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An Integration of Some Attribution Theories.

by

John W. Medcof

McMaster University

Working Paper No. 275

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McMAS VERSITY
1280 Main
Hamilton, da L8S 4M4
Telephone 40

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Running Head: Attribution Integration

ABSTRACT

This paper describes a probabalistic model of attribution processes which integrates correspondent inference theory, Kelley's theories and the work of several other theorists. The model provides a conceptual framework for attribution theory and adds precision to the meaning of several of its basic concepts. Implications for future research are drawn from it.

AN INTEGRATION OF SOME ATTRIBUTION THEORIES

Attribution theory (see Harvey and Weary, 1984; and Kelley and Michela, 1980; for recent reviews) is a body of ideas in psychology which attempts to describe how observers interpret the events they see in everyday life. In the past twenty or so years attribution theory has enjoyed considerable attention in the literature, has generated a great deal of research and has been shown capable of explaining a wide range of empirical phenomena.

Despite this success (or perhaps because of it), attribution theory has remained a rather loose federation of theories and research. Recently the two most influential theorists have been Jones and Davis (1965) and Kelley (1973), but there are a great many attribution phenomena which fall outside the bounds of these theories. The grouping of these theories and phenomena under the title "attribution theory" is widely accepted but is based as much upon a rather vague intuition that they belong together as upon any systematic demonstration that there is a common, elegant core of ideas underlying them all.

Although attribution research has enjoyed considerable success in its vague form, the development of an elegant conceptual core for it is a desirable aim (Harvey and Weary, 1984). The primary reason for this is that such a core is one of the signs of a mature science. Physics, for example, is characterized by being able to describe and explain a wide variety of empirical phenomena, and by being able to conceptually relate most of those explanations to a single elegant statement, $E = MC^2$. Furthermore, the relationship between the conceptual core and the other concepts and theories is clearly and explicitly drawn; it is not left to vague intuition. As psychology matures as a science it must develop itself in both of these ways as well, explaining and predicting a wider and wider range of empirical phenomena and refining its conceptual core. At this point in time psychology does not have a single conceptual core but it does have theories. It is these which must be refined.

There can be little doubt that the aim of establishing a clear and elegant core for attribution research is believed to be a desirable and attainable end by a number of researchers. It is generally accepted that most of what we call attribution research and theory springs ultimately from the work of Heider (1958). But although Heider is accepted as the intellectual forefather of this field of study, Heider's work, in its richness and suggestiveness, is not necessarily drawn with much clarity. Consequently, a number of writers have attempted to show more clearly the links between various parts of attribution theory, including Ajzen and Fishbein (1975), Jones and McGillis (1976) and Kruglanski (1980).

In keeping with this spirit of conceptual clarification, this paper will present a single elegant core for Kelley's (1973), Jones and Davis' (1965) and several other more recent theoretical developments in attribution theory. The idea that these theories are all connected is not new. What has not yet been done, though, is a thorough demonstration of this, showing in detail the interchangeability of concepts and terminology. This analysis will make it clear that these theories need not be described separately, as has been done in the past, but can be treated as a single theoretical entity.

The core model which will integrate these theories uses some old terminology in some new ways. This may tempt the reader to object that this is not what was intended by the original theorist. This may be true in some cases but the ultimate test of such reinterpretations is whether the empirical support for the old definition is also consistent with the new. This will be found to be the case.

But this integration is not primarily an invalidation of former theories. It is primarily a demonstration that with a modified interpretation of some terms and the addition of some linking concepts, the older theories are valid and consistent with each other and that they are much more intimately interrelated than has previously been suspected or demonstrated. The core model does, however, provide some insights of its own and points to some possibly fruitful areas of research.

THE CORE MODEL

The first step in the integration of these theories will be the presentation of the core model. This core model is a relatively brief set of propositions about how observers store and use information about their environments, which will be shown to underlie both causal and disposition attributions.

