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THE EFFECT OF INCONGRUENT INFORMATION ON SCHEMATIC
PROCESSING IN PERSON MEMORY

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THE UNIVERSITY OF OKLAHOMA

GRADUATE COLLEGE

THE EFFECT OF INCONGRUENT INFORMATION

ON SCHEMATIC PROCESSING

IN PERSON MEMORY

A DISSERTATION

SUBMITTED TO THE GRADUATE FACULTY

in partial fulfillment of the requirements for the

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By

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Norman, Oklahoma

THE EFFECT OF INCONGRUENT INFORMATION

ON SCHEMATIC PROCESSING

IN PERSON MEMORY

A THESIS

APPROVED FOR THE DEPARTMENT OF PSYCHOLOGY

By

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The Effect of Incongruent Information on Schematic Processing

in Person Memory

Schema theory, a concept proposed by Bartlett (1932),

has recently been adopted by social psychologists seeking a

cognitive approach to a variety of phenomena, including

attitude change (Wyer and Hartwick, 1980), attraction

(Tesser and Reardon, 1981), and stereotyping (Linville and

Jones, 1980). In a speculative paper demonstrating the

range of applications of schema theory to social psycholo-

gical issues, Taylor and Crocker (1981) presented possible

reinterpretations of past findings in terms of schema

theory. Their approach suggested that attitudinal biases

may be explained as artifacts of attentional and memorial

processes, rather than of traditionally conceived components

of attitudes, including affect. Despite its intuitive

appeal and general utility, schema theory had two related

weaknesses in its original form: it was over-explanatory,

supporting contradictory predictions; and it lacked a pro-

cessing model (Fiske and Linville, 1980).

The essential characteristic of schematic processing is

that incoming events or stimuli are categorized on the basis

of prior experience, providing organization to the elements of the stimulus and expectancies about additional characteristics of the stimulus configuration. Both the expectancies and the organization of information should facilitate encoding and memory of the event. Schema theory, therefore, provides a constructivist perspective on social processes, and accounts for normative aspects of social behavior and perceptions on the basis of information processing heuristics rathern than positing emotional or motivational constructs.

A question that suggests itself given this view of social processes is: At what point might an inapplicable schema lose its utility as an information processing heuristic and be abandoned? Whether incongruent information will produce this effect is also a case in which schema theory can generate contradictory predictions. As Wyer and Gordon (1982) note, information that is incongruent with an activated schema is distinctive and may be deeply processed (Craik and Lockhart, 1972), two factors which would render disconfirming information salient and memorable. The availability of incongruent information could contribute to the breakdown of the schema. On the other hand, in Taylor and Crocker's (1981) presentation, the schema filters out irrelevant and incongruent information, or, when incongruencies are encoded, they are construed as special cases and result in subcategories within the schema. In their

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view, the schema seems to be immune to invalidation.

Much recent research has explored this issue by measuring memory of congruent and incongruent information introduced after activation of a person schema. Many studies have found that schema incongruent information is remembered better than congruent information (Hamilton and Gifford, 1976; Hastie and Kumar, 1979; Srull, 1981; Hastie and Mazur, Note 2) but some others have found that congruent information is remembered better (Rothbart, Evans and Fulero, 1979; Snyder and Uranowitz, 1978; Cohen, Note 1; Johnson and Judd, Note 3). More importantly, this research has generated two schematic processing models. Hastie (1980) has proposed an associative network model based on HAM and FRAN (Anderson, 1973; Anderson and Bower, 1973), and Smith and Graesser (1981) have proposed application of Schank and Abelson's (1977) script-pointer + tag model. These applications were particularly designed to account for the treatment of schema incongruent information in memory. Both models predict that incongruent information will be more memorable than congruent information in immediate recall or recognition, and data are presented to support the predictions.

However, the true measure of the limits of schematic processing (and of the two models) would not be demonstrated by recall of incongruencies, but by some effect of these incongruencies on the schema itself. In studies of discon-

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firming information in person memory, although it has often been found that incongruent items are remembered better than congruent items, trait rating scales administered subsequent to the memory tests reflect schema congruent information primarily (cf. Hastie and Kumar, 1979; Carlston, 1980): remembered incongruencies do not appear to influence schematic processing to the extent that impressions are altered by them. Thus false encouragement may have been taken from the simple memorability of the disconfirming information. For example, Clore (1982) notes that if deviant assertions require more processing, and are therefore more memorable, the stage is set for cognitive change. Yet does it occur? Answering this question involves looking at more than the treatment of disconfirming information in memory; it also involves investigating the effect of the disconfirming information on the schema itself.

The current research focuses on the effect of incongruent information on schematic processing in the domain of social stereotypes. By investigating memory of congruent information in the face of disconfirming information, we may be able to discover the processes underlying the strange discrepancy between the memorability of disconfirming information and its inefficacy in altering the effects of categorization and schematic processing. In Experiment 1, subjects were presented with stereotypical characters followed by two levels of congruent information (consistent and

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inconsistent), crossed with two levels of relevance to the
schema (core and peripheral) and an irrelevant item. Recall
of the original schematic information was tested either
immediately or two days later. Although Hastie's (1980)
network associational model and Smith and Graesser's (1981)
script-pointer + tag model are equally able to account for
the superior memory of incongruent information, the proposed
models support different hypotheses for the results of this
experiment.

Hastie's (1980) Model

Hastie's model was formulated on the basis of several
studies he and his colleagues had conducted. In this
research, subjects were presented with several trait adjec-
tives, intended to activate the schema, followed by behav-
iors that were congruent and incongruent with the traits.
In Hastie and Mazur (Note 2) and Hastie and Kumar (1979),
level of incongruency (high, medium, and low) and propor-
tions of congruent to incongruent items were varied ("set
sizes" were 9:1, 7:3, and 5:5). They found superior recall
of moderately or highly incongruent items to congruent items
when there were fewer incongruent than congruent items.
Hastie (1980) concluded that behaviors are remembered when
they are highly informative, and they are highly informative
when they are either highly prototypical, infrequent, or
highly incongruent.

The model Hastie proposes to account for the memor-

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ability of highly informative events has a short term
memory, working memory, and long term memory, and proposi-
tional networks. The probability of recall of an item is a
function of the number of linkages it has to other items.
Linkages are established between any two items when they
make contact in short term or working memory. For two items
to become linked, they must not merely cohabit working
memory, but a process Hastie considers analogous to Craik
and Lockhart's (1972) elaborative processing must take
place. Under this model, the reason highly incongruent
items are well remembered is that they require elaborative
processing, including causal attribution, to be understood.
In the course of this reasoning, incongruent items become
extensively linked to other items.

The paradigm to be used here is similar to Hastie's in
that a schema will be activated and congruent or incongruent
information will be presented subsequently. It is different
in that, for any particular schema, only congruent or incon-
gruent information will follow; and recall of the original
expectancy-inducing information will be measured, rather
than focusing on recall of the subsequent congruent or
incongruent items. Applying Hastie's model to this para-
digm, schematic information that is followed by highly
incongruent information should be remembered better than
schematic information that is followed by highly congruent
information. According to Hastie's description, the intro-

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duction of highly incongruent information instigates a review of stored information. This review involves elaboration of and causal reasoning about the incongruent item, in the context of schematic information. In this case, the stored (schematic) information would have more linkages, especially to the incongruent item, than stored schematic information that was simply followed by additional congruent information.

Hastie has also found that the retention interval has no differential effects on recall of congruent and incongruent items. Since all linkages are assumed to decay at the same rate, better memory for incongruent than congruent items is still found after a delay. Therefore, for the current research, this model predicts persistence of the facilitating effect of disconfirming information on recall of schematic information.

Another difference between the two models is the purported relationship of high and low relevance items to schematic information, and such a variable was included in Experiment 1. One can predict from Hastie's model that the facilitating effect of incongruencies will be restricted to the highly relevant (core) incongruent items, which should be best remembered and benefit recall of preceding information. Peripheral incongruent items, like his low incongruent items, should be less memorable and should not facilitate recall of schematic information because they would

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not be evaluated as informative. Core congruent items should be remembered well themselves, because "quintessentially characteristic" items also receive deep processing, but they should not benefit recall of previous schematic information because they do not require retrieval of stored information for comprehension. Peripheral congruent items should be supremely forgettable and have no effect on the schema. Therefore, incongruencies which are peripheral to the schema should be 'filtered out' as Taylor and Crocker (1981) propose, but central incongruencies should be distinctive and deeply processed, as Wyer and Gordon (1982) propose.

These predictions indicate that Hastie's model, which seems to suggest that expectations might be altered and schemas broken down because of continued high availability of disconfirming information, also suggests that the very discrediting of a schema strengthens it by making supportive information more memorable. Perhaps this is the answer to the puzzle Clore (1982) raises: given the deeper processing and accurate recall of deviant statements, "why are we not constantly in cataclysms of cognitive change?" (p. 767). It could be that encountering deviancy renders normative information more available.

Smith and Graesser's (1981) Model

Reformulation of Schank and Abelson's (1977) script-pointer + tag model as a more general schema-pointer + tag

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model had previously been suggested by Graesser, Woll, Kowalski and Smith (1980). Smith and Graesser (1981) tested this reformulation. In their presentation, the memory representation of a schematic event has "a pointer to the generic schema that interrelates both the stated and inferred very typical actions as a whole... [which] implies that the schema is accessed in an all-or-none manner and that most or all of the schema-relevant information is copied into the specific memory trace..." (p. 551). Actions that are not very typical are tagged. Depending on the congruency of the tagged information with the schema, the tag appears in one of two places: moderately typical items are individually linked to the block of generic schema items; atypical items are directly linked to the memory trace. Thus moderately typical items are tagged under the pointer, but atypical items are tagged under the memory trace with no direct connection to the pointer.

Two types of retrieval processes are proposed in conjunction with the model. Recall is guided by conceptually driven retrieval, which utilizes organized strategies in which the schema plays a role. Recognition is guided by conceptually driven retrieval, and by data driven retrieval which relies on cues providing direct access to the item in memory.

