On the Coherence of Mental Models of Persons and Relationships: A Knowledge Structure Approach

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I saw John for the first time in a local bar, having a few drinks. He was a slim, attractive man, in his forties I'd say, tall with nice wavy black hair and a touch of gray. He wore a business suit, and his briefcase was sitting by the bar stool. I noticed he wasn't wearing a wedding band. He looked over at our table and seemed to nod in my direction. Wendy and I looked at each other and smiled. "He's all yours, Mary," she said. We told the bartender we'd like to offer that fellow his next drink. It didn't take long to get a response. "I'm John," he said, as he tipped his drink and asked if he could join us. John was attentive and charming. He told me I was attractive and that he'd had his eye on us since he came in. We both found ourselves listening and giving him the floor. He talked about his job, his recent failed marriage, and his college days at Princeton.

What do these actions mean? Why did Mary and Wendy invite John to their table? Why did he accept? What was he doing in the bar? Such kinds of questions are common in everyday life. As observers and interactants we want to understand events and so attempt to construct a coherent picture of sequences of actions, what individual are doing, and what they are like. Moreover, as relationships develop with time and further interaction, we construct more detailed models of our partner and the relationship. These models are critical for guiding behavior in interactions and in relationships. Yet we know surprisingly little about how people construct such models and how they cohere. The aim of this chapter is to outline a model of how people develop coherent models of others.

Coherence is a concept used by scholars in a variety of fields (e.g., linguistics, communications, cognitive science, philosophy, and psychology). Although definitions of coherence vary widely (see Kellerman & Sleight, 1989), a common theme concerns the extent to which elements (e.g., sentences in a text, propositions in a network, or speech acts in a conversation) go together to form a
meaningful whole (Fisher, 1989). But what factors determine whether things go together or cohere? Although researchers have suggested a number of possibilities, we believe that the coherence central to social interaction is provided by theories, omen crucial and goal-based theories, concerned with how things are related to one another or go together (Murphy & Medin, 1985). These theories are often embedded in complex knowledge structures, such as those analyzed by Schank and Abelson (1977) (also see Galambos, Abelson, & Black, 1986; Schank, 1982).

Knowledge structures include goals, plans, scripts, tales, and themes. These structures enable us to make inferences from elements (e.g., behavior, speech acts, events) and to link these inferences and elements to help form coherent models of interactions, persons, situations, and relationships. We suggest that a variety of principles of coherence (Thagard, 1989) guide the development of these models and guide the choices we make among different competing mental models. Furthermore, we suggest that seeing coherence is an important and fundamental goal of understanding; it provides the underlying dynamic in the development of individuals' mental models of interactions, other persons, self, and relationships in the world. The more that people perceive that a model coheres internally and with other outside information, and judge it as more coherent than alternative models, the more that individuals are apt to feel that they understand events.

People construct models, and thus make judgments of coherence, at a variety of levels: at the level of specific short behavioral sequences; at the level of longer behavioral consequences and extended conversations; and at the level of elaborate models of persons, situations, and relationships. People's models of the current situation, as well as their more general models of their partners and relationships, play a major role in guiding their interactions. Thus, understanding how individuals develop coherent mental models is a fundamental issue in studying social interaction and developing relationships.

To further explicate what we mean by coherence and to investigate the process by which individuals develop coherent mental models, we first outline the knowledge structures that are apt to be used in developing coherent mental models (Miller & Read, 1987; in press; Read & Miller, 1989). Next, we describe a model of how mental models of events, persons, and relationships are constructed and examine the principles of coherence (Thagard, 1989) that are applied in building mental models. In doing so, we illustrate how the constructs that we often use in everyday parlance (e.g., traits, roles) can be economical labels for elaborate mental models and how attempts to develop and combine these models may shed light on (a) the goal-based structures that may underlie them and (b) what coherence principles are applied in their construction. Finally, we discuss the implications of this approach for interpersonal relationships.

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KNOWLEDGE STRUCTURES USEFUL FOR UNDERSTANDING PERSONS AND RELATIONSHIPS

As the theory of Inter-personalism argues (Miller & Read, 1987; in press; Read & Miller, 1989), goal-based structures (e.g., goals, plans, resources, and beliefs) provide a common language for thinking about the relations among persons and between persons and situations. Within this framework, stable individual differences are viewed as chronic configurations of the individual's goals, plans, resources, and beliefs. Similar structures can be used to conceptualize situations and relationships. Thus, the theory offers a common language of goal-based structures to analyze how individuals interact with situations and with each other. Earlier work (Miller & Read, 1987; Read & Miller, 1989) used these structures to outline a framework for thinking about cognition and behavior in relationships. Here we focus on the implications of this approach for understanding how people comprehend the behaviors of others and build coherent models of them. First, let us consider the building blocks of these structures in greater detail.

Building Blocks

Goals. A goal is something that the individual desires or wants to attain. Among the wide range of possible goals are basic biological needs, such as food, sleep, and sex; social goals, such as companionship, respect, love, security, and success; and more abstract goals, such as truth and justice. Goals that are particularly relevant to social relationships include, for example, making a positive impression, establishing an intimate relation of friendship, and avoiding rejection. In our earlier example, Mary may have desired a close relationship and possibly a marriage partner; she may have perceived that John had the same goals. John may actually have had the goals of wanting to impress and flatter her, and wanting physical intimacy. Individuals must infer partner goals from behavior; their inferences about partner goals may or may not overlap with actual partner goals.

Knowledge of relationships among goals is important for understanding behavior both alone and in interactions with others. Wilensky (1983) has analyzed extensively two major types of goal relations: interpersonal goal relations, which are relations among the goals of a single individual, and interpersonal goal relations, which are relations among the goals of two or more individuals. Interpersonal goals may be unrelated, they may overlap (in which case the same plan may achieve multiple goals), or they may conflict. Goal conflict may be due to one or more limitations (e.g., resource limitations such as insufficient time to carry out all of one's plans; state limitations, such as physically being unable to
Plans and strategies. Plans are organized sequences of behavior aimed at the attainment of a goal. They are organized in a goal-subgoal hierarchy, composed of subgoals of behavior that are combined in an overall plan. Plans can vary tremendously in detail, from the quite sketchy to the highly detailed. Often, an individual possesses several alternative plans for a given goal. For example, if our goal is to establish a close relationship, we might choose between disclosing intimately and being particularly responsive to our partner's needs. The choice of a plan depends on factors such as the perception of the context, the availability of resources, and the judged likelihood that it would achieve one's goals. Mary and Wendy may perceive that John needs to talk, and perhaps that the best way to allow him to achieve his goal is to listen; this may also achieve their goal of being perceived as likable and responsive, and may fit it with other personal structures for Mary (e.g., to be perceived as feminine) or John (e.g., beliefs about what men and women are like and what one does to win a woman over). Although particular goals and plans are associated, a particular plan can often achieve several goals, and several different plans could be used to attempt to achieve the same goal.

Resources. Plans have conditions that must be satisfied for them to be enacted. Satisfaction of some of these conditions depends on states of the world that are beyond the individual's control. However, satisfying these conditions often depends on the individual's possession and utilization of the necessary resources.