The core model will be stated in terms of probabilities, a procedure which has some advantages and disadvantages. An advantage is that it strips away some excess conceptual baggage to show the core logic of the theorist. It is because of this that the core model is able to show the common logic of a number of attribution theories. It must be borne in mind though that stripping away the excess conceptual baggage also strips away some useful conceptual baggage. Some of the value of the original theorists is lost. Because of this it is important to think of the core model as complementory to the other theories rather than as a replacement for them. For the foreseeable future all will have a role to play. Another problem with using probabilities to represent people's cognitive processes is that there are ample demonstrations in the literature (e.g. Kahneman and Tversky, 1973) showing that people deviate from "correct" probability thinking. Although people do not always reason with probabilities, the statement of the theory in those terms provides an heuristic device for research in the area. The probability model provides hypotheses about how people might act, which empirical research can test. The adherences to and deviations from the probability model can lead to further testable hypotheses.

The core model will borrow some terminology from Kelley (1973). As in his system, causal agents can be actors or entities. Actors are, of course, people; and entities are non-human things. However, an entity can be a specific, non-human thing, such as an automobile or an animal, or it can be a complex configuration of specific entities and/or persons. For example, a cocktail party is a situation which consists of a number of actors (host, hostess, friends, acquaintances, etc.) and entities (drinks, food, too few chairs, etc.). Such complex entities will be called situations. So the term entity will refer to both specific, individual entities and to situations. Also, the word agent will be used to refer generically to any possible or actual causal agent, be it actor, specific entity or situation.

PROPOSITION 1

<u>People observe the world and store their observations about agents and events as probability statements.</u>

For most events of which they are aware, observers develop some impression of how likely those events are, across a variety of circumstances. For example, people have an impression of how likely snowstorms are, and they will remark if, in a particular year, snowstorms are more frequent than usual. This will occur without any conscious attempt to systematically record and compare the frequencies of snowstorms. These impressions of likelihood are not always accurate but they are there and people spontaneously make statements about them. The core model assumes that these beliefs about the general probabilities of events are stored as unconditional probabilities, of the form , p(event) = X. The core model assumes further that observers note that the probabilities of some events are higher in the presence of some agents than they are in the presence of others. For example, snowstorms are more probable given the presence of clouds than they are in the presence of sunshine. These kinds of observations are stored as conditional probabilities, p(event/A) = X. Observers are capable of storing probabilities involving multiple conditions as well. For example, they may have some impression of p(accident/rain $\cap$ night $\cap$ narrow road). Empirical evidence already available suggests that observers are capable of storing probabilities and do so in a systematic way (e.g., Budesur & Wollsten, 1985; Einhorn & Hogarth, 1985; Fischoff & Bar-Hillel, 1984; Kahneman & Tversky, 1973; Kruglanski, Friedland & Farkash, 1984; Solomon, Ariyo & Tomassini, 1985; Wagenaar & Keren, 1985).

PROPOSITION 2

Observers use these probability statements as the basis for assigning charactaristics to agents. When these agents are actors, the characteristics assigned are called dispositions, when the agents are entities, the characteristics assigned are called constraints.

The assignment of dispositions to actors begins when observers perceive reliable associations between specific individuals and certain events or behaviours. These associations are stored as probabilities. Observers notice that Jack Smith, for instance, often gets into arguments. This can be stored as, p(argument/Jack Smith) = .75. On the other hand, Jack's brother Bill seldom gets into arguments, or, p(argument/Bill Smith) = .05. In addition, observers can compare probabilities and notice whether the probability of an event, given the presence of a particular actor, is greater or less than the unconditional probability of the event. If p(argument) = .45, then Jack Smith is above this norm and Bill Smith is below it.

When observers perceive that the probability of an event, given a particular actor, is greater or less than the unconditional probability, they tend to say that that person has a certain trait or disposition. They label Jack Smith as "argumentative" and Bill Smith as "nice".

Such assertions seem to provide some observers with the feeling that they "understand" Jack and Bill Smith. The actions of the Smith brothers are "explained" by the fact that they have certain traits or dispositions. But these are pseudo-explanations. They are really just labels which reflect observers' beliefs about the past and future behaviours of the individuals observed.

A general definition of disposition will now be given. So far, the only events discussed here have been human behaviours. However, other kinds of events might also be associated with an individual, for example, a car crash. For this reason, this general definition is stated in terms of events, rather than in terms of the particular kind of event which is of most interest here, human behaviour.