The predictions from this model for recognition are straightforward: atypical items should be recognized

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better than typical items because they are tagged. The predictions for recall are more complex. In immediate recall, atypical items will benefit from the discriminability of tagged items while highly typical items will be confused with inferences provided by the generic schema. When responses are corrected for guessing, according to Smith and Graesser (1981), atypical items are remembered better than typical items. This relationship is reversed with delayed recall. As the retention interval increases, retrieval becomes more dependent upon the generic schema, memory becomes more reconstructive, and recall of typical items is superior to atypical items.

The primary hypothesis that can be generated from this model for the current research is that the addition of incongruent information should not affect recall of schematic information. Atypical tagged items have no other relationship to the schematic information than that they are part of the same memory trace. They are not directly connected to the schema. Only congruent items are related to the schema. Highly congruent items, whether given to establish the schema or subsequently, should become part of the generic schema information and should be easily recalled because they will be under the pointer. They should also be recalled if any other schematic information is retrieved because the schema is accessed in an all-or-none fashion.

Retention interval should affect relative recall rates

of the congruent and incongruent items themselves, but it is difficult to conceive of a way that remembering or forgetting these items might affect the schematic information. All the tagged items should be remembered more successfully than the core congruent item under immediate recall, but these items should decay more rapidly and the core congruent item should be remembered best under delayed recall.

There should be no difference among core incongruent, peripheral incongruent, and neutral items in recall or in their effect on the schema. All three item types would be represented as atypical tags under the memory trace. It is not necessary to distinguish among them under Smith and Graesser's (1981) model, because only schema relevant and congruent items are related to the schema and benefit from conceptually driven retrieval.

Peripheral congruent items, however, might behave differently from the other types of tagged items because they are related to the schema. They can be expected to be recalled better than core consistent items under immediate recall because they are tagged, but they might not decay as rapidly as other tagged items because of their relationship to the generic schema. It is also possible that they could enhance recall of the original schematic information by making it more discriminable because they are tagged onto the schema itself. If the peripheral congruent item does facilitate immediate recall of schematic information by

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tagging it, this effect should diminish under delayed recall because the peripheral congruent tag will be less accessible over time, although perhaps decaying at a slower rate than other tagged items. The precise treatment and effect of the peripheral consistent item may not be clear, but any finding that the peripheral consistent item behaves differently from atypical items as a group would tend to favor Smith and Graesser's (1981) model over Hastie's (1980).

The script-pointer + tag model and the network associational model are equally able to account for the persistence of schemas in the face of memorable disconfirming information, but do so in a very different manner. Under the script-pointer + tag model, an inappropriate schema might persist because it is an intact unit to which only supportive information is added, and recall of schematic information is assisted by a pointer. Incongruent information is memorable only because it is tagged, not by virtue of a special relationship to the schema. It is to be expected, under this model, that incongruent items would not affect trait ratings because they are separate from the schematic information. In any case, this high memorability of incongruent information is short-lived, and could have no lasting effect on the schema.

Because the two models describe different relationships between incongruent and schematic information, they engender different hypotheses for the current research. The network

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associational model proposed by Hastie (1980) suggests that
initial information establishing and highly congruent with a
schema should be remembered better when it is followed by a
highly incongruent item than when it is followed by a con-
gruent or moderately incongruent item. It also predicts
that this pattern should hold with delayed recall. Smith
and Graesser's script-pointer + tag model predicts that
recall of highly congruent information should not be
affected by the level of congruence or relevance of subse-
quent information, with the possible exception of peripheral
congruent information having a facilitating effect with
immediate recall. It also predicts that this pattern of
equivalent memory of schematic information across conditions
should hold with delayed recall.

The competing hypotheses from these two models will be
tested in Experiment 1. Prior to introducing Experiment 1,
a factor that was considered of importance to the outcome of
the experiment, development of experimental stimuli, will be
discussed. It was deemed critical to use materials that
would be likely to evoke the intended schema in the labora-
tory, and about which subjects had high levels of agreement.
It was also neccesary to determine the organization of the
schemas to develop core and peripheral consistent and incon-
sistent items. Since the outcome of procedures used to
elicit materials resulted in a different conceptualization
of the internal structure of person schemas than has been

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adopted elsewhere, the procedures used to develop experimental stimuli will be described in some detail.

Development of Materials

The first consideration in developing experimental materials was choosing a domain for which subjects would exhibit high levels of common knowledge. We thought there would be much shared social knowledge among the subject population of first and second year college students about the categories of students, their attributes, and how they were designated. This choice made the research relevant to the accumulating literature on person memory and proposed cognitive models. Before beginning Experiment 1, three procedures were performed to develop materials. The first procedure was designed to elicit stereotype categories salient to the subject population; the purpose of the second procedure was to elicit the attributes associated with the stereotypes; and the third procedure was performed to determine the relative importance of these attributes to each stereotype.

From the data elicited in these procedures, five stereotypical characters were created. Each was labeled with a stereotype category name, and credited with two of the attributes highly characteristic of that stereotype. These five stereotypes were rotated through five conditions of materials, determined by the levels of consistency (consistent and inconsistent) and relevance (core and peripheral) of additional information. The preliminary procedures

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described in this chapter also yielded data about the centrality of attributes for creating the materials conditions.

Stereotype schemas were elicited from three groups of students drawn from the same population as subjects in Experiment 1. All subjects were 21 years old or younger and had resided in a dormitory on campus at the University of Oklahoma for a semester during the preceding year (1980-1981).

The purpose of the first phase was to determine the most frequent stereotype categories. Thirty subjects (15 females and 15 males) were first asked to think of eight types of people they were likely to meet on campus and to give a label to each type. When they had written down eight labels, they were asked to write six descriptors of each type under the label. In calculating category frequency from these responses, stereotypes were considered the same if they had the same label, synonymous labels (e.g., "Frat Rat" and "Greek"), or if the descriptors were the same across subjects (e.g., "Freaks", "Druggies" and "Hippies" shared three attributes consistently). Retaining the most frequently given labels -- excluding Professor, the only non-student category elicited -- Phase 1 yielded the following six stereotypes: Jocks, given by 87% of the subjects; Greeks, given by 53%; Brains, 50%; Independents (nonGreeks), 40%; and Jesus Freaks, 30%. (Another category, Foreigner, also had a frequency of 30% but there was lower agreement on

descriptors of this type than for Jesus Freaks.)

In the second phase, 30 subjects (15 males and 15 females) were given the six category labels elicited in Phase 1 and asked to list eight characteristics of each type. Two judges determined equivalence of differently worded descriptions, and the eight most frequent attributes of each type were calculated, yielding a total of 48 attributes for six stereotypes.

The 19 subjects (10 females and 9 males) who participated in the third phase were given the six stereotype labels from Phase 1 and a randomly ordered list of the 48 attributes from Phase 2. They were asked to assign each attribute to a stereotype, exhausting the list of attributes without repetition. They were then asked to rank the eight attributes under each stereotype according to their importance in describing that type.

Analysis of responses in the third phase was used to determine the structure of the stereotype schemas for Experiment 1. The category Independent was eliminated after an initial analysis showed that 77% of the 48 attributes were listed under this label by at least three subjects, indicating that there was not a well defined stereotype of nonfraternity members. The remaining five stereotypes were subjected to an analysis of the cue value of attributes.

The formula used to calculate cue value was designed to capture the intent of Rosch and Mervis' (1975) "family

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resemblance score", according to their conceptualization of the noncriterial structure of natural categories. Cantor and Mischel (1979), who extended this conceptualization to person categories, describe the family resemblance score as a weighted sum taking into account both degree of association of an attribute with a category, and the distinctiveness of that association as compared with neighboring categories. Here, cue value was computed by taking the frequency of association of an attribute with a stereotype (number of subjects who listed the attribute under that label), multiplying it by a weight (mean rank assigned to the attribute for a stereotype), then subtracting the frequency of association with other stereotypes (as a measure of distinctiveness).

For each stereotype, there were either eight or nine attributes with a cue value greater than +10, out of a possible range of -9 to +152. The eight highest scoring attributes for each stereotype were divided into two groups: the highest four, termed "core"; and the lowest four, termed "peripheral". Using the ninth attribute when necessary, adjustments were made so that all stereotypes had roughly equal total cue values and the stronger and weaker attributes roughly clustered into two groups of four (see Table 1).

Core attributes, as determined by these procedures, were used in Experiment 1 both to establish the stereotype and to

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create the Core Consistent and Inconsistent conditions, and peripheral attributes were used to create the Peripheral Consistent and Inconsistent conditions. The materials used differed, as a result of this approach, from those that have been used to establish, and to confirm or violate impressions in previous experiments. Typically, a set of trait adjectives, such as "intelligent and kind", is given to establish the impression, and a set of behaviors which are consistent and inconsistent is given subsequently (cf., Hastie and Kumar, 1979; Srull, 1981; Marmurek, Note 4). The reason for the widespread adoption of this procedure has been stated by Hamilton, Katz, and Leirer (1980) who also utilized it:

> it is usually assumed that trait information is more abstract than, and probably inferred from, more concrete behavioral information: this suggests a hierarchical structure of the cognitive representation, yet little is known about its nature. (p. 150)

The data from our elicitation procedures do not support this assumption about the structure of person categories. We find, on the contrary, that behaviors predominate but the proportion of traits increases at lower levels of organization. Of the 20 core attributes, 75% are behaviors and 25% are traits; of the 20 peripheral attributes, 45% are behaviors and 55% are traits. Thus, in previous experiments where the level of consistency of attributes with types was

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manipulated, the "incongruent behaviors" may have played a
different role than intended. For example, Hastie and Mazur
(Note 2) performed an experiment comparing recall of three
levels of incongruent items (high, moderate and low) and one
level of congruent items. It is possible that they manipu-
lated degree of incongruence, but not level of incongruence
as determined by the actual hierarchical organization of the
schema. Here, highly incongruent items are those which are
incompatible with a central aspect of the schema, and low
incongruent items are those which are incompatible with less
central aspects: they are not bizarre behaviors, nor do
they contradict a previously mentioned trait; they are sim-
ply unexpected given previous information.