There are a number of different kinds of resources that are relevant to the successful enactment of social plans. Various taxonomies of these resources have been suggested (e.g., Fox & Fox, 1974; Wilensky, 1983). Here we focus on an abbreviated version of a taxonomy proposed by Read and Miller (1989). There are several general sources of resources: personal resources that the individual has access to individually, resources that are afforded by the situation, and resources that are available through our relationships with others.

Personal resources include (a) cognitive resources, which include mental skills, abilities, and strategies; (b) knowledge concerning the social and physical world as well as one's memories of past experiences and events; (c) specialized talents and abilities, such as musical and athletic skills; (d) physical attributes, including such things as physical attractiveness, body build, health, and energy level; (e) social, expressive, and communicative skills; (f) position and status; (g) time; and (h) possessions, such as money and physical objects that can play a role in plans. When we lack important resources we may fabricate having these resources to impress others and to encourage the belief that we are the type of person who fits their needs. Men and women are known to fabricate aspects of their appearance, and to exaggerate or fabricate other resources (e.g., social class, position, college backgrounds, intelligence). However, if we are attracted to another because of their resources (e.g., appearance, social and communicative skills, money, inner spirituality, social status), and these are vital to the fulfillment of our goals, we are less likely to stay in the relationship if we discover we were mistaken in our initial judgment—or worse, deceived.

Situational resources are those afforded by a particular situation. For example, situations afford access to particular people and objects that may be important to our plans.

Finally, relational resources are afforded by our relationships with others. Among these are (a) cognitive resources, which include such things as transactional memories (Wegner, Gialiano, & Fertel, 1985) in which a couple's joint knowledge is greater than the sum of its parts; (b) material resources, such as a home, that a couple can only afford together; (c) social and affective resources, such as mutual love and social networks; and (d) physical resources, such as sex and resulting offspring.

Although our knowledge remains quite sketchy about the nature of different kinds of resources and their role in people's plans, it is quite apparent that there are important differences among resources. These differences have important implications for people's ability to carry out their plans and for the potential relations among plans (Read & Miller, 1989; Wilensky, 1983). Such resource differences may provide important clues as to when we should and should not expect consistency in behavior across situations. Furthermore, knowledge of the differences among resources may provide insight into how people can deal with various kinds of goal conflict. For example, John may perceive that he lacks the resources Mary needs to consider him for a sexual relationship. If he fabricates these, he may win her over; because he is not really interested in a long-term relationship, he will be long gone before she discovers the deception and he may have achieved his goal.

Beliefs. Individuals possess an enormous number of beliefs about themselves, other people, and the world. These beliefs affect the choice and execution of goals and strategies. They also play a role in inferences about one's own and
others' behavior. Beliefs may also influence the evaluation of the effectiveness and morality of plans. And beliefs may involve inferences about the characteristics and likely behavior of social objects, as well as inferences about the nature of our relationship with others.

Beliefs may be part of complex systems, in which some beliefs activate other beliefs in a given cluster. We may have schemas involving organized sets of beliefs about the self, others, relationships, or even about what we think others may think. Some of these schemas may be culturally shared (e.g., stereotypes, themes about roles, social norms and rules, scripts); some may be unique for the individual (e.g., mental models about what others generally are like, self-schemas) and how the individual views particular others or particular unique relationships (e.g., mental models of one's own marriage). For example, John may believe that others are basically not trustworthy, that you have to hurt others before they hurt you, that it is impossible to be close to others, and that you cannot depend upon others. In contrast, Mary may perceive that others are trustworthy and that she can depend upon them and feel close in relationships. It is noteworthy that beliefs and knowledge, viewed as a resource, involve some overlap. Beliefs, we would argue, could usefully be viewed as resources to the extent that they enable the utilization of plans to achieve goals.

Complex Structures

Using these basic building blocks a variety of more complex configurations can be constructed to represent persons, situations, and relationships.

Traits and other person structures. We have argued (Miller & Read, 1987; Read & Miller, 1989) that stable individual differences can be conceptualized in terms of chronic configurations of four components: (a) an individual's chronic goals, (b) the plans and strategies for achieving those goals, (c) various resources that are required to successfully carry out the plans and strategies, and (d) beliefs about the world that affect things as the likelihood of activation of goals and the execution of plans. Similar arguments about the importance of one or more of these components in the analysis of individual differences have frequently surfaced (Allport, 1937; Alston, 1970, 1975; Carnevali, 1979; Cattell, 1965; John, 1986; Mischel, 1973; Fervin, 1983). Although such configurations may be idiosyncratic to an individual, configurations that are shared across individuals in a culture will often be recognized by a trait label. Thus, we believe that traits can be analyzed in terms of the above four components.

John (1986) has recently presented an insightful conceptual analysis of traits that is similar to the above analysis and is in some ways more explicit. He has argued that the meaning of traits lies in underlying event scripts that are responsible for people's recognition of a behavior as an exemplar of a particular trait.

Such event scripts can be thought of as a general frame possessing a number of slots that can be filled by the appropriate concept. Among its slots are those for (a) a behavioral act, (b) the consequences of the act, (c) the roles and characteristics of the participants in the act, and (d) the goals and intentions of the participants. For example, consider John's analysis of the trait "charitable." To infer that someone is charitable, that individual must transfer a resource to someone and the recipient must be needy. In addition, the plan should use the appropriate resources; in this case the resource transferred should be something the recipient needs. Finally, actors should have the necessary goals: They must intend to benefit the recipient, and they must not expect to receive anything in return. Thus, the extent to which a behavior is a good exemplar of a trait should depend on how well the behavior matches the appropriate event script.

Interestingly, trait concepts often have embedded within them stories of the relationships between an actor and others. For example, when we use the trait "vindictive" we infer that there is a history between the actor and another, that the actor perceives that the other once harmed him, and that the actor is now in a position (e.g., has the resources) to reciprocate that harm and intends to harm (or has harmed) the other. Such examples suggest that the perceived goals of a behavior play an important role in trait inferences.

Consistent with the argument that goals are important components of traits, Read, Jones, and Miller (1990) have shown that ratings by one group of subjects of the extent to which a behavior achieved the goals associated with a trait strongly predict the confidence with which a separate group of subjects will make a trait inference from that behavior. Further, there is evidence that goals mediate the relations between various traits and the perception of obstacles to safer sex (Miller & Bettencourt, 1989).

The preceding components can be used to analyze the underlying structure of many traits and tell us much about the nature of the relations among traits that seem similar in some ways but quite different in others. For example, a lonely person and a sociable person may have very similar goals but differ in their plans, beliefs, and resources for goal achievement. Or, individuals may have similar strategies, resources, and beliefs (e.g., self-monitors and sociable individuals) but differ in their goals. By considering these goal structures as components of traits, researchers should be better able to understand why expected behaviors do not consistently occur (e.g., a resource was unavailable) and why and when we might expect behavioral change (e.g., development of new skills or alternate strategies).

Also, the relationships among goals, as suggested in this model, may affect the choice of plan and the subsequent behavioral enactment. A person who desires intimacy and wants to avoid embarrassment may find intimate disclosures too risky and opt instead to engage in a behavior that, while not necessarily the most effective for either goal, is the most acceptable given the overall configuration of goals.
This approach to traits is exciting because it allows us to understand the dynamic significance of trait terms, concepts that can be incredibly rich. Further, it provides insight into how people can use traits to summarize and explain the complex models they construct of the goals, plans, resources, and beliefs of others.