An actor is said to have a DISPOSITION if:

$$p(\text{event/actor}) \neq p(\text{event})$$

The assignment of constraints to entities follows the same general principles as the assignment of dispositions to actors. Observers notice that actors tend to act in predictable ways when in the presence of certain entities. For example, there may be a great deal of audience laughter at a particular movie. The movie is therefore likely to be labelled a comedy. This constraint label indicates a certain probability of laughter associated with this particular movie. Such constraint labels are used when the probability of the event, given the presence of the entity, is different from the unconditional probability. The definition for constraint labelling is therefore analogous to that for disposition labelling.

An entity is said to have a CONSTRAINT if:

$$p(\text{event/entity}) \neq p(\text{event})$$

Later in this paper there will be some theoretical discussions in which it will be cumbersome to identify agents as either actors or entities and to refer to dispositions and/or constraints. To facilitate these discussions the following general definition of how characteristics are assigned to agents will be used.

An agent is said to have a CHARACTERISTIC if:

$$p(\text{event/agent}) \neq p(\text{event})$$

People can come to believe that an agent has a particular characteristic by means other than direct observation. These cases can also be represented as probabilities. For instance one may hear from associates that Jack Smith is argumentative. This statement can be stored by the hearer as $p(\text{argument/Jack Smith}) = x$. But the x value assigned by the hearer in response to the word "argumentative" may be different than the x value intended by the speaker who said that Jack is argumentative.

Regardless of the source, direct observation or hearing from other people, the core model suggests that characteristics can be represented as probabilities.

PROPOSITION 3

Observers will perceive the strength or potency of a characteristic assigned to an agent to be a positive function of the difference between the probability of the event given the presence of the agent and the unconditional probability of the event.

For example, if p(argument/Jack Smith) = .75, the p(argument/Bill Bailey) = .95, and the unconditional probability of argument is .45, then observers will say that Bill Bailey is more argumentative than Jack Smith. In probabilities, this proposition has the following form.

The perceived STRENGTH OF AN AGENT'S CHARACTERISTIC is directly proportional to:

$$|p(\text{event}/\text{agent}) - p(\text{event})|$$

PROPOSITION 4

When asked about the characteristics of an agent, observers will base their answers upon the stored probability statements associated with that agent. This stored information allows the observer to determine whether or not an agent has a particular kind of characteristic, and if the agent does, the strength of that characteristic.

Different observers may report different characteristics for the same agent. Those differences may come from a number of sources. For example, when reporting on the disposition of an actor, if different observers have different beliefs about p(event/actor) they are likely to assign different dispositions. But differences in perceived p(event) could also lead to different disposition labels, even when there is agreement upon p(event/actor). This is because perceived dispositions depend upon variations around p(event). Differences in the nature of disposition labels themselves could also influence the labelling process. Sometimes disposition labels designate quite obviously the particular behaviours being associated with an actor, e.g., talkative. Very often though, the disposition term refers to a class of behaviours which are not clearly designated, e.g., careless. When such general terms are used, observers will have to do more interpreting to determine if a particular behaviour fits into a class of behaviours. This may lead to some variation between observers in what is stored and therefore in statements about what is stored.

The phenomenon of stereotyping can be understood in this framework. Stereotypes usually include statements about the physical characteristics of the individual involved (e.g., female, black) and statements about their typical or most probable behaviours (e.g., non-dominant, musical). On this model a stereotype is a collection of probability statements about the kinds of behaviours likely to be emitted by certain classes of people. Once a person is identified as belonging to a certain stereotyped group, a whole host of assumptions about behaviour probabilities is made. These behaviours are sometimes "explained" by stating that the person is a member of the stereotyped group; for example, "She acts that way because she is a woman". This kind of explanation operates on the same basis as explaining behaviour in terms of dispositions. To the user it seems to explain, but it is really just a statement about the user's belief about the probability that some behaviour will occur. Treatments of stereotypes as probabilities are already available in the literature. Rasinski, Crocker and Hastie (1985), for instance, used probabilities as measures of observers' stereotypes and went on to compare the strength of these values with the strength of new information in determining observers' predictions of the probabilities of future behaviours. Entities can be treated in a stereotypical way as well. For example, the "stereotypical" haunted mansion has a whole host of human behaviours and other events associated with it. The concept of script (Schank & Abelson, 1977) posits that certain entities and situations have certain sets of behaviours strongly associated with them. It is not a great step to suggest that those associations can be expressed as probabilities. Schutte, Kenrick and Sadalla (1985) specifically investigated the effects of situation prototypicality (stereotypicality) upon both memory and predicted behaviour.