Experiment 1

In previous studies of incongruencies in person memory,
expectancies were manipulated and memory of subsequently
introduced congruent and incongruent behaviors was measured.
Here, the initial expectancy-inducing information was held
constant, subsequent consistent and inconsistent information
was manipulated, and recall of the initial information was
measured.

From the data elicited in the preliminary procedures,
five basic stereotype frames were constructed in the form of
fictional biographies of students. An initial paragraph
introduced the character and established the stereotype.
Five conditions were created by following this paragraph
with an additional highly relevant consistent item (Core
Consistent), a highly relevant inconsistent item (Core In-
consistent), a less critical consistent item (Peripheral
Consistent), a less critical inconsistent item (Peripheral
Inconsistent), or an irrelevant item (Neutral).

Each subject was exposed to five biographies, one from
each condition, and asked to write down everything she or he
remembered about each person, either immediately after
hearing the fifth biography, or two days later. Recall of

the stereotype labels and attributes was measured.

<div align="center">Method</div>

Subjects

One hundred fifty male and female subjects participated
in the experiment in partial fulfillment of an introductory
psychology course requirement. All were native born Ameri-
cans, under 21, and had resided in a university dormitory
for at least one semester in the preceding year (1980-1981).

Materials

Five biographies of fictional students were created
representing the five stereotypes elicited previously. Each
biography started with a name and a neutral fact (year in
college). The next sentence labeled the character with one
of the stereotype names (Label). Two more sentences des-
cribed the character as possessing the second and third core
attributes of that stereotype (Two Supporting Facts). This
paragraph constituted the first information presented to the
subject to establish the stereotype.

The second information began with a sentence presenting
either the first core attribute (+C); the opposite of that
attribute, not necessarily in negative sentence form (-C);
the eighth peripheral attribute (+P); or the opposite of
that attribute (-P). A neutral condition was created by
rotating a single irrelevant fact through all five biogra-
phies. The second paragraph concluded with two more
neutral facts (e.g., hair color and town of origin within

the state).

Twenty-five stimulus sets (given in Appendix A) were created by rotating each biography through the five materials conditions, with five orders of presentation for each assignment of materials to conditions. A tape recording was made of each stimulus set by a female experimenter, reading in an even tone and pace.

Design

The design was a 2 (Consistent/Inconsistent) X 2 (Core/Peripheral) X 2 (Immediate/Delay) factorial design with two repeated measures (levels of consistency and relevance) and one between-subjects variable (retention interval). A neutral condition of materials was included in the experiment to provide a baseline measure or control condition, but was not included in the statistical analyses for significance because to have included a fifth condition would have precluded the two-way analysis for effects of congruence and relevance.

Procedure

The 75 subjects in the immediate recall condition were run individually, and the 75 subjects in the delayed recall condition were run in groups of three. Subjects were told they would hear descriptions of five University of Oklahoma students and be asked questions about them. The tape recorder was started and the first paragraph of the biography was played.

After hearing the first information, subjects were asked to answer two questions on paper, one estimating the typicality of the student compared with other students at the university, and the second estimating the percentage of students at the university who were like this student. This interpolated judgment task was included after the initial information to ensure that subjects were attending to the tape and that the stereotype was established before inconsistent information was introduced.

After answering the two questions, subjects were told they would hear more information about the same person, and the remainder of the biography (second information) was played. Subjects then answered the two typicality questions again, about the same "student". They were told they could respond the same way as the first time, or differently. The interpolated task was repeated after presentation of the second information to avoid a procedurally induced bias toward recall of the initial, congruent information.

This procedure was repeated for five biographies. For subjects in the immediate recall condition, the incidental recall task was then introduced. Subjects were asked to write down everything they remembered about the five people. They were given five recall sheets, one at a time, with the name of the character at the top, in the same order as the tape presentations. After they had filled out the fifth sheet, they were given the option of filling out a sixth

unlabeled sheet with any additional biography they remembered. Subjects in the delayed recall condition returned two days later and followed the same procedure. (Instructions are given in Appendix B.)

Results

Each subject's recall responses were scored for three different measures: recall of the stereotype label; recall of the two core "supporting facts" which followed the label in the first paragraph; and recall of the additional fact in the second paragraph ("second information") which determined the materials condition. Results were tabulated by condition, and separate statistical tests were performed on the three dependent measures. Each test was a 2 X 2 X 2 (consistency x relevance x retention interval) mixed analysis of variance. Results of the three analyses will be discussed separately. All means are reported in Table 2, and ANOVAs are given in Appendix C.

For scoring purposes, stereotypes were identified by the label, or by core attributes in the absence of a label. Either verbatim or synonymous responses were considered correct for recall of the label. A supporting fact was considered correct unless given under the wrong stereotype label. Recall of the second information was counted if it occurred with the appropriate label and/or supporting facts, or if neither the label nor supporting facts was recalled elsewhere. Information on the optional sixth recall sheet

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was counted only if it introduced a stereotype which had not
been recalled; if it merely added to an earlier description,
it was not counted.

Recall of the Stereotype Label

Memory of the label was not affected by any of the inde-
pendent variables. Average recall of the label was 61% for
subjects in the immediate recall condition, and 57% for
subjects in the delayed recall condition. Mean recall for
both congruent and incongruent conditions was 59%.

Recall of the Two Supporting Facts

Recall of the two supporting facts in the first informa-
tion was the primary dependent measure used to test the
effect of different levels of congruent and incongruent
information on schematic processing. The ANOVA on the two
supporting facts showed no significant main effects for the
within-subjects variables, consistency and relevance, but
there was a significant interaction: $F(1, 148)=4.16$,
$MSe=.3852$, $p<.05$. The two core facts in the first informa-
tion were best recalled when followed by highly incongruent
information, and recall was poorest when the additional
information was in the core consistent condition (see Figure
1).

There was also a significant main effect for delay,
$F(1, 148)=31.10$, $MSe=.6604$, $p<.001$. Mean recall of the
two supporting facts by subjects in the immediate recall
condition was 1.21, while for subjects in the delayed recall

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condition it was .84.

Recall of the Second Information.

A tertiary analysis was performed on the second informa-
tion presented to subjects. Since this sentence from the
second paragragh determined the experimental conditions,
results of this analysis are confounded with linguistic
factors and results should be viewed with caution. Nonethe-
less, we had some interest in recall of the consistent and
inconsistent items themselves, in relation to their effect
on the preceding information.

No interactions were significant, but all main effects
were. Consistent information was remembered better than
inconsistent information: $F(1, 148)=5.62$, $MSe=.2322$, $p<.05$.
Recall of core facts was significantly better than recall of
peripheral facts: $F(1, 148)=42.0467$, $MSe=.1833$, $p<.001$.
Immediate recall was superior to delayed recall: $F(1, 148)=12.8134$, $MSe=.3252$, $p <.001$.

Discussion

Experiment 1 reported two findings that are germane to
the issues in modeling schematic processing: first, recall
of the two supporting facts, but not the label, was affected
by the level of consistency and relevance of the second
information; and second, recall of the two supporting facts
decayed at the same rate across conditions, while recall of
the label was unaffected by retention interval in any con-
dition. An additional finding, involving the second infor-

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mation, was that congruent items were remembered better than incongruent items, and core items better than peripheral.

From Hastie's (1980) model, we had predicted that schematic information would be remembered better when followed by incongruent information than by congruent information, and this prediction was upheld in analysis of the two supporting facts (but not the label). Smith and Graesser's (1981) model predicted that level of incongruency would not affect recall of schematic information: this prediction is not supported by analysis of the two supporting facts, but is by analysis of recall of the stereotype labels.

Hastie's model predicts that the patterns of recall will not be affected by the retention interval. Consistent with this prediction, we found that the two supporting facts decay at the same rate across conditions. Smith and Graesser's model predicts that some types of information will decay less rapidly than others. Specifically, information under the generic schema should decay less rapidly than tagged information. Although it would be expected under this description that all schematic information, including the two supporting facts, would decay slowly, some support for this proposal is found in retention of the label.

Finally, both models allow for differences in memory of central versus peripheral information. The results of Experiment 1 support this common prediction with a main effect of superior recall of core second information. It

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was suggested that Smith and Graesser's different placement of the tag for peripheral consistent items as opposed to atypical tags might be manifested in some differential effect or memory of the peripheral consistent item as compared to core and peripheral inconsistent items, or to neutral items. The means in Table 2 indicate little support for this supposition. The peripheral consistent item is remembered slightly but not significantly better than the peripheral inconsistent item, and its effect on the two supporting facts is the same as that of a neutral item.

Discussion of these findings will be organized in terms of the two primary issues: what is the role of the schema in memory? and, what effect do incongruencies have on schematic processing?

Schematic Organization

Any differences found between core and peripheral items reflect application of the schema to incoming information. The core and peripheral items are not inherently different in informativeness; it is only in the context of a schema that they can be classified as highly relevant or unimportant. For example, "likes to party" is a peripheral attribute of a Greek, but a core attribute (inconsistent) of a Jesus Freak, according to the procedures used to develop the materials. If the schemas did figure in the processing of the information presented to subjects, then there should be differences in the effect of introducing similar items in

the context of two different stereotypes. We can infer from such differences that action of the schema at encoding must be included in the model.

The results show some confirmation of the predicted structural and processing differences. Core items were remembered significantly better than peripheral items. This finding is consistent with Hastie's principle of informativeness. However, although Hastie's model is termed a schematic processing model (Srull, 1981), he does not explicitly provide for involvement of the schema. Smith and Graesser's pointer does provide a mechanism for representing the schema, and their model generally provides a more adequate account of schematic organization of new information at encoding.