Situation structures. Argyle, Furnham, and Graham (1981) have presented an analysis of situations that parallels in many ways our analysis of person structures. First, they argued that a major component of a situation is the goals whose satisfaction the situation affords. Second, different situations have different roles associated with them; this makes some plans more salient, whereas others may be restricted. Third, in a given situation, particular behavioral sequences can be enacted for achieving goals within that situation. Fourth, rules governing appropriate behavior are associated with different situations. Finally, many situations have been associated with them particular resources that are important in carrying out plans. Therefore, in any given situation, behavior should depend upon the type of match between the individual's structures and the parallel structures in the situation.

Relationship structures. In addition to their use in analyzing individuals and situations, goal-based structures can be used to examine how individuals influence each other in a developing relationship over time. First, prior to or at the beginning of an interaction, an individual's goals, plans, resources, and beliefs may influence his or her choice of interaction partner for achieving various goals. For example, our views of how different partners may impact on our goals may considerably restrict who we date. Or our beliefs that married people should be faithful may keep us from achieving the goal of sexual intimacy with someone other than our spouse. Recent work on attachment styles suggests that perceptions of one's relationship with one or both parents and resultant models of self and others may influence dating (Collins & Read, 1990) and marital partner choices, and also patterns of vigilance, affect display, and satisfaction in interactions with current marital partners (Cooke & Miller, 1989). Furthermore, just as we may think of "possible selves" (Markus & Nurius, 1986), we may also think of "possible others" and "possible relationships" that we use to predict how our goal-based structures may interface with those of our partners (Miller & Jones, 1989). For example, in deciding whether to interact with someone we have been told is shy, we may take into account what some of the resource limitations of shy people might be (e.g., access to social networks, social skills deficits) and how these limitations might interface with our goal-based structures (e.g., we might have a working model that "a shy person would be OK with me because I'm so non-threatening I'd really be able to bring him/her out of their shell").

In addition to these general relationship structures, as individuals come to know others they are more and more likely to develop a unique relationship in which individuals influence each other and a unique model of the relationship emerges. Like mental models of physical systems (Gentner & Stevens, 1983; Johnson-Laird, 1983), these mental models of particular relationships are causal models that represent the characteristics of the persons in the dyad, such as their goals, plans, resources, and beliefs, as well as representing the relations among these elements. These dynamic representations are constantly updated in response to new information. Furthermore, because they are causal models they can be run, so that we can use our model of a person to simulate how they might respond to some action of ours. Thus, such models could be used to guide our interactions with a particular partner and predict and explain behavior. Such representations are apt to take into account whether the other person's goals and plans mesh or conflict with one's own, whether present and possible future goals integration is possible (e.g., will it be possible to negotiate two careers?), whether one's personal resources will be depleted or enhanced by one's relationship with another, and how this relationship might change how we view others, ourselves, and our own future possibilities. Over time, individuals may develop fairly detailed models of their partners and how they are likely to respond to themselves. As a result, the mere presence of the partner may activate goal-based structures that are unique to a particular relationship.

Much of our information about others comes from observations of their behavior in social interaction. But how do we understand the meaning of behaviors in even a single social interaction? For example, let us consider a conversation. An interaction between a speaker and a listener is a dynamic interaction involving mutual influences in which the speaker and the listener are enacting behaviors based on prior inputs from and assumptions about each other. To understand the meaning of a disclosure, for example, it is critical to understand why and how it is embedded as an utterance in a conversation. Clark (1985) noted:

When a person talks, he can't just utter words aloud and expect to be understood.
He must consider the people he is talking to, make an encyclopedia full of assumptions about them, and design his utterances accordingly. He must design what he says so that his specific addressees can figure out what he means, and they must interpret what he says assuming that he has selected it for them. (p. 227)

In addition, addressees, using a variety of linguistic and perceptual information as well as amplification of knowledge and beliefs, are also ascertaining the goals of the speaker and the speaker's intent, in developing a model of the speaker and of the interaction (Clark, 1985). How do individuals arrive at coherent models of the speaker and of the interaction?
DEVELOPING MODELS OF THE INTERACTION, THE PARTNER, AND THE RELATIONSHIP

Several theorists (e.g., Abelson & Lalljee, 1988; Druius & Omessi, 1985; Lalljee & Abelson, 1983; Read, 1987) have argued that understanding a dyadic interaction is very similar to what happens when we read a short story or novel. As we progress we build a representation of the sequence of events. New information is integrated with the preexisting representation. We continually build and add to our model of the characters and the sequence of events (Read, 1987). Of course, unlike reading a novel, our ongoing interpretation of events affects how we respond to others and the situation, and how others respond to us. Thus, participants' interpretations of events are part of the changing flux of events as individuals mutually influence each other. We attempt to build coherent models of the interaction, of the people in it, and of ourselves, so we can coordinate, guide, and understand the meaning of our interactions with others. In order to have smooth interactions with others, these models of interactions, persons, and relationships should be at least compatible, if not shared (Miller, 1990). Precisely how do people construct their representations of interactions?

Connectionist Modeling and Parallel Distributed Cognitive Processing

Te answer this question, we propose a model that is based on a connectionist model of comprehension (Kintsch, 1988; Manne & Kintsch, 1989) and work on parallel distributed cognitive processing (Rumelhart & McClelland, 1986; Thagard, 1989). The model includes two major steps. First, sets of concepts related to the input are activated; second, these activated concepts are organized into a coherent representation of the input. Although these steps can be understood on their own conceptual merits, certain aspects have been explicitly modeled in various computer simulations (Kintsch, 1988; Thagard, 1989).

Step 1: Activation of related concepts. Initially, input leads to the activation of a number of related concepts. Consider the earlier example of Wendy and Mary meeting John in a bar. An input like “bar” might activate related concepts such as “stool,” “drink,” or “pick up.” Via taxonomic relations, categories such as “chair” might be activated by “stool;” “social meeting place” might be activated by “bar.” Causal connections might activate other concepts. If we see a man spill a drink, it might activate the following thought, “Oh, no, he’s going to get it all over her dress.” A man’s presence in a bar might activate goal-based concepts such as “he’s trying to forget his troubles” or “he’s trying to pick someone up.” That is, a behavior may activate a particular goal (to forget one’s troubles) that this behavior (drinking) is known to achieve. If we see this man approach a woman and inquire, “What’s your sign?” we might via a part-whole relation activate the “pick up script” (Galambos, 1986). An action or object may also activate a role concept because it is an important part of the plans that are central to that role. For example, we may observe price quotes in a briefcase and wonder whether the owner is a salesperson.

Self-disclosures also provide a rich data source and allow one to make inferences beyond the present context about what partners are generally like or how they generally cope with situations and relationships. If John says, “I was just offered a promotion that I turned down because I didn’t want to work so hard on weekends,” such statements may activate other concepts (e.g., lazy, able, son vandant). Additional behaviors may also activate related trait concepts. For example, if John interrupts Wendy a number of times, and only talks about his own feelings and experiences while bragging about his accomplishments, traits like “egocentric” and “self-centered” may be activated. Visual information about the individuals, including such things as the physical appearance of individuals (e.g., wavy hair, grey business suit, white, male, tall, middle-aged) may activate stereotypes and concepts concerning race, age, gender, social class, roles, and so on.