PROPOSITION 5

When asked about their expectations regarding future events, observers will base their answers upon the stored probabilities they have about past events.

This assumption suggests that observers perceive characteristics to be relatively enduring things, stable aspects of the agents involved. The probability statements represent the best predictors available about the likelihood of future events. For that reason they are very useful for observers. This assumption ties the probability model to Heider's (1958) proposition that a prime human cognitive activity is to predict future events.

PROPOSITION 6

Observers will perceive an agent to be a facilitator of an event when the presence of that agent is a predictor that there is a higher than normal probability that the event will occur. The strength of that facilitative effect is determined by the difference between the probability of the event given the agent and the unconditional probability of the event. In probabilities this proposition has the following form:

An agent will be perceived to be a FACILITATOR OF AN EVENT when:

p(event/agent) > p(event

The STRENGTH OF THE FACILITATIVE EFFECT OF THE AGENT, upon the event, is directly proportional to:

|p(event/agent) - p(event)|

This proposition is based upon lay-people's tendency to base perceptions of causality upon predictability. For example, if Bill Smith is constantly getting into arguments with a variety of people in a variety of circumstances so that p(argument/Bill Smith) > p(argument) observers begin to believe that Bill Smith causes the arguments; "He brings it on himself". Although he does not get into an argument on <u>every</u> encounter, he certainly facilitates arguments. Further, when asked about Bill Smith's characteristics, observers, in accord with proposition four, will probably label him as "argumentative".

PROPOSITION 7

<u>Observers will perceive an agent to be an inhibitor of an event when the presence of that agent is a predictor that there is a less than normal probability that the event will occur. The strength of inhibitory effect is determined by the difference between the probability of the event given the agent and the unconditional probability of the event. In probability terms, this proposition is as follows:</u>

An agent will be perceived to be an INHIBITOR OF AN EVENT when:

p(event/agent) < p(event)

The STRENGTH OF THE INHIBITORY EFFECT OF THE AGENT, upon the event, is directly proportional to:

|p(event/agent) - p(event)|

This proposition is an analogue to proposition 6. An example of inhibition is seen when the audience ceases to talk as the presence of the conductor is noticed.

The probability statements which define facilitative and inhibitive agents are similar to those which define characteristics (dispositions and constraints) of agents. It follows that the assignment of a disposition to an actor represents the assignment of a facilitative or inhibitive effect to that actor and that to perceive an actor as a facilitator or an inhibitor of an event is to assign a disposition to that actor. The analagous logic applies to the assignment of constraints to entities.

PROPOSITION 8

When asked to give causal or characteristic attributions after observing an event, observers, because they prefer conservative explanations, will give their attributions using one of four explanation modes:

1. Unknown cause
2. Known characteristics
3. New characteristics
4. Revised characteristics

The statement that observers are conservative springs from Heider's (1958) point that human beings are constantly striving to construct cognitive models of the world which provide a stable interpretation of the world and allow events to be predicted. Because of this observers will prefer explanations of events, or descriptions of agents, in terms of the stable, already known characteristics of agents. Only when an explanation is not possible in these terms will they move to some other mode of explanation. Other modes of explanation include the belief that the event is unexplainable, the inference of a new characteristic to an agent and/or the revision of a belief about an agent.

In the "Unknown Cause" mode of explanation the event in question was not predictable given the observers' prior beliefs about the available agents. This mode will be discussed first, even though it is not the preferred mode, because some of the ideas associated with it are necessary in order to explain the preferred mode which is the "known characteristics" mode. In the unknown cause mode, when observers are asked for the cause of the event they will name "luck", "fate" or some other poorly defined and/or understood factor; they will not name any of the available agents alone or in combination. Observers' characteristic attributes will not be altered much, if at all, by the occurrence of the event. This mode is more fully explained in proposition 9.