Core and peripheral inconsistent items had different effects on the processing of the initial information, as predicted from Hastie's model, but not from Smith and Graesser's. It seems that the primary distinction in schematic processing is between highly relevant and less relevant items, as Hastie proposes with his informativeness notion, rather than between highly congruent (i.e., predictable) and incongruent attributes, as in Smith and Graesser's representation. Therefore, although Smith and Graesser's model can account for schematic organization of new information, the particular organization they propose is not supported by the findings here.

Additional evidence of schematic processing comes from examining recall of the label: that memory of the label alone did not decay indicates that this information is somehow different from other kinds of information presented to the subjects. An apparent difference is that it is a nominative or subject, rather than a predicate or argument, as the other items were. The question remains how such nominative items are encoded or retrieved that prevents them from decaying at the same rate as attributes. One possibility is Smith and Graesser's (1981) suggestion that items that do not decay as quickly as others are reached easily through concept-driven retrieval because they are part of the generic schema. Hastie's model does not clearly predict that the label will decay slowly, although the model can accommodate the finding. Given the methodology used in Experiment 1, it is highly likely that the stereotype label, rather than the character's name, would constitute the subject node in Hastie's propositional network. In this case, it would be likely that any information retrieved about the character would be accessed through the label; and it would also mean that any particular item retrieved could lead back to the label.

This finding is interesting, however the label is represented, because the label is unique in that it may always be shared by the schema and the event memory. Other types of highly congruent information might or might not be present

in any particular instance. Such items might be guessed or inferred by some subjects, but for schematic processing to take place, it may be that a label (categorization) is always inferred. In the retention of the label, then, we may be seeing the clearest evidence of the effect of the schema. If so, the high memorability of the label may be due to its special relationship to 'generic' information or semantic memory. It remains to be determined whether a mechanism like the pointer is necessary to represent the dual origin of the label from the experienced event and from semantic or conceptual memory.

Generally, we can conclude that the schema is evident in the evaluation of new information as relevant or irrelevant (core vs. peripheral and neutral); in evaluation of relevant information as consistent or inconsistent; and in the special role of the schema label. Although Hastie's informativeness principle more successfully captures the pertinent organizational dimensions than Smith and Graesser's organizing principle of typicality, we find that Hastie has not explicated how the informativeness principle enters into the processing of schematic information.

Effect of Incongruencies

The core inconsistent item reliably facilitated recall of the two supporting facts. This finding provides clear support for Hastie's (1980) construction: after a preliminary evaluation to determine relevance to the schema, a

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highly relevant but incongruent item instigates retrieval of previous relevant information in an attempt to integrate and explain the incongruency.

There is a problem, however, with the mechanism Hastie proposes to account for the facilitating effects of elaborative processing. It is the core inconsistent item that becomes multiply linked, he explains, when it is compared with all other information. By this account, the two supporting facts should have shown superior recall in the core inconsistent condition because they were connected to the eminently memorable core inconsistent item. However, superior recall of the core inconsistent item itself was not found. Therefore, while it seems that elaborative processing instigated by the introduction of a highly relevant incongruency did facilitate recall of schematic information, this facilitation may not be best represented by linkages between the incongruent item and the two supporting facts. We might tentatively consider the notion that review of the two supporting facts upon introduction of a core inconsistency somehow integrated the schematic information, perhaps by establishing linkages (not otherwise present) between the two supporting facts.

In summary, Experiment 1 is found to support the notion of schemas generally, in that information is organized and amount of processing is determined with reference to relevance and consistency of new information with the appro-

priate schema. This organization conforms more to Hastie's description than to Smith and Graesser's, in that core items are remembered better than peripheral items whether consistent or inconsistent, and only core items seem to affect processing. Peripheral consistent items are neither remembered better than 'atypical' items, nor do they facilitate recall of schematic information more than atypical items, as might be predicted from Smith and Graesser's representation. Support might be found for Smith and Graesser's model in that recall of the label is unaffected by the retention interval, although Hastie's model can account for this finding also if the label is regarded as the subject node through which all other information in the network is accessed.

Core inconsistencies do facilitate recall of schematic information as Hastie's model predicts, but the precise mechanism he proposes does not quite fit the data. The finding of superior recall of consistent to inconsistent items favors Smith and Graesser's proposal that consistent items should be remembered better because they are under the pointer, but the primary prediction from this model that such consistent items should decay more slowly than all other item types was not supported.

We can, in conclusion, tentatively adopt Hastie's model with three provisos: it apparently fails to account for how the schema enters the picture, and therefore how decisions

of relevance and consistency are made; concommitantly, there is no account of how the schema might affect retention or retrieval, such that the schema label does not decay as rapidly as all other item types; and finally, the account of the facilitating effect of the core inconsistent item does not seem to be entirely accurate. We may tentatively adopt as a solution to the second problem Smith and Graesser's pointer to the label to prevent its rapid decay; and suggest in regard to the third problem that schema congruent information is integrated when disconfirming information causes retrieval and elaborative processing of this information.

In order to investigate further the role of inconsistencies in schematic processing, a second experiment was performed with two incongruent (and two congruent) items. The peripheral consistent and inconsistent conditions were not repeated, since Experiment 1 showed, as predicted, that they are neither memorable nor do they have an effect on processing of prior schematic information.

Experiment 2

Experiment 2 was designed to investigate the reliability and generality of the finding that a highly incongruent fact improved memory of the original schematic information, with the exception of the schema label, as found in Experiment 1. In addition to repeating conditions with a single highly congruent and a single highly incongruent item, conditions with two highly congruent and two highly incongruent items were introduced. With two highly incongruent items, the proportions of schema consistent and schema inconsistent information would be equal, excluding the label. We hoped to learn from this condition more about the role of the label, and whether schematic processing might be disrupted when there was as much counterevidence as supporting evidence, pursuing interest in the limits on schematic processing -- or, as it might turn out, in the perseverance of schematic processing in the face of disconfirming information.

No peripheral items were included, because Experiment 1 DEHAIMTROTED, as predicted, that the congruency of items that are not critical to the schema is immaterial. Only immediate recall was tested. Thus there were five within

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subjects conditions in Experiment 2: One Core Consistent
(+1C); One Core Inconsistent (-1C); Two Core Consistent
(+2C); Two Core Inconsistent (-2C); and Neutral. The design
and execution of the experiment were essentially the same as
in Experiment 1, although the materials were modified
slightly.

There were two alternative hypotheses for the effect of
two incongruent items on processing of the initial schematic
information. On the one hand, it could be expected that two
incongruent items would disrupt schematic processing. If
so, a character presented in that condition would be less
memorable than the others, and recall of the label would be
affected. Recall of other items associated with characters
in the -2C condition would be random, rather than being
organized by the schema. In that case, recall of the
initial core facts would be superior for the conditions with
only highly congruent items, in which schematic processing
could be expected to persist, than for the condition with
two highly incongruent facts.

Alternatively, on the basis of Hastie's (1980) model,
one might predict that two incongruent items would produce
even higher levels of recall of the two supporting facts
than a single incongruent item. The introduction of two
items requiring elaborative processing might induce two
retrievals of preceding schematic information from long term
memory, resulting in more interepisode linkages than intro-

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duction of a single incongruent item would produce. There would also be one more incongruent item to which the previously introduced congruent items could be connected.

Method

Subjects

Subjects were 100 students (50 females and 50 males) from an introductory psychology course participating in partial fulfillment of a course requirement or for extra credit. Requirements for participation were residence in a university dormitory for at least one semester during the preceding two years (1980-1982), age of 21 or less, and native speaker fluency in English.

Design and Materials

The design was a 2 (Consistent/Inconsistent) X 2 (One Second Fact/Two Second Facts) repeated measures factorial.

Materials were modified in three ways from Experiment 1. First, in order to create the conditions with two highly consistent or inconsistent items in the second information, the fourth ranking core fact was used in addition to the first. These items were not identical with those used in Experiment 1, however, because of a change in the calculation of cue values.

The second change is that one of the factors in the formula used to calculate cue value was modified. The measure of distinctiveness was previously defined as the number of

times an attribute was assigned to another stereotype category. Cue value was recalculated, weighting distinctiveness just as the measure of association was weighted: by multiplying the frequency by the mean rank assigned to the attribute for a stereotype. With this modification, an attribute that was frequently associated with a stereotype and was infrequently associated with other stereotypes, but was given high ranks in regard to the other stereotypes, would have a lower cue value than previously, and might exchange final ranking with another attribute that was more frequently listed under other stereotypes but was rated as less important to those stereotypes.

Two additional changes in the materials were made on the basis of observations stemming from a study on stereotype categories conducted in the interim. Norming procedures for this study revealed that the "Greek" (fraternity member) stereotype was no longer in the top five, having been replaced by a "Preppy" stereotype, one of whose core characteristics was membership in a fraternity; and the drug-using "Freak" had become a "Druggie". The new stereotypes and their attributes are given in Appendix D.

For this study, there were five assignments of stereotypes to conditions, and 10 orders of presentation of conditions, resulting in fifty different stimulus sets. Twenty-five tape recordings were made, one for each character in each condition. Each unique combination of stereotypes,

conditions and orders was heard by two subjects.

<u>Procedure</u>

Subjects were run in pairs. As in Experiment 1, they were told they would hear descriptions of five OU students and answer questions about them. They heard the first paragraph containing a name, year in college, stereotype label and two core consistent facts, then answered the two questions estimating typicality. They then heard an additional consistent fact (+1C); two additional consistent facts (+2C); an inconsistent fact (-1C); two inconsistent facts (-2C); or a neutral fact (N). Two more irrelevant details about the character followed. After hearing all the information, subjects responded to the typicality estimates again. Each subject heard five tapes, one in each condition, then performed a surprise recall task. The experiment lasted about 25 minutes.

<div align="center">

Results and Discussion
</div>

Three separate 2 X 2 repeated measures analyses of variance were performed on the data, one for each of the dependent measures: recall of the label, recall of the two supporting core facts in the first information, and recall of the one or two consistent or inconsistent items in the second information.