Information about the context (e.g., a wall full of liquors and glasses, men initiating interactions with women) may activate additional concepts (e.g., bar or dating scene). Our own goals in the interaction, either as participant or observer, are also part of the context. For example, if we are interested in a long-term companion and this target is a middle-aged male, we may begin to assess whether or not this is a desirable candidate with whom to initiate an interaction. In doing so, we may wish to avoid meeting an alcoholic. Our goals may lead directly to the activation of concepts, or they may do so indirectly by affecting our attention to various aspects of the situation and our interaction partner. For example, we might wonder whether he is available. Does he look around, asking the bartender about someone who catches his attention? Does he attend to someone, offer another a drink, and so forth? Do his behaviors suggest a plan (e.g., finding a date)? Concerning whether he is an alcoholic may lead to the following type of information search: How many drinks does he order? How stiff are his drinks? How attentive is he to drinking? How quickly does he finish his drinks? Does he order a new drink before he finishes the last? Does he know the bartender? And so forth. In addition to the information available in the context, we may also have knowledge about these individuals based on our past history with them and information that others have told us.

We can illustrate concretely the activation of concepts by returning to our example of Wendy and Mary in the bar. They observe John and later invite him to join them. Figure 3.1 shows a variety of pieces of information from the ongoing sequence (here E1 to E18) that may be activated for Wendy. This information may be activate at the beginning of the interaction or it may be activated by events that occur later.

Wendy also makes inferences that allow her to summarize or explain the
events that the observer. These inferences can vary from being relatively low level and specific, to being much more general and higher level. For example, as indicated in Fig. 3.1, Wendy may infer that a number of relatively lower level structures (e.g., John is egocentric, John is trying to pick up Mary) explain much of the data. These lower level structures may in turn be explained by a higher order structure, "John is narcissistic" and may cohere around it. Further aspects of this figure, such as the numbers associated with the boxes, are explained in the next section.

Kintsch (1988) suggested that concepts are initially activated somewhat promiscuously, with no real check on whether they are consistent with the context or with other activated concepts. Following this, the initial input and the activated concepts are linked into a network of concepts. Initially, this network includes a mix of information activated by the input that is relevant, irrelevant, or even inconsistent with the eventual representation of the event. At this point there is only a loose network of concepts that is not yet a coherent representation of the interaction.

We assume that there will be a strong preference for linking concepts that have causal and goal-based relations to each other (G禧ambos, et al., 1986). There are three general possibilities for how any two concepts may be linked. First, there may be a positive or excitatory link, where the activation of one concept will increase the activation of another. In Fig. 3.1 these are represented by the single-headed arrows. Concepts that are causally related or have goal relations, causal relations, or part-whole relations (e.g., an action that is part of a script or plan) will be positively linked. Second, there may be a negative or inhibitory link, where the activation of one concept will decrease the activation of another. In Fig. 3.1 these are represented via the bold double-headed arrows. This occurs when concepts are inconsistent with one another. General examples are mutually exclusive roles, mutually exclusive category membership, mutually inconsistent event sequences, conflicting goals, mutually inconsistent explanations, and so forth. In Fig. 3.1, Wendy's inference that "John is egocentric and doesn't want to get close" seems inconsistent with the inference that "John is interested in Mary for a close relationship." Finally, there may be no relation between two concepts. The greater the number of positive (excitatory) links with other concepts and the smaller the number of negative (inhibitory) links with other concepts, the greater the degree of activation of a concept when activation is spread through the network.

**Step 2: Spreading activation through the network.** Once the initial loose network is built, a parallel constraint satisfaction process (e.g., Kintsch, 1983; Rumelhart & McClelland, 1986; Thagard, 1989) will be used to determine which of the activated concepts best characterizes the interaction and to arrive at a coherent, consistent representation of the interaction. In this process, activation is propagated through the links and concepts in parallel to arrive at the resulting
level of activation for the concepts. The greater the number of excitatory links to a concept and the greater the strength of the links, the higher the activation of that concept. Conversely, the greater the number of inhibitory links and the greater their strength, the lower the activation of that concept. By this process, concepts that are not supported by other concepts in the network die out, and concepts that are supported are strengthened. Concepts that are highly activated are taken as the representation of the interaction up to that point.

This process runs in cycles, with each cycle corresponding to an actor in the social interaction. For each cycle a new network is built consisting of new input, newly activated associative concepts, and information that is passed along from the previous cycle. Inferences, such as higher order knowledge structures, that receive high levels of activation will be among those that are passed on to the next cycle. In each cycle, we add new behaviors that are observed and any additional information to the representation. At this point, the new information, as well as the inferences from the previous cycle, will activate new concepts. These new concepts will then be connected into a network, and the parallel constraint satisfaction process will be applied. This cycle will continue throughout the interaction. As more data are received and more inferences are made, broader and more encompassing structures can be built. Further, inferences and representations at a number of different levels are created throughout this process.

In the preceding account we have talked about parallel constraint satisfaction processes in general terms. However, the details of how this is done (e.g., specified explicitly in different computer simulation programs) differ depending on the purpose and assumptions of a given model (e.g., Holyoak & Thagard, 1989; Kintsch, 1988; Rumelhart & McClelland, 1986; Thagard, 1989). One parallel constraint satisfaction process that is particularly useful for understanding how people form coherent models is Thagard’s (1989) recent model of Explanatory Coherence. What makes Thagard’s model and simulation particularly useful is that, unlike other connectionist models, this model and simulation are explicitly based on a set of assumptions about how higher order, causal, and goal-based theories are used to explain data and other inferences; consistent with Thagard’s position, we would argue that explanatory links to causal and goal-based theories underlie the coherence of mental models.

Thagard’s Model of Explanatory Coherence

Thagard proposed several principles for evaluating the coherence of the network of data and hypothesized explanations. The operation of these principles is actualized by applying a parallel constraint satisfaction process to the network. Thus, these principles are implemented via a computer simulation, although the validity of these principles can be usefully considered quite apart from their connectionist implementation (see Reed & Marcus-Newhall, 1990). First, the explanation that requires the fewest assumptions will be more coherent. This is the well-known principle of Parsimony or Simplicity. This follows from the structure of Thagard’s (1989) model because the activation provided by a fact is divided among the hypotheses that are needed to explain it. More hypotheses mean less activation for each hypothesis. Second, an explanation that explains more facts, that has greater breadth, will be more coherent. Thus, an explanation that explains more facts than an alternative explanation is more coherent. Further, any given explanation becomes more coherent as more facts are introduced that support it. This is a natural outcome of the model because explanations that are connected to (explain) more facts receive more activation than do explanations connected to fewer facts. Third, explanations are more coherent if they are explained by higher order explanations. This follows because a higher order explanation contributes activation to the explanation it explains. Here we can see the importance of high-level knowledge structures in coherence. And fourth, explanations are more coherent if they are supported by an analogy to another system with the same causal structure. This follows because the analogous explanation provides activation to the explanatory hypothesis.