In the "Known characteristics" mode of explanation the event was predictable given the observers' prior beliefs about the available agents. In this mode, when asked for the cause of the event, observers will name one or a combination of the available agents. Observers prefer this mode over the others because in it an explanation is possible in terms of the already held beliefs of the observers. Observers' characteristic attributions will not be altered much, if at all, by the occurrence of the event. This mode is more fully explained in proposition 10.

In the "new characteristics" mode of explanation the event was not predictable given the observers' prior beliefs about the available agents. However when asked for the cause of the event, observers will name one, or a combination of, the available agents. But this explanation is made possible by observers inferring new characteristic(s) to the agent(s) expressly for the purpose of explaining the event. This explanation is therefore not based upon prior beliefs about the available agents. Observers' characteristic attributions for the agent(s) named as cause(s) could therefore show considerable change as a result of the occurrence of the event. The amount of change will be determined by the nature of the characteristics which must be inferred in order to explain the event. The newly inferred characteristics do not contradict any of the prior beliefs of observers. For agents not implicated as causal, the occurrence of the event will have little, if any, impact on the characteristics they are perceived to have. This mode is more fully explained in PROPOSITION 11.

In the "Revised Characteristics" mode the event was not predictable given the observers' prior beliefs about the available agents. However, when asked for the cause of the event, observers will name one, or a combination of, available agents. But this is made possible by observers revising prior beliefs about the characteristic(s) of agent(s) expressly for the purpose of explaining the event. Observers' characteristic attributions to causally implicated agents could, therefore, change considerably as a result of the occurrence of the event. This mode is more fully explained in proposition 12.

PROPOSITION 9: Unknown Cause

Observers will attribute an event to unknown cause unless they believe:

$$p(\text{event}/\text{agent}, \ \ldots \ \text{agent}_n) > p(\text{event})$$

where "agent,...agent_n" are the agents available in this particular congregation of agents.

This proposition is based upon Heider's (1958) idea that the cognitive activities of observers can be understood as attempts to predict the future. Given this, when observers provide a causal explanation for an event they prefer to do so in terms of unchanging characteristics of the agents involved. However, such explanations, in terms of stable characteristics, are viable only if observers believe that if these same agents came together in the past, or were to come together again in the future, the same event would occur. The interaction of the stable characteristics of available agents would probably produce the same result, regardless of time. In other words, the congregation of available agents must be a facilitator of the event or, p(event/agent, ... $agent_n$) > p(event).

If observers believe that the congregation of agents is a facilitator of the event they can proceed to explain the event in terms of a stable characteristics of one or more of the available agents. In this case they would be operating under one of propositions 10, 11 or 12, as will be described below.

If observers believe that this congregation is not a facilitator of the event, they cannot explain the event in terms of stable characteristics, so they will plead "unknown explanation". In this case observers may refer to "chance", "luck", "fate", "circumstances", or to some other ill-defined force, as the cause.

Although observers may initially believe that the event is not predictable given this congregation of agents, they may change their minds in order to provide an explanation for the event. They may begin to believe that this event was predictable, that this congregation of agents is a facilitator of the events. If this is done, observers will then be operating under proposition 10, 11 or 12, as described below.

If observers are operating under proposition 9, the observation of the event will have little or no impact upon their beliefs about agent characteristics. Since the event is believed to be due to some unknown cause it is irrelevant to the stable characteristics of the available agents. Observers maintain their prior beliefs about the agents and perceive the event to be an unexplainable anomaly.

PROPOSITION 10: Known Characteristics

When asked to explain the cause of an event which has occurred with a particular congregation of agents; observers, if they believe that the congregation is a facilitator of the event (proposition 9), will scan their probability statements and will name as the cause of the event an agent, or combination of agents, which fulfills the following conditions:

1. p(event/AGENT) > p(event)

2. $|p(\text{event/AGENT}) - p(\text{event})| > |p(\text{event/AGENT}_n) - p(\text{event})|$

When AGENT represents either a single agent or a combination of agents, and AGENT_n represents any other single agent or combination of agents.

The first of these conditions means that the AGENT named as the cause must be a facilitator of the event. As discussed above, an AGENT cannot be a cause unless it is a facilitator.