<u>Recall of the Label</u>

A single significant effect was obtained in recall of the label: the label was recalled more often in the incon-

sistent conditions than in the consistent conditions, $F(1, 98)=4.2$, MSe=.1339,p<.05. Mean recall of the label in the inconsistent conditions was 82%, and in the consistent conditions it was 74%. This finding contrasts with the results of Experiment 1, in which there were no differences in recall of the label by condition. The label now shows the same effect exhibited by the two supporting facts in Experiment 1. (See Figure 2.)

Recall of Two Supporting Facts

There was also a significant main effect of consistency for the two critical target items in the first information. When there was highly inconsistent information in the second paragraph, recall of the original consistent items was superior ($\bar{x}=1.185$) to conditions in which consistent information followed ($\bar{x}=1.03$), $F(1, 98)=5.4219$, MSe=.4431,p<.05. This finding (shown in Figure 3) is parallel to Experiment 1, replicating the finding of a facilitating effect on recall of the two supporting facts when followed by a single highly inconsistent item, and extending it to the case of two highly inconsistent items. Two inconsistent items did not facilitate recall of the two supporting facts more than a single inconsistent item, as predicted from Hastie's model, nor did they inhibit schematic processing as was alternatively predicted.

Second Facts

As in Experiment 1, analysis of this variable was

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confounded because target items in the second information were not held constant across conditions. Furthermore, in Experiment 2 there were one or two second facts, and recall was converted into proportions for the statistical analysis.

There was a single significant main effect. One fact was recalled proportionately more frequently ($\bar{x}=.74$) than two ($\bar{x}=.53$), $F(1, 98)=30.7439$, $MSe=.1334$, $p<.001$. Thus the finding in Experiment 1 of superior recall of the highly congruent item was not replicated.

Of the two alternative outcomes projected for Experiment 2, the pattern of results best fits the predictions from Hastie's (1980) model: highly incongruent items significantly facilitated recall of the schematic information. Both the label and the two supporting facts were affected. However, additional facilitation from two incongruent facts compared to one incongruent fact was expected from Hastie's model but was not found.

There was no reliable difference in recall of the core inconsistent and consistent items themselves. This finding is not necessarily incompatible with Hastie's (1980) description. When there are equal numbers of congruent and incongruent items, incongruent items are less unusual and therefore deemed less informative than when they are infrequent. On the other hand, highly congruent items receive elaborate processing because of their informativeness. This deep processing of core consistent items in the second

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information would render them memorable, but would not affect recall of the original schematic information.

As in Experiment 1, the results are more compatible with Hastie's model than with alternative predictions, yet the data are not a perfect fit with Hastie's model. Hastie's model generally predicts superior recall of schematic information when followed by incongruent information, and this facilitation was replicated in Experiment 2. Two incongruencies did not produce more facilitation of the two supporting facts than one incongruency, but an increase in the effect is manifested in a different way: the schema label, which was unaffected by incongruency in Experiment 1, shows facilitation in the incongruent conditions in Experiment 2. Results from both experiments will be considered in the light of the models, and a modified model accomodating all the findings will be proposed in the concluding chapter.

Conclusions

In the introduction, the question was raised, why, if
information incompatible with our beliefs is so salient and
memorable, are we not constantly in a state of cognitive
change? In a similar vein, Walter Lippmann, who coined the
term stereotype, observed "There is nothing so obdurate to
education or to criticism as the stereotype," (1922). The
data presented here might provide an answer to Clore's
(1982) puzzle and a cognitive processing explanation for
Lippmann's observation. The reason, we may infer from these
data, that stereotypes and other schemas resist disconfirma-
tion is that the effect of presenting evidence against their
accuracy or validity is to strengthen the beliefs on which
they rest, and to enhance memory for evidence supporting
their validity.

In noting the resistance of schemas to change, and the
resistance of people to abandoning an inappropriate schema,
Taylor and Crocker (1981) suggested several possible
underlying "liabilities" of schematic processing,
such as the interpretation of neutral information as
supporting evidence and the failure to encode (peripheral
inconsistent) aspects of the stimulus configuration

which are incompatible with expectations. They may have been correct that both these processes have a role under some conditions but in the absence of ad hoc research and a specific processing model, their account did not include additional processes suggested by the current research which result in maintainance of an inappropriate schema.

The next question, then, is: what sort of model of schematic processing does this research support? The model must account for schematic processing, in the sense of providing a role to expectancies and a mechanism for the imposition of schematic organization on new information. This explanation should include a description of the function and behavior of the label. The model should also account for the effects of incongruencies on the schema, and for the effects of different retention intervals.

It will be argued that Hastie's (1980) model can account for most of the effects found here yet his model does not provide a mechanism for implementing effects of the schema itself. Smith and Graesser's (1981) proposal, in contrast, provides a model of the schema, but cannot account for processing effects. In order to develop a model that can account for all the effects, first a list of the current findings with implications for modeling will be given; then the adequacy of available models to account for each of these effects will be evaluated; and, finally, a proposal for a comprehensive model will be made.

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<u>Findings to be Modeled</u>

The primary findings that must be accounted for simultaneously by a model are the following:

1. The schema plays a role in the organization of information at encoding: highly relevant items, both consistent and inconsistent, are remembered better than peripheral or neutral items; and highly inconsistent items are recognized as such.

2. The introduction of highly incongruent information facilitates recall of previously introduced congruent information, under both immediate and delayed recall conditions and whether there are one or two pieces of disconfirming information. Two incongruent items are not more facilitating than a single incongruent item.

3. All items decay at the same rate, with the exception of the schema label.

4. The schema label appears to be affected by subsequent information only when there are conditions in which the number of pieces of disconfirming evidence is equal to the number of pieces of supporting evidence, as compared to conditions in which there is more supporting than disconfirming evidence.

<u>Adequacy of Available Models</u>

The schema plays a role in organization of the information at encoding. It is necessary to posit that this organization of information according to the schema takes place at

encoding rather than at retrieval if we are to attribute the
facilitating effect of incongruent information on schematic
information to a review of previously stored information:
the incongruent information must be recognized as such at
encoding. Therefore, some set of expectancies must be
called up from long term memory (conceptual or semantic
memory) when the schema is activated. In the experiments
conducted here, we can assume the schema is activated by the
schema label. In other research on person memory, it is
assumed to be activated by the initial trait ensemble, or by
the impression formation task given after introduction of
the traits.

Although activation of the schema is assumed in
Hastie's model, and its origin is given as conceptual
memory, the schema is not mechanically represented in his
model, and has no further role. In Smith and Graesser's
model, the schema is mechanically represented by a pointer
to semantic memory and has a role in retrieval. Although we
have considered borrowing this mechanism and incorporating
it into a model resembling Hastie's, what information is
under the pointer and what information is tagged is problem-
atic. Experiment 1 suggests that only the label, not all
schematic information, is under the pointer, because the
label does not decay as rapidly as other types of informa-
tion and is unaffected by subsequent information, conforming
exactly to Smith and Graesser predictions for information

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under the pointer. In Experiment 2, however, the prediction breaks down. The label is affected by subsequent information. A second problem with adopting Smith and Graesser's representation is posed by other results of Experiment 1. In their model, core incongruent, peripheral incongruent, and neutral items would all be labelled 'atypical' and tagged onto the memory trace. Yet we find that core (congruent and incongruent items are remembered better than peripheral (congruent and incongruent) items.

The second process to be explained is the effect of the introduction of different levels of congruence on the initial schematic information. This effect was of primary interest in the current research. Because the finding of superior memory of schematic information when followed by highly incongruent information was predicted from Hastie's model, we have generally adopted a network associational approach. However, this model in the form presented by Hastie is unable to account for the absence of significantly better recall of the facilitating incongruent item itself, in Experiment 1. It is also unable to account for the equivalent facilitation from one and two incongruent items in Experiment 2.

Recall of the label was not affected by subsequent incongruencies or by delay in Experiment 1. We can account for the absence of an effect of delay or other variables in Experiment 1 by hypothesizing that it is the label alone to

which Smith and Graesser's pointer and generic schema information description applies. All other information would decay at the same rate because all linkages decay at the same rate. As suggested above, it might be just the label that is under the pointer and within the generic schema block. Such information quite conceivably could be invulnerable to manipulations. Yet obviously the label is not so invulnerable since it was recalled reliably more often when followed by inconsistent information in Experiment 2.

Looking to Hastie's model for an alternative explanation, we might suppose that in Experiment 1, where there was a single truly disconfirming item in one out of five stereotypes, only the two supporting facts were reviewed in trying to construct a causal attribution for the incongruent item; but in Experiment 2, where there was a total of three highly incongruent items in two out of five stereotypes, the label itself was retrieved and possibly called into question. As anecdotal support to this supposition, several subjects in the second experiment audibly reviewed the label on hearing the two inconsistent items, or questioned the experimenter. Subjects in the first experiment were not driven to such displays. Although this supposition may be essentially correct, it is not captured in Hastie's representation. All items are already connected to the subject node and linkages do not have differential strengths. Therefore, retrieval of the label from long term to working memory when two incon-

gruent items are introduced could establish no more or no
stronger linkages between the subject node and other items
than would exist otherwise.

It seems then, that neither of the two models under
consideration can perfectly account for the current data.
However, they provide partial predictions and close approxi-
mations from which an adequate model can be constructed.

Modified Model

The first problem is that to account for the appro-
priate evaluation of relevance of core and peripheral items
in Experiment 1, the vaguely referenced "expectancies" must
be represented. In keeping with Hastie's approach, we pro-
pose that the schema be represented by a network retrieved
from conceptual memory to working memory upon introduction
of the label in the experiments. This network has as its
subject node the same or a similar label as the experimental
stimulus. Under the subject node of the conceptual network
are "expectancy nodes", which might be visualized as
unfilled spaces corresponding to highly associated attri-
butes. Core attributes will pertain to these expectancy
nodes, but peripheral and neutral items entering working
memory will not. Thus linkages between the subject node and
core consistent items will be provided by the network from
conceptual memory.