Because Thagard’s (1989) simulation is a parallel process, connectionist model, it applies all the principles simultaneously to the entire set of explanatory propositions in judging the coherence of a set of propositions, rather than evaluating the principles and propositions one at a time. This is possible because these principles are actualized in terms of the ways in which data and explanatory propositions are connected in this model. Interestingly, it seems that the general notion of explanatory coherence and many of the principles that have been identified as the foundation of judgments of coherence naturally fall out of a mode that depends on a parallel constraint satisfaction process.

Let us use our example of Wendy to make this process more concrete. Figure 3.1 is based on output from Thagard’s (1989) Echo program. In that program, evidence or data (E1 to E18) are specified. In Wendy’s hypothetical interaction, these inputs are generally observations of behaviors or statements made in a conversation. Higher order propositions that are inferences made about the data are also specified. In Fig. 3.1, propositions A1 to A8 involve negative inferences about John, and propositions C1 and C2 involve positive inferences regarding his intentions with respect to Mary.

Following this, it is necessary to specify what explains each data entry and which inferences explain other inferences. For example, C2 (John wants to get to know Mary better) explains E15 (John told Mary he wants to see her again). Analogies may be specified (although none are specified in this example) as well as contradictions. As indicated in Fig. 3.1, four contradictions are specified in Wendy’s hypothetical model of John, all involving the inference “John is interested in Mary for a close relationship.”

Data have excitatory links to hypotheses that explain them (e.g., E1: John is leaving a drink in the bar, is explained by A1: John is an alcoholic) and inhibitory
links to hypotheses that are inconsistent with them (none present in this example). In addition, hypotheses that conflict have inhibitory links (A2: John is egocentric and doesn't want to get close, conflicts with C1: John is interested in Mary for a close relationship). Further, higher order explanations can explain (e.g., A3: John is engaging in a pick up script, explains A4: John wants Mary to like him) or contradict (e.g., A8: John is narcissistic, contradicts C1: John is interested in Mary for a close relationship) lower order explanatory hypotheses, which lead to excitatory and inhibitory links respectively. Finally, if a set of explanatory hypotheses are analogous to an already well established set of hypotheses, the established set of hypotheses will have an excitatory link to the proposed explanatory hypotheses (this is not illustrated here).

This set of data, and explanatory and contradictory propositions is then run. In each cycle (e.g., input in the conversation or behavior in a sequence), the activation level of each concept is computed. Activation levels at the point of data entry in the behavior: interaction of Wendy and Mary are given in Fig. 1 for each higher order inference: for example, .31 for C2 (John wants to get to know Mary better); .84 for A8 (John is Narcissistic). These activations can be thought of as the relative strength of these inferences in Wendy's model of the interaction. At the end of the reported interaction in Fig. 1, we see that Wendy has two competing mental models of John—one more positive, involving higher order structures C1 and C2, and a more negative model involving higher order structures A1 to A8. Wendy's model of John coheres around the inference that "John is narcissistic" (A8). That construct is more coherent than "John is interested in Mary for a close relationship" (C1) because it has more breadth and because C1 receives negative activation from higher order structures that are well supported by the data.

Wendy's model that John is narcissistic, egocentric, lying, and engaging in a pickup script is fairly coherent (the actual coherence of the overall model could be calculated using a variation of a statistic called "Harmony"; Thagard, 1989; personal correspondence). Now compare Wendy's representation of John and this event against Mary's version of events (Fig. 3.2). First, Mary's representation involves a somewhat different, although overlapping set of data that are activated (or encoded). Second, Mary's inferences in general tend to be more positive, although the higher order inference, "John is a liar," does get activated. Still, that inference is deactivated by the contradictory alternative inference, "John is an impressive man," which receives considerably more activation from the data. Mary's inference that John is interested in a close relationship with her is taut, in contrast to Wendy's, a leading hypothesis in her model of John. Still, Mary's model, although more positive, is far more fragmented and less coherent than Wendy's.

Advantages of this approach. The type of model outlined here has several advantages over alternative, more serial models. First, in discussing models of
discourse comprehension, Kintsch (1988) has pointed out that previous models need very smart inference rules that could figure out precisely what should be connected to what. A parallel constraint process does not need to be so smart, because it can start out with a somewhat incoherent network representation and settle on a representation that best fits, based on evidence from a number of sources. Second, it seems clear that the evaluation of the adequacy of the interpretation of a behavioral sequence often depends on the successful integration of multiple sources of information. A parallel constraint process makes it fairly easy to integrate information from a number of different sources concurrently. Also, it seems intuitively obvious that in any social interaction there are too many pieces of information available at the same time for people to integrate them sequentially. A parallel process allows them to be integrated at the same time, with each piece of information influencing each other piece of information.

In addition, this model helps us to understand how people choose among various characterizations of a sequence. Thagard’s (1989) model provides an elegant approach to understanding how people might choose among alternative knowledge structures as characterizations of individuals’ actions. Different scenarios could be constructed out of the same, or similar, set of facts, using different knowledge structures. Which knowledge structures are chosen and which scenario is constructed depends on which is more coherent. For example, as illustrated in Fig. 3.1, if two different structures, “John is interested in Mary for a pickup” versus “John is interested in Mary for a close relationship,” were potentially applicable to an interaction, we should prefer the one that requires fewer assumptions (simplicity) and that is able to handle more of the sequence (breadth). In addition, we might prefer structures that are consistent with previous interpretations of similar events (analogies), for example, we just saw a soap opera about a guy like John. Further, the principle that a hypothesis will be more coherent if explained by other hypotheses suggests that a characterization of a sequence would be more coherent, and thus more likely to be selected, if it could be explained by other features of the people involved, such as personal characteristics, goals, or abilities. For example, “John is interested in Mary for a pickup” would be more coherent if it were explained by “John is narcissistic.” Finally, Thagard’s model suggests that we should be unsatisfied with the application of a structure to a sequence if it leaves many of the facts and events unaccounted for. Read and Marcus-Newhall (1990) have recently provided experimental evidence that such principles of explanatory coherence play an important role in people’s evaluations of explanations for everyday social situations.

Thagard’s (1989) model can be applied not only to the coherence of interactions, but also to the coherence of mental models of other people. Thagard argued that a system S will tend to have more global coherence than another if (a) S has more data in it, (b) S has more internal explanatory links between propositions that cohere because of explanations and analogies, and (c) S succeeds in separating coherent subsystems of propositions from conflicting subsystems. This analysis suggests ways in which individuals are apt to differ in the extent to which their models of others cohere. For example, more coherent models would be those in which an individual has more accessible other-relevant data (e.g., close friends who know one another well), in which there are more internal explanatory links between beliefs and behaviors, and in which models in which coherent subsystems of beliefs and behaviors are effectively separated from conflicting subsystems.

Models of others are apt to differ both in the ways in which different behaviors and propositions are weighteal, as well as in the order in which inputs are encountered. As Thagard (1989) pointed out, the order of data entry can affect the likelihood that an individual will select a given hypothesis and retain it (even in the face of counterinformation and equally plausible alternative hypotheses). Analogies and preexisting knowledge structures (e.g., stereotypes) may also bias the process of perceiving persons and building models of them. For example, analogies from past relationships may bias how we construe propositions and behaviors of an individual in a current relationship. Thus, it is possible to examine how individuals differ idiosyncratically in terms of the construction and coherence of their models. Figure 3.1 illustrates how Wendy may differ from Mary (Fig. 3.2) in her construction of events about John. At the same point in time (in the bar on their initial meeting), despite similar exposure to “stimulus input,” Wendy’s most coherent model of John, represented here in Fig. 3.1, is that he is narcissistic and just looking for a pickup; Mary’s most coherent model of John, represented in Fig. 3.2, is that he is “interested in me for a close relationship.”

