack, but which, I propose, serves as good *prima facia* evidence for the schizophrenic that his *overt* speech is his own.

This also raises the much broader issue raised by **Zivin**, namely, the relationship between verbal imagery and the motor processes of inner speech. She notes that the sole focus of Sokolov (1972) and Luria (1961) is inner speech viewed as a neural readout of a motor speech plan. Surely motor activity is much more readily studied than images, which cannot be directly measured. If such neural readouts can constitute a conscious nonimagistic experience, then **Junginger**'s question about whether the schizophrenic's "audible thoughts" need to be verbal images can be answered in the negative. Although I believe there is indeed some face validity to the assumption that verbal images accompany inner speech, I also agree with Zivin that inner speech viewed as verbal translations of motor readouts will do as well for my model. Certainly Sokolov fully accepts that inner speech has a verbal form since he discusses the syntactic changes and phonemic reductions of inner speech (Sokolov 1972, p. 50). How we experience these verbal representations – as "heard auditory images" or somehow just "felt" as implied by **Allen** – seems less important than the fact that inner speech is an action that can be intended. Even if inner speech is not always composed of verbal images that are "heard," it can still be the case that, in response to experiential unintendedness, these verbal representations – and verbal representations they must be – can be transformed into "heard" images that sound more or less as if they derive from the outside.

I am intrigued by **Zivin**'s review of neuromotor control concepts and wonder to what extent they can be related to discourse planning and control. The translation cannot be direct insofar as speakers do not have a fully elaborated motor plan that covers the entirety of extended multisentence discourse. At best, our motor speech plans extend across a phrase or sentence. Nonetheless, higher-level analogues of "corollary discharge" and "efferent copy" may be operative in checking discourse plans.

7. Summary

All commentators raised important clarifying issues. Particularly useful were the discussions by **Brand** and **Gordon,** whose concepts of subpersonal goals and mock intentionality helped me to think through other issues related to the model. The most substantive criticism, I believe, pertained to hallucinatory phenomena in normals and cross-cultural variables in psychopathology, which deserve much greater attention than they have received to date. For example, although it is true that many normals report VHs (Posey & Losch 1983), it is completely unknown what percentage of these "normal" VHs occur during goal-directed activity; my model predicts that this percentage is extremely low. Another major research issue, emphasized by the commentators and in my response, concerns whether disordered speech in schizophrenia is a top-down or a bottom-up disturbance. The former is compatible with the hypothesis that parasitic disruptions of associative memory are the cause of the redundancy of VHs. A bottom-up model lacks any plausible explanation to account for this feature. On the other hand, the bottom-up model is appealing because it is more readily explored experimentally. Regardless of which strategy is correct, a distinct discourse-planning level of langauge production needs to be postulated in order to link VHs to unintended language representations. I still think that this postulated linkage provides the best model of schizophrenic VHs to date, and I hope that this presentation will spur future study and research on psychopathology from a psycholinguistic and cognitive science perspective.

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