The network from conceptual memory may have essentially
the same effect as Smith and Graesser's pointer to generic

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schema information. It might be possible, then, to modify the script-pointer + tag model to accommodate the findings about schematic organization in Experiment 1. It has been noted here that the first organizational distinction at encoding is between relevant and irrelevant information, rather than between congruent and incongruent information, as Smith and Graesser suggest. This distinction could be captured in their model if, instead of placing moderately typical (peripheral consistent) tags under the generic information and atypical tags under the memory trace, highly atypical (core inconsistent) items were tagged under the schema and the irrelevant items (peripheral and neutral) were tagged under the memory trace.

Turning to the second issue, the modified Smith and Graesser model can provide an account of the effect of core incongruencies on recall of the initial information. They would play precisely the role hypothesized for peripheral congruent items in the introduction: by tagging the information under the pointer, incongruencies would render the generic schema information more memorable.

However, it becomes problematic, under this modified model, to account for the absence of effect of incongruencies on the label in Experiment 1. This finding also presents problems for Hastie's model, but Smith and Graesser's model has two additional problems: it posits all-or-none accessing of information under the pointer, which clearly

was not found here, and it posits more rapid decay of tagged items than schematic items. The latter premise was not supported by interactions in analysis of immediate and delayed recall.

Modifications of Hastie's model are more easily accomplished to bring it in line with the current data. Tracing the process from the beginning, when the label is introduced, the schema is retrieved from conceptual memory. The two core facts in the first information instantiate two of the expectancy nodes, and the network is stored in long term memory. When another highly relevant and consistent fact is introduced in the second information, it is simply added to this memory trace as an additional instantiation: because this item easily "fits" the expectancy, prior information is not reevaluated. When a core inconsistent fact is introduced in the second information, the two supporting facts are retrieved from event memory, as Hastie describes, and causal reasoning takes places in an effort to understand the incongruent item. According to Hastie, during this elaborative processing, the incongruent item becomes linked to all other items and thereby facilitates their retrieval. The problem with this explanation is that it predicts superior recall of the incongruent item, which was not found here or in several other studies. A possibility is that during this reconsideration of the schematic information, the two supporting facts become linked to each other. These

new linkages would represent the "integration" of schematic information suggested earlier. Retrieval of the two supporting facts would then be improved because of but not via the core inconsistent item.

The difference between the findings in Experiment 1 and Hastie's findings could then be explained in terms of differences in the relationship of the highly incongruent item(s) to the subject node, due to differences in the experimental procedures used here and those used elsewhere. Here, the subject node was clearly the label. Subjects were not required to learn the characters' names, and did not store the information under the fictitious names. In Hastie's experiments, long lists of attributes were presented about a single character at a time (recall was tested after each character). For Hastie's subjects, then, the subject node may well have been the character's name, and the incongruent behaviors may have been linked to the subject node as well as to other congruent behaviors. In Experiment 1, the incongruent item may not have been linked to the subject node with which it was inconsistent, but was linked to the two supporting facts retrieved from event memory. A core consistent item, whether appearing in the initial or second information, could be accessed from the subject node through a linkage established in conceptual memory, but a core inconsistent item would not. This conceptualization, in contrast with Hastie's, is represented in

Figure 4.

An advantage of the proposed modified representation is
that it can also account for the fact that two incongruent
items do not facilitate recall of the two supporting facts
more than a single incongruent item. If access to the con-
gruent items depends on their linkages to incongruent items,
as under Hastie's model, they should be twice as likely to
be reached with two incongruent items. However, if the
incongruent item serves to establish linkages between the
congruent items, additional incongruencies could add
nothing. This explanation might also apply to a finding of
Hastie's, over which he expressed puzzlement. When Hastie
and Kumar (1979) varied proportions of congruent and incon-
gruent items, recall of incongruencies was affected, but
recall of congruent items was unaffected. Hastie (1980)
mentions that he is unable to account for the absence of set
size effects on recall of congruent items.

The third finding to be modeled is that all items decay
at the same rate, with the exception of the label. The
network associational model can easily accommodate this
finding. Hastie's model predicts that all items decay at
the same rate, but also that information is accessed through
the subject node, a concept similar to Smith and Graesser's
'all-or-none' access. If nothing else about the character
is recalled, it is likely that the label will be recalled,
but if anything else about the character is recalled (with

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the exception of recall of a single core inconsistent fact

only), it is likely that the label would be recalled.

The final problem is deriving a post hoc explanation for

the facilitating effect on recall of the label of one or two

incongruent items in Experiment 2, when the label was not

affected in Experiment 1. We have suggested earlier in this

discussion that when subjects are frequently hearing discon-

firming information, as in Experiment 2, the label is

retrieved along with the two supporting facts. Hastie's

model is unable to account for the facilitating effect of

this additional consideration of the label, since under his

model the subject node is already connected to all addi-

tional items. Under the modified model, however, the single

core inconsistent item in Experiment 1 is connected to the

two supporting facts, but is not linked to the label. We

can then suppose that when the counterevidence is so strong

that the subject not only tries to explain the incongruency

but also questions the categorization and therefore

retrieves the label, as in Experiment 2, the inconsistent

item becomes linked to the label in working memory. Under

Hastie's principle that recall is a function of the number

of linkages to an item, the subject node will be more likely

to be retrieved in the inconsistent than the consistent

conditions (see Figure 4).

In summary, the model proposed to account for the endur-

ing qualities of schemas, expectancies and prejudices is

similar to Hastie's network associational model, but adds a sort of network map from conceptual memory to represent the schema in working memory and explain its apparent normative role in encoding and retrieval. This schematic network assures that supportive evidence will generally be available from the subject node. The advantages of Hastie's model are retained, allowing for the representation of highly relevant but inconsistent items within the network in episodic memory, as opposed to other schematic models, such as Smith and Graesser's, which retain the schema as a rigid entity within episodic memory. With a modification of Hastie's depth of processing mechanism, the model can account for the facilitating effect of incongruent items without requiring the highly disputed superior recall of incongruent to congruent items. Instead of accounting for the high recall of additional core consistent items by Hastie's somewhat unsatisfying proposal of elaborative processing of "quintessentially characteristic" items, it is accounted for by a tacit schematic network from conceptual memory, and the direct linkage of core consistent items with the subject node. This proposal also resolves Hastie's puzzle about the absence of set size effects on congruent items.

As Fiske and Linville (1980) have noted, the problem with schema theory is that it lacks a model. They also point out that an advantage of schema theory as a basis of modeling cognitive processes is that it incorporates both

structure and process in a single theory. However, subsequent attempts provide a model for schema theory have focused on the schema structure (as in Smith and Graesser's model) or have accounted for the dynamic processes (as in Hastie's model). In this research, in looking for the answer to an old question about the stubborn, apparently irrational, persistence of mental habits, an attempt was made to find a model which would incorporate a conceptual schema into a processing model.

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Stimuli for Experiment 1

Stereotype frames:

Jesus Freak

Bill Norris is a freshman. He has been called a Jesus
Freak. He passes out pamphlets. He goes to church every
Sunday.

Bill...He is from Norman. He is nineteen.

Freak

John Innis is a sophomore at O.U. He is considered a freak.
He goes to rock concerts. He wears torn jeans and a t-
shirt.

John...He is from Tulsa. He is of average height.

Greek

Richard Dana is a senior at O.U. He is a Greek. He wears
Izod shirts and topsider shoes. He keeps up with the latest
fashions.

Richard...He is from Lawton. He has brown hair.

Jock

Peter Smith is a junior. He is a jock. He is big. He
wears gym shorts a lot.

Peter...He is from Oklahoma City. He likes Mexican food.

Brain

Jim Cravens is a second semester freshman. He is the smart
type. He studies constantly. He carries a large stack of
books with him.

Jim...He lives in the dorms. He eats in the cafeteria.

Items creating five conditions:

Jesus Freak

Core Consistent: Bill always carries a bible.

Core Inconsistent: Bill never carries a bible.

Peripheral Consistent: Bill is polite

Peripheral Inconsistent: Bill is rude

Freak

Core Consistent: John enjoys mind altering drugs.

Core Inconsistetn: John never touches drugs.

Peripheral Consistent: John is easy going.

Peripheral Inconsistent: John is uptight.

Greek

Core Consistent: Richard likes preppy clothes.

Core Inconsistent: Richard doesn't like preppy clothes.

Peripheral Consistent: Richard likes to party.

Peripheral Inconsistent: Richard doesn't like to party.

Jock

Core Consistent: Peter is extremely muscular.

Core Inconsistent: Peter is not very muscular.

Peripheral Consistent: Peter is not very interested in
                        school.

Peripheral Inconsistent: Peter is interested in school.

Brain

Core Consistent: Jim has a 4.0 GPA.

Core Inconsistent: Jim is on academic probation.

Peripheral Consistent: Jim enjoys time alone.

Peripheral Inconsistent: Jim doesn't like to be alone.

Neutral (same for all stereotypes):

X had a midterm last week.

Appendix B

Experimental Instructions and Materials

Instructions to subjects

After signing a consent form, subjects were told: "I
am going to play descriptions of five OU students and ask
you questions about them, so I just want you to listen."
The first half of the tape was played, and the subject was
handed an estimate sheet (sample included in this appendix)
with four questions. The experimenter then said, "I want
you to answer the first two questions by circling one of the
numbers," and pointed at the numbers aligned vertically
under question 1, and horizontally under question 2.

As soon as the subjects had answered the two questions
(before they had time to read the next two), the experimen-
ter said: "Now I'm going to play more information about the
same person," and restarted the tape recorder. When the
tape was finished, the experimenter said: "Now I want you
to answer the next two questions. You can answer them the
same way as the first time, or you can answer them differ-
ently." As soon as the subjects finished, the estimate
sheets were collected. The experimenter said, "I'm going
to play a description of another student." Again, after the
first half of the biography, the subject was handed an
estimate sheet, and asked to "answer the first two ques-
tions." After two biographies, it was not necessary for the
experimenter to repeat instructions. The subject listened

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to the tape, was handed the estimate sheet, held onto it
while hearing the second half of the biography, then turned
it in after answering the second two questions. Before the
fifth biography, the experimenter said, "This is the last
one."