Thagard’s simulation provides an intriguing methodology to explore individual differences in the coherence of rich, idiosyncratic models. In addition, because the output provides activation levels for higher order structures, it is possible to relate these levels of activation to other variables (e.g., positive or negative responses to partners, personality dimensions, the coherence of partner’s models of the same interaction, understanding of the sequence and partner). It is also possible to plot changes in activations for new inputs over the course of an interaction or relationship to examine resultant changes in the mental models and activation of higher order structures.

In addition, by adding new evidence or inferences into a connectionist model, it is possible—at least hypothetically—to examine how such new information might affect a person’s current representation. And, if part of the network was changed (i.e., for example, if one belief was altered), the model may be able to predict the likely higher order structures around which the resulting model would cohere. Such possibilities are exciting for therapists interested in forecasting how specific changes in a client’s ways of construing events or others may influence the client’s overall models.
Behavior and Its Fit with Existing Models

We previously discussed how individuals develop models of people and interactions. But how is new information integrated with already existing models? What determines a perception of fit or lack of fit? Because research in this area is, at best, sparse, we will offer some concepts and ways of thinking about this problem.

**Latitude of fit.** When we ask to what extent a sequence of actions fits with our current model, we use the model to guide our expectations. Much of this processing will be top down rather than bottom up. As a result, minor or perhaps even major deviations may be viewed as fitting the model until enough critical pieces are present that a “not fit” threshold is reached.

Because the meanings of behaviors often depend on context and their timing, relative to other actions and events, even the same behaviors may lead to very different inferences about the goals and other knowledge structures in a given interaction (Read, Bruner, & Miller, 1989). Furthermore, initial hypotheses about the meaning of actions are likely to play a critical role in organizing subsequent information affecting what inferences are made. When we have pre-existing knowledge structures, such as traits, that have been useful in past contexts, we may attempt to fit observed behaviors within these structures.

Some behaviors, for example, listening attentively, are more malleable with a wider latitude of fit than others. “Wide latitude” behaviors are those that would fit in easily with almost any preexisting interpretation of the other. These would include smiling and being nonverbally responsive. For example, if we see one person smiling at another, that may fit with any number of traits attributed to this person by us in the past such as sociable, manipulative, warm, and superficial.

But not all actions may fit easily with existing structures. “Narrow latitude” behaviors, such as a slap or an insult, may fit with a much smaller number of potential structures. As a result, narrow latitude behaviors have a more limited range of possible meanings and are more restricted in their possible fit with existing structures. If an action departs from a prevailing model of the other, conscious processing is more apt to occur. The probability of such conscious processing should depend on the importance of the altered model for the relationship we are in, the extent to which discrepant information has accumulated in the past, and the ramifications for our own personal goals.

If we decide that a given model is no longer completely applicable to a person, there are several ways in which our conceptions might change. First, they may change in a qualitative way, as we decide that the individual is lower or higher on a particular dimension. We may have decided initially that Joe was highly sociable because we first met him he was the life of the party, making jokes and being the center of attention. Then, we see him at a party where he does not know anyone and he spends the bulk of the evening listening to a few people but taking a back seat. One way we may alter our conception of him is to decide that he was not as sociable as we thought.

Alternatively, our model of Joe may change in a much more qualitative way. For example, we may develop a more complex model of Joe (e.g., Joe engages in really extroverted actions only when he is feeling comfortable and secure). Such a view suggests that we have a model of Joe as having a configuration of chronically salient action structures (e.g., goals chronically salient to the person such as wanting to entertain but not wanting to be rejected) that gives the appropriate situational factors (e.g., a relaxed, accepting setting) results in highly extroverted actions. Implicit in this view of Joe is the knowledge that Joe could engage in the behavior (he has the requisite abilities and skills), but the enactment of extroverted actions depends upon other factors. Our model may also change in other ways. We may discover that Joe only seems friendly and outgoing when he is trying to impress people in order to achieve his professional goals (e.g., status, wealth, power). We may, thus, alter our model of Joe from being sociable to being Machiavellian.

Previously we discussed how a new piece of information may fit within an existing structure. People also frequently combine multiple subsystems of information about individuals and attempt to develop coherent models of them. Next we discuss how structures such as traits and roles may be combined, and how such combinations may be viewed as miniature but complex mental models.

**Conceptual Combinations and Coherence**

**Combining two trait concepts.** Asch and Zuckier (1984) investigated how people formed an impression of an individual, when they were told that the individual was characterized by two apparently discordant trait terms such as cheerful—gloomy, generous—vindictive, or strict—kind. Subjects found it relatively easy to arrive at coherent interpretations of the individuals with these traits. However, the resolutions were not usually the result of averaging the evaluations of the traits. Moreover, different resolution strategies were used for different trait pairs. Two important types of strategies that we would like to discuss are (a) inferring a higher order structure that explains the two apparently discordant traits and (b) one trait modifying the meaning of another.

When given the pair cheerful—gloomy, many subjects inferred a higher order knowledge structure that could explain both traits—for instance, that the individual was moody. This result can be explained straightforwardly in terms of our account of how people form models. According to this account, each trait activates a set of associated traits and concepts that are loosely linked. For example, the concept moody is likely to be activated because it is related to both gloomy and cheerful. Activation then spreads through the network, following Thagard's (1989) principles of explanatory coherence. The trait or concept that is most strongly activated, being the most explanatorily coherent, is moody.
The resolution for the generous—vindictive pair seems more complex. Many subjects suggested that the individual was only apparently generous, but was actually devious and scheming and used his or her apparent generosity in gaining revenge. Here, vindictive dominates the impression and strongly modifies our interpretation of the individual's generosity. Unlike the cheerful—gloomy pair, one member of the pair changes more than the other. This resolution process can be analyzed as follows. We have proposed that traits are composed of chronic configurations of four components: goals, plans, resources, and beliefs. Consistent with this position, Jofa (1986) has argued that traits can be viewed as frames possessing roles or slots, where information is stored both about the defaults for these slots and the range of concepts or values that are acceptable for these slots.

Thus, generous and vindictive have, as part of their representation, slots for the goals associated with the trait and slots characterizing the behaviors that can achieve those goals. Further, there are constraints on the range of values that can fill these slots. For instance, the range of goals for vindictive seems fairly narrow. It is hard to think of vindictive individuals and their behaviors as having any goal other than to hurt someone. In contrast, there seems to be a greater range for the goals related to generous. Although the most likely goal is probably something like helping or benefiting someone, there are other reasons why someone is generous, including self-presentational and strategic reasons.