After the fifth estimate sheet had been turned in, the
experimenter said: "Now I want you to write down everything
you remember about these five people. This is called a sur-
prise recall task. I have five recall sheets; each one has
the name of one of the characters at the top. I'll give
them to you one at a time in the same order as the descrip-
tions." The experimenter continued, "It doesn't matter so
much whether you get the right name with the right person as
that you try to remember all five people and write five
separate descriptions, so that we can tell which one you are
talking about." Subjects were given five recall sheets, one
at a time. Recall sheets were taken only when the subject
voluntarily returned it. They were not permitted to go back
to an earlier sheet and add to it once they had handed it
in.

When they had turned in five recall sheets, they were
asked "Is there anyone you were unable to remember but has
come back to you? If so, we have a sixth recall sheet with
no name that you can use to write down another description."
Most subjects did not want the sixth sheet. Some wanted it
to add on to a description they had already given and were

told, "It's just for another whole person." Some subjects who had returned a blank recall sheet were able to add a biography that they had not been able to remember in the correct order (or what they believed to be the correct order).

Subjects in the delayed recall condition heard essentially the same instructions, but left the first day after turning in the fifth estimate sheet, and heard the recall instructions on returning two days later, after an introductory statement, "Remember the five OU students you heard descriptions of the other day?" Subjects in Experiment 2 heard the same instructions as subjects in the immediate recall condition of Experiment 1.

Example of "Estimate" response form:

1. How typical of undergraduates at OU is Mark Innis?

    1
    extremely typical

    2
    very typical

    3
    fairly typical

    4
    somewhat typical

    5
    not very typical

    6
    not at all typical

2. What is the percentage of the student population at OU

   that is like Mark Innis?

   75%   60%   45%   30%   15%   5%

Your answers to the questions below might not agree with the
answers above.

3. How typical of undergraduates at OU is Mark Innis?

   1
   extremely typical

   2
   very typical

   3
   fairly typical

   4
   somewhat typical

   5
   not very typical

   6
   not at all typical

4. What is the percentage of students at OU that is like
   Mark Innis?
   75%   60%   45%   30%   15%   5%

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Example of recall response sheet:

 Write down everything you remember about Mark Innis.

ANOVA Tables for Experiment 1

Recall of the Label

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob
GP²	1	0.2817	0.2817	1.0221	0.31466
SS GP	148	40.7867	0.2756		
CI**	1	0.0017	0.0017	0.0068	0.93220
CI GP	1	0.3750	0.3750	1.5258	0.21624
SS GP CI	148	36.3733	0.2458		
CP***	1	0.1350	0.1350	0.4929	0.50916
CP GP	1	0.0817	0.0817	0.2982	0.59264
SS GP CP	148	40.5333	0.2739		
CI CP	1	0.0017	0.0017	0.0088	0.92266
CI CP GP	1	0.6017	0.6017	3.1637	0.07364
SS GP CI CP	148	28.1467	0.1902		
CORRECTION FACTOR		207.6817			

Recall of Two Supporting Facts

Source	DF	Sum Of Squares	Mean Square	F-ratio	Prob
GP	1	20.5350	20.5350	31.0966	0.00001*
SS GP	148	97.7333	0.6604		
CI	1	0.6017	0.6017	1.3075	0.25338
CI GP	1	0.0417	0.0417	0.0906	0.76168
SS GP CP	148	68.1066	0.4602		
CP	1	0.1350	0.1350	0.2386	0.63170
CP GP	1	0.8817	0.8817	1.5584	0.21129
SS GP CP	148	83.7333	0.5658		
CP CI	1	1.6017	1.6017	4.1578	0.04063*
CP CI GP	1	0.1350	0.1350	0.3504	0.56194
SS GP CP CI	148	57.0130	0.3852		
CORRECTION FACTOR		634.4817			

*GP=Immediate vs. Delay
**CI=Consistent vs. Inconsistent
***CP=Core vs. Peripheral

Recall of Second Fact

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob
GP	1	4.1667	4.1667	12.8134	0.00078*
SS GP	148	48.1266	0.3252		
CI	1	1.3067	1.3067	5.6272	0.01794*
CI GP	1	0.3267	0.3267	1.4068	0.23560
SS GP CI	148	34.3667	0.2322		
CP	1	7.7067	7.7067	42.0467	0.00000*
CP GP	1	0.1667	0.1667	0.9093	0.65625
SS GP CP	148	27.1266	0.1833		
CI CP	1	0.4267	0.4267	2.5873	0.10581
CI CP GP	1	0.1667	0.1667	1.0106	0.31748
SS GP CI CP	148	24.4066	0.1649		
CORRECTION FACTOR		119.7067			

Appendix D

Stimuli used in Experiment 2

Stereotype Frames:

<u>Druggy</u>

Mark Innis is a junior. He is a druggy. His eyes are often blood-shot. He goes to rock concerts.
Mark...He is twenty. He has a sister.

<u>Preppy</u>

William Cole is a senior. He is a preppy. He belongs to a fraternity. He is sometimes snobbish.
William...He is from Norman. He is twenty-one.

<u>Jock</u>

Bob Louis is a sophomore. He is a jock. He is a big guy. He has a cocky manner.
Bob...He has brown hair. He is nineteen.

<u>Brain</u>

Brad Richards is in his third semester. He is a brain. He studies most of his free time. He always carries a lot of books.
Brad...He is from Oklahoma City. He has a brother and a sister.

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Jesus Freak

Sam Carlson is a freshman. He is very religious. He always
carries a bible. He goes to church every Sunday.
Sam...He is eighteen. He has a brother.

Items creating conditions for each stereotype:

Druggy

1 Consistent: Mark wears old jeans and t-shirts.

2nd Consistent: He has long hair.

1 Inconsistent: Mark wears dress slacks and shirts to
                class.

2nd Inconsistent: He has short hair.

Preppy

1 Consistent: William wears alligator shirts and dock-
               siders.

2nd Consistent: He is concerned with being in style.

1 Inconsistent: William wears overalls without a shirt.

2nd Inconsistent: He is careless about his appearance.

Jock

1 Consistent: Bob is muscular.

2nd Consistent: He wears gym shorts to class.

1 Inconsistent: Bob is physically weak.

2nd Inconsistent: He wears a coat and tie to class.

Brain

1 Consistent: Brad has a 4.0 GPA.

2nd Consistent: He usually wears glasses.

1 Inconsistent: Brad has a 2.0 GPA.

2 Inconsistent: He is vain about his appearance.

Jesus Freak

1 Consistent: Sam passes out pamphlets on the South Oval.

2nd Consistent: He doesn't drink or party.

1 Inconsistent: Sam never talks about religion.

2nd Inconsistent: He likes to drink and party.

Neutral (Same for all stereotypes)

 X had an exam last week.

Appendix E

ANOVA Tables for Experiment 2

Recall of Label

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob
CI*	1	0.5625	0.5625	4.20000	0.04054*
SS CI	98	13.1250	0.1339		
OT*	1	0.2025	0.2025	1.0736	0.30321
SS OT	98	18.4850	0.1886		
CI OT	1	0.0625	0.0625	0.3671	0.55312
SS CI OT	98	16.6850	0.1703		
CORRECTION FACTOR		241.8025			

Two Supporting Facts

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob
CI	1	2.4025	2.4025	5.4219	0.02068*
SS CI	98	43.4250	0.4431		
OT	1	0.0625	0.0625	0.1110	0.73908
SS OT	98	55.1850	0.5631		
CI OT	1	0.0025	0.0025	0.0048	0.94326
SS CI OT	98	51.0450	0.5209		
CORRECTION FACTOR		490.6225			

Second Facts as Proportions

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob
CI	1	0.0056	0.0056	0.0369	0.84228
SS CI	98	14.9312	0.1524		
OT	1	4.1006	4.1006	30.7439	0.00001*
SS OT	98	13.0712	0.1334		
CI OT	1	0.0306	0.0306	0.1831	0.67342
SS CI OT	98	16.3918	0.1673		
CORRECTION FACTOR		160.6556			

*CI=Consistent vs. Inconsistent second fact(s)
**OT=One vs. Two second facts

Table I

Attribute structure for five stereotypes in Experiment 1

CATEGORY:	ALL	Jesus Freak	Freak	Greek	Jock	Brain
CUE VALUE†						
Core Mean	84	89	81	77	81	92
Peripheral Mean	34	41	22	39	31	36
Grand mean	60	65	59	58	56	64
Range	12-120	18-97	12-110	32-98	13-115	22-120

Summary data on cue values for five stereotypes

†Cue value = (frequency of association of an attribute with
a stereotype) x (mean rank) - (frequency of
association with other stereotypes)

Table 2

Mean recall for three dependent variables in Experiment 1

| | Recall Interval | | |
	Immediate	Delay	M
Dependent Variable			
Label:			
Core Consistent	.61	.53	.57
Core Inconsistent	.60	.55	.57
Peripheral Consistent	.56	.65	.61
Peripheral Inconsistent	.67	.53	.60
Neutral	.60	.55	.57
Two Supporting Facts:			
Core Consistent	1.16	.76	.96
Core Inconsistent	1.37	.88	1.13
Peripheral Consistent	1.19	.88	1.03
Peripheral Inconsistent	1.13	.85	.99
Neutral	1.09	.97	1.03
Second Fact:			
Core Consistent	.69	.57	.63
Core Inconsistent	.56	.41	.49
Peripheral Consistent	.41	.29	.35
Peripheral Inconsistent	.45	.17	.31
Neutral	.29	.05	.17

Table 3.