Thus, the model suggests the following account of how people construct a representation of an individual who is both vindictive and generous: When we encounter the trait vindictive it activates a narrow range of goals having to do with hurting others and gaining revenge. In contrast, "generous" probably activates a wider range of goals, among them the goal of helping others, as well as self-presentational goals. The activation of self-presentational goals may be particularly likely when vindictive and generous are encountered at the same time. Further, people may infer that the individual is being deliberately deceptive and trying to hide his or her true vengeful motives by acting helpful. These concepts are linked in a loose network, with the goal of helping others (implied by generous) connected by an inhibitory link with the self-presentational goals related to generous, the inference about deception, and the goals of hurting others and getting revenge (vindictive). At the same time, the self-presentational goals of generous will have a positive link with the goals of hurting others and getting revenge, because such self-presentational goals enable one to hurt others.

In addition, the inference about deliberate deception will have a positive link with both the self-presentational goals and the goal of revenge. Then, when activation spreads through the network, the goal of helping others is strongly inhibited by the self-presentational goals related to "generous", by the goals of gaining revenge and hurting others, and by the inference about deliberate deception. On the other hand, the self-presentational goals related to generous, the inference about deliberate deception, and the goals associated with vindictive will mutually support one another because of their positive links.

One can carry out a similar analysis of the trait pair strict—kind, also investigated by Asch and Zukier (1984). Parallel to the above analysis, the range of acceptable goals seems greater for strict than for kind. These are multiple reasons why someone may be strict, including the goal of helping others, but it is hard to think of someone as being kind who does not have the goals of helping others. Thus, people can see strict behaviors enacted in order to be kind. For example, one may believe that children need discipline and will grow up to be psychologically healthier if they have that discipline.

It also seems quite plausible that for many people this conclusion is bolstered by, or even based entirely on, the retrieval of a stereotype or a particular memory of a strict teacher, coach, or parent who really did this because they wanted their charges to become moral and competent human beings. This would be an example of Thagard's (1989) principle that an explanatory relation is bolstered if it is supported by an analogy to another structure.

These examples are by no means exhaustive of the ways in which trait concepts, or indeed any social concepts, can interact. Asch and Zukier (1984) presented many other strategies that people use in combining discordant terms.

Combining social roles and traits. In the present discussion we have focused on how trait concepts can be combined. However, it seems likely that this general kind of modification model could be applied to any situation in which concepts are combined. One example of this would be combinations involving social roles. Krant and Higgins (1984) gave the example of the conceptual combination casual surgeon. The adjective casual by itself receives a positive evaluation as does surgeon alone, yet a casual surgeon receives a negative evaluation. But clearly the result of this combination does not depend just on the meaning of casual, because a casual professor receives a positive evaluation. Presumably what happens is that casual modifies the surgeon's performance of his job.

It is clearly the ways in which the concepts interact that are important. For example, consider combinations involving social roles, such as feminist bank teller and Republican social worker. Where our model of such individuals clearly is not simply the addition of two concepts. Recent work by Haslé, Schroeder, and Weber (1990) and Kunda, Miller, and Claire (in press) demonstrate that our model of such individuals often include emergent attributes that are not due simply to the addition or averaging of the attributes of the two concepts. Or consider the combinations aggressive man and aggressive woman. Why might those combinations result in very different inferences? One exciting possibility is that stereotypes associated with men, such as assertive and instrumental, can be easily combined with aggressive, so that we may assume that this man fits in the typical range and that his being aggressive is in the service of being instrumental. On the other hand, stereotypes associated with women (e.g., warm, kind, caring, helpful) present a problem: One is unlikely to be aggressive in the service of being warm. One possibility is to focus on the dimensions (e.g., warm, kind,
caring, helpful) associated with the concept “woman” and infer that this woman is not in the typical range. To combine this information, some observers might infer that this is an uncaring woman or a woman who is hurtful in contrast to the typical woman. Interestingly, if we knew that the same woman was both helpful and aggressive, a different conceptual combination might result; for example, she is aggressive in her sales job in trying to get leads but helpful at home. Or we might infer that she is aggressive (e.g., in her search for information) in trying to help others. It is an intriguing possibility to consider how this combination might be resolved differently for men. For example, this combination might be resolved as “men are helpful (e.g., with a client) in order to be more aggressive (e.g., competing against others in trying to secure the client’s business).” Thus, what could differ for perceivers in evaluating factors such as gender are the presumed organization of goals stereotypically associated with men and women.

We do not believe that the combination of just two items at a time is completely representative of how people develop detailed impressions of others from the richer information typically available in social interaction. Rather, we view such conceptual combinations as model systems that allow us to study, in miniature, how concepts are combined to form more comprehensive concepts or models. It allows us to get a handle on what is an extremely complex process.

**Interpersonal combinations.** In addition to conceptual combinations of interpersonal structures (e.g., traits, stereotypes, roles), individuals also combine in formation about one person with information about another in order to explain or make judgments about the dyadic relationship. For example, consider the tasks engaged in by matchmakers. They need to determine what it is about a woman and a man that will make a good combination. How do they do this? Do they take into account the goals of each person and the extent to which each person’s resources enable these goals to be achieved? Do they consider how the individuals might go about achieving their goals and the possible sources of conflict? Recently, Miller and Jones (1985) have explored the possible relationships that people create when given various different combinations of individual characteristics for men and women. When the same persons are matched with different partners, rates describe their relationships quite differently and make different judgments about couples, depending upon the expected fit between partners. Interestingly, if the characteristics assigned to the male and female members of the pair were swapped, this altered the relationship judgments. Thus, it would tentatively appear that gender stereotypes and sex roles, as well as trait inferences, may influence the development of mental models of possible relationships that individuals may have with each other.

**Goals in the organization of impressions.** Most of the examples we gave previously of conceptual combinations in impression formation involved traits. This was done largely for ease of exposition—traits are easy to talk about—rather than because we believe that traits are primary in impression formation. Indeed, we would argue that the organization of person information around an individual’s goals, plans, resources, and beliefs is at least as important, and maybe more important than a trait-based organization. Moreover, there are a number of reasons for thinking that traits are only one among several possible organizational structures. For example, work by Hoffman, Mischel, and Baer (1984) demonstrates that people are more likely to organize information by traits when they think they will have to communicate an impression to someone else, rather than keep the impression private.

Further, from a functional perspective, in terms of building mental models that can be used to predict another’s behavior and plan one’s own, organizing information in terms of goals, plans, resources, and beliefs would result in a representation that is much easier to use for simulating another’s behavior. First, in thinking about how an individual would react with a given situation, it would seem much easier to think about how the goals, plans, resources, and beliefs of the individual would fit with the parallel structures in the situation, than purely in terms of traits. Similarly, in thinking about how two individuals would interact, it would seem much easier to think about whether the partners will mesh in terms of their goals, plans, resources, and beliefs, than it would be to think about them in terms of their traits. And even when traits are important in organizing impressions, we have argued that it is the underlying frame or event script that is critical a how people combine the trait with other concepts.

Further, although researchers have rarely focused on forms of organization other than traits, we already know that many other forms of organization are important. For example, we undoubtedly organize much of what we know about people in terms of their roles (Cohen, 1981; Cohen & Exbesca, 1979). And Cantor, Mischel, and Schwartz (1982) have provided evidence that we organize information about others in terms of person-in-situation prototypes, where we explicitly represent the behavior of specific kinds of individuals in specific kinds of situations. Furthermore, Traub (1989) has recently reviewed a large body of research demonstrating that goal-based structures of various types play a major role in the organization of social information (see also, Galambos et al., 1986).