Mean recall for three dependent variables in Experiment 2

| | Number of Second Items | | |
	One	Two	M
Dependent Variable			
Label:			
Consistent	.73	.75	.74
Inconsistent	.78	.85	.82
Neutral			.77
Two Supporting Facts:			
Consistent	1.04	1.01	1.03
Inconsistent	1.21	1.17	1.19
Neutral			1.24
Second Fact(s):			
Consistent	.73	.55	.64
Inconsistent	.74	.52	.63
Neutral			.29
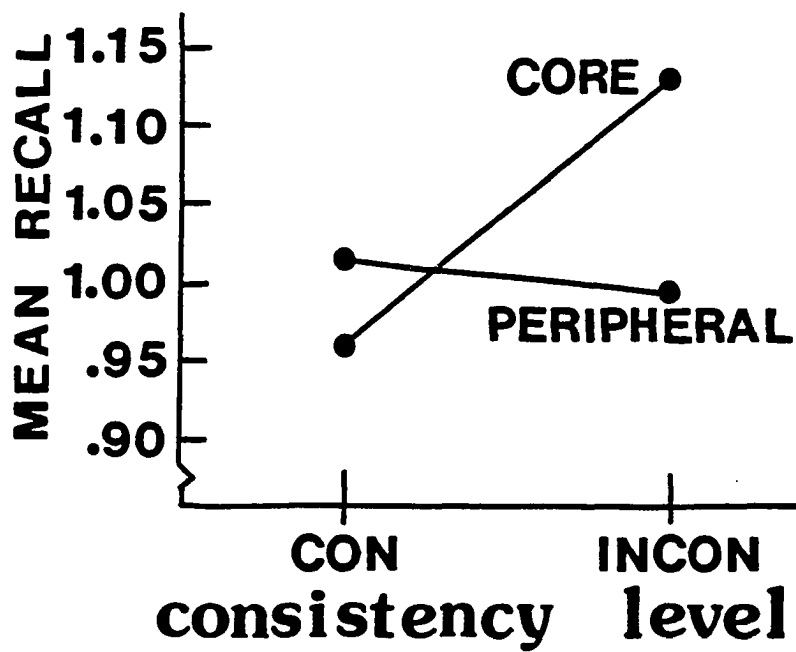
Figure 1

Mean recall of two supporting facts in Experiment 1,
collapsed across immediate and delayed recall conditions.
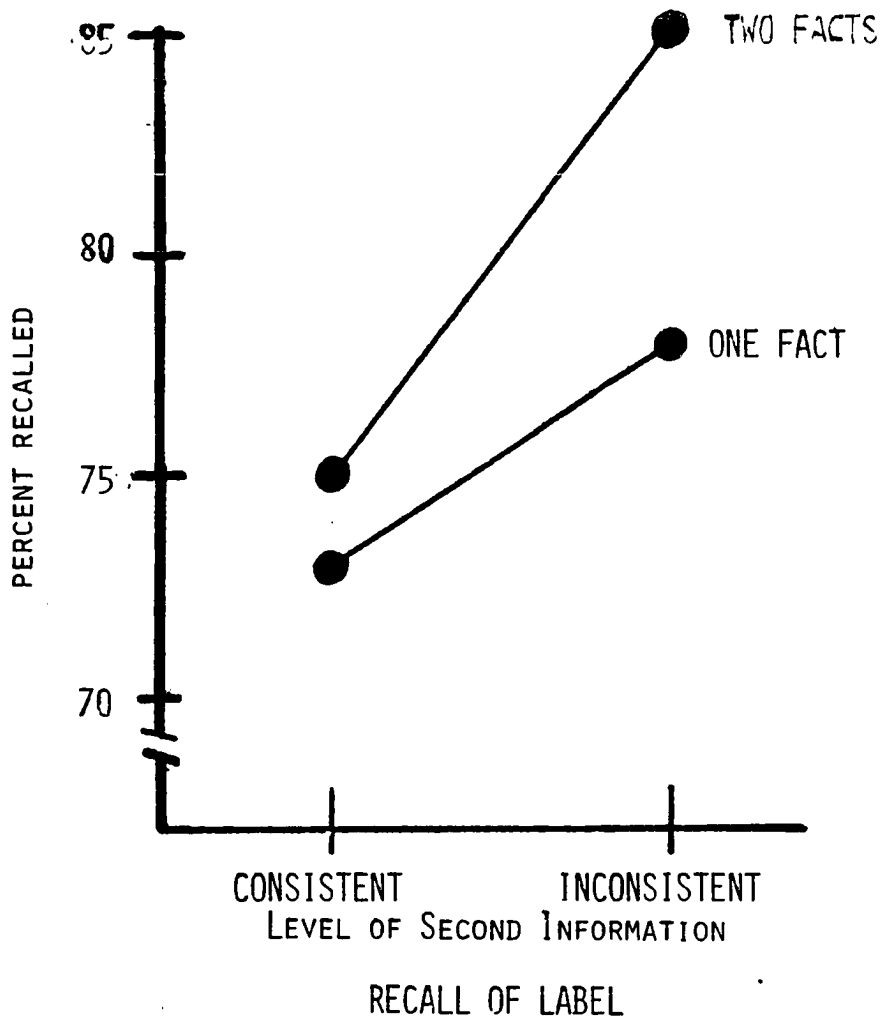
Figure 2

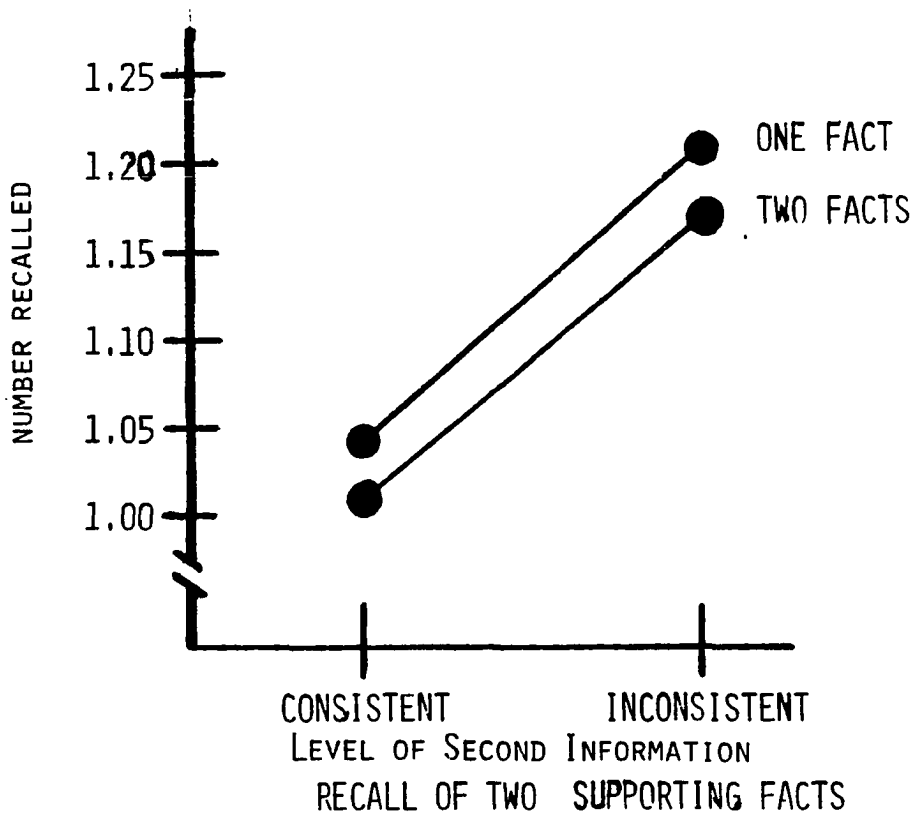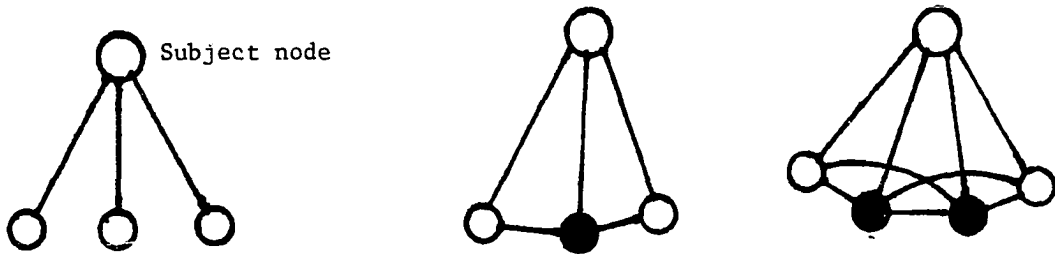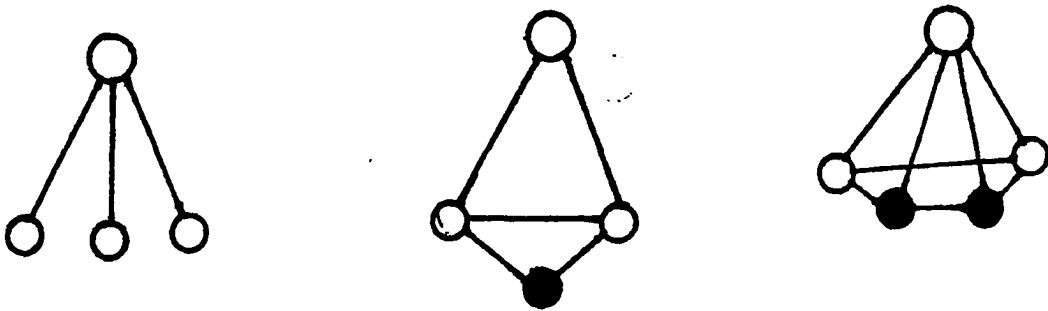Percent recall of stereotype label in Experiment 2

Figure 3

Mean recall of two supporting facts in Experiment 2

Representation of relationships among subject node, congruent
items, and incongruent items according to Hastie's (1980) model

○ Congruent item

● Incongruent item

Representation of relationships among subject node, congruent
items and incongruent item(s) according to proposed modified
model

Figure 4

Representations of effect of introduction of incongruencies
in network models