**Implications**

**Implications and Strengths of a Knowledge Structure Approach**

As Abelson and Black (1986) argued, one hallmark of the knowledge structure approach is that it provides a unified cognitive architecture that can be applied to a variety of problems and tasks. There is both a common set of representations and a common set of processes that are available for use in a variety of problems.
and tasks, such as (a) planning one's own behavior, (b) predicting another's behavior, (c) explaining one's own behavior and the behavior of others, (d) autobiographical memory, (e) analogical reasoning, (f) learning, and so on. We see this as an important strength in an attempt to develop an understanding of coherent mental models within a comprehensive model of dyadic interaction.

Another advantage of the knowledge structure approach is that it provides a level of representation that captures higher order configurational and emergent properties. For example, the concept of competition captures a particular kind of relation among the goals of two or more individuals in which only one individual can achieve his or her goals. If we think about a dating script, the notion of a date captures a whole configuration of information, much of which goes beyond the actual behaviors to such things as the goals and social norms involved in such interaction. In addition, the knowledge structure approach emphasizes the importance of goals and plans in providing the structure of many social categories, and the importance of action-oriented structures in the representation of social knowledge. Within such a framework it is possible to think about the coherence of dynamic and ever-changing mental models that are responsive to new input and that are apt to play an important role in directing behavior. These facts are difficult to imagine without higher order knowledge structures.

Implications for understanding persons. In earlier work (Read, Jones, & Miller, 1990; Read & Miller, 1989) we have argued for the importance of a knowledge structure approach in understanding individual differences and traits, and the role of goals in mediating trait effects. Here, we have also argued that knowledge structures play an important role in the coherence of individuals' icographic mental models. These mental models may be about the interaction, the other, relationships, or the self. In understanding events, individuals construct models based on a wide variety of input, inference and higher order structures. Understanding how these factors are combined is critical for understanding why individuals differ in the ways they construe events, situations, and other persons, and respond differently to those factors.

Implications for relationships. As a number of prominent interpersonal researchers (Kelley et al., 1983; Kenny, in press) have argued, central to the study of relationships is understanding how individuals mutually influence one another. To understand mutual influence, Kelley et al. (1983) argued that the "basic data of relationships must (1) identify the activities (e.g., the thoughts, feelings, acts) of each person that affect and are affected by the activities (thoughts, feelings, acts and so on) of the other, and (2) specify the nature of the effects of each person's activities on those of the other." (p. 12). We would concur but argue that, in addition, we need to know much more.

First, we need to know how activated thoughts, feelings, and perceptions of behaviors during an interaction are related to one another and to other knowledge structures regarding one's self, one's partner, and the relationships, and how such relations produce coherent models of the other and the interaction. To address this issue, we need a way to idiosyncratically describe and explore these interconnections. Given the current framework we can (a) address simultaneously how the data fit together and are organized for the individual and embedded in higher order knowledge structures that provide for coherent models of interactions, others, self, and relationships; (b) examine changes in model coherence and the activation of structures on a moment-by-moment basis during a behavioral interaction; (c) predict how new inputs and their explanatory links are apt to affect the overall coherence of our mental models of the other; and (d) simulate how changes in an individual's model (e.g., as a result of therapy) might alter the important coherent models of the individual's partner.

Second, we need to understand how the individuals' models influence their subsequent behaviors, and how these models change during the interaction as new inputs are received. When Wendy develops a coherent model of John as narcissistic, that model is likely to result in negative, or sarcastic behaviors directed at John and attempts to persuade Mary that John is not the wonderful person Mary perceives him to be. On the other hand, Mary's model of John is apt to result in more positive behaviors from Mary toward John, such as smiling and disclosing intimately. Such behaviors are likely to be important inputs for John's inferences and subsequent responses. The resulting inferences must then be inserted into his existing models of the interaction, Mary, Wendy, himself, and actual and possible relationships with each of these women. For example, because Wendy is responding negatively to him he may see her as difficult and her relationship with Mary as an obstacle for achieving his goals. In contrast, he may perceive Mary's more positive behaviors as indicative of either a caring or a gullible person, depending upon her actual goals in the interaction. These new inputs influence not only the nature and coherence of John's models, but these updated models may, in turn, influence John's plans and subsequent behaviors (e.g., needing to get rid of Wendy, so taking her home first).

To further explicate the utility of the current model for relationship researchers, we now apply the current formulation to two areas of interpersonal research: work on marital attributions and work on attachments in relationships. Let us begin with marital attributions. In a recent review, Bradbury and Fincham (1990) argued that dissatisfied couples are more likely than satisfied couples to make negative attributions for partner behaviors; these attributions, in turn, may influence marital satisfaction (also see Fletcher & Fincham, this volume). Furthermore, attributions of partner intent may also affect subsequent partner behavior (Bradbury & Fincham, 1988). Thus, this line of research suggests one way in which couples mutually influence each other: One individual's behavior is influenced by his or her cognitions about the meaning of the other's behavior; this behavior in turn is apt to influence partner cognitions, perceptions of intentionality, and subsequent response. Research in this area is exciting because
researchers are beginning to explore the links between attributions and subsequent behavior. Still, subjects' accounts in this research concerning the links between behaviors and intentions are limited and give an incomplete account of the overall mental model that partners have of one another. By exploring how subjects explain the multiple behaviors of their partner over time, more detailed mental models could be explored and simulated, and serve to provide a basis for more detailed predictions concerning when partners' models of the other are likely to guide behavior how these models overlap, and how partners may differently construe the same acts.

An important new area of research in interpersonal relationships is based on Bowlby's (1972/1980) attachment theory and is concerned with adult attachment styles (Collins & Read, 1990; Cooke & Miller, 1990; Hazan & Shaver, 1987), and how past relationships between children and parents may provide the basis for adults' mental models of relationships that may guide romantic relationships. Recent work with married couples (Cooke & Miller, 1990) also suggests that working models (Bowlby, 1982/1989) of past relationships with parents may be activated in a current interaction. Given the attachment framework, these activated models should then play a role in a coherent representation of one's current dating or marital partner. For example, if one's mother was clingy, we may be likely to construe a partner's behavior, such as "suggesting we both go shopping," as controlling and the person is intrusive.

How might such connections to past relationships models affect the behaviors in which individuals engage? The present work suggests ways of exploring the connections among behaviors and higher order knowledge structures, and the implications of these activations for models of one's partner; it also suggests ways of exploring the extent to which models of past relationships may be connected to structures relevant to our current relationship that contribute to coherent representations of the partner.

Theoretical models, such as the one presented here, may allow us to understand how people use a variety of units of information to develop models of ongoing interactions. They also simultaneously allow us to understand how detailed unique working models of the self and others continue to influence the behaviors of individuals within interactions over extended periods of time, and how past relationships and prior knowledge may influence our interpretation of events in our current ongoing relationships. The current theoretical account also has promise for helping us understand how individuals develop models not only of current relationships but also of possible or future interactions. Understanding such processes, and developing methods for their exploration, may be critical to advances in studying interpersonal processes. Understanding how we can think about, represent, and evaluate the coherence of mental models opens exciting doors for explaining how we develop models of our partners and relationships, and how such models play a central role in our close relationships.

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