The second of the conditions captures two requirements and the first of those requirements is that the focal AGENT must have a facilitative effect stronger than that of any other AGENT. In other words, when observers name the cause of an event they name the strongest available facilitator. For example, a teacher writing on the blackboard with his back to the class is hit on the back of the head with a piece of chalk. He must decide which of his several students is the cause of the thrown chalk. He has several possibilities, looking over his beliefs about the past behaviours associated with each. Little Willie Frolic has never done anything bad in his life (at least in the mind of the teacher) and p(chalk missile/Willy) = .000. Mary Smith is a more likely suspect, p(chalk missile/Mary) = .05. But she is not nearly as bad as her brother, Jack, p(chalk missile/Jack = .10. Jack Smith has the highest probability and is therefore the most likely cause. The teacher will probably blame him for the chalk missile. This vignette shows that the agent chosen as the cause must be a facilitator of the event and must also be the strongest available facilitator.

The second requirement captured by the second probability statement is that the AGENT named as the cause must be of sufficient facilitative strength to overcome the available inhibitors. For example, the event in question might be a large catch of fish today, by Bill, in a particular creek. If the creek is known to be a poor fishing place and Bill is believed to be a very good fisherman, observers could attribute the large catch to Bill's great fishing ability. If, however, the fishing place were very bad and Bill were a middling fisherman, Bill's skill would not be perceived to be sufficient to overcome the inhibitive effect of the creek. In this case observers would probably attribute the large catch to luck. Stating this in probability terms, let us suppose that the observers have the impression, from their past experiences, that the probability, across all fishermen and all fishing places, of getting a large catch is .40; that Bill is an excellent fisherman, p(large catch/Bill) = .65; and that this creek is not as good as most as a place to fish, p(large catch/creek) = .20. The strength of Bill's disposition, fishing ability, is given by |p(large catch/Bill) - p(large catch)|, which is, .65 - .40 = .25. This represents the strength of the facilitative effect of Bill. The strength of the creek's inhibiting constraint, poor fishing place, is given by, |p(large catch/creek) - p(large catch)|, which is |.29 - .40| = .20. Since the facilitative effect of Bill is greater than the inhibitive effect of the creek, .25 > .20, observers will name Bill as the cause of the large catch. If, however, the inhibitive effect of the creek were much stronger, this explanation would not be viable. Suppose the observers' beliefs about p(large catch) and p(large catch/Bill) remained the same as they are above,but the creek involved was a very very bad fishing hole, p(large catch/creek) = .05. In this case the inhibitive effect of the creek, |.05 - .40| = .35 is greater than the facilitative effect of Bill, .25. In this case, although Bill is a facilitator of the event, observers will not name him as the cause because his facilitation is not seen as strong enough to overcome the available inhibitions. Observers therefore cannot explain the event in terms of their currently held probability statements. They will have to attribute the event to luck or change their probability statements to provide an explanation. In other words they would have to switch to one of the less preferred explanatory modes, which are described in propositions 11 and 12.

The above examples show why proposition 10 is the preferred mode of causal explanation for observers. If observers scan their probability statements and find an AGENT which fulfills the two conditions of proposition 10, they have found an explanation for the event in terms of their prior beliefs. They can thus explain the event in terms of stable, predictable characteristics of the available AGENTS, and no revision of their prior beliefs is necessary.

If asked about the characteristics of the available agents, observers could do so easily. In addition, the answers they gave before the event would be about the same as those given after the event, since no change in prior beliefs was necessary in order to explain the event. The event might have an incremental effect upon the beliefs of observers because the event represents one more observation to be added to their storehouse of knowledge. However, this increment, which might be predicted using Bayes' theorem (see the discussion of Ajzen and Fishbein, 1975, below) will be small when compared to changes in beliefs that are described in propositions 11 and 12.

The illustrative examples discussed here were simple but that should not be allowed to obscure the possibility of dealing with more complex cases. In both of the examples used here an explanation was possible using only a single agent. In many real-life situations multiple agents are causal. How do observers deal with these more complex situations? Further refinement of theory is needed here. For example, it seems likely that observers will prefer an explanation which involves as few agents as possible. It also seems likely that when observers are combining facilitative agents in order to have a facilitative effect to overcome some available inhibitor(s), they will combine only as many as are necessary to meet the inhibitory force.

PROPOSITION 11: New Characteristics

When asked to explain the cause of an event which has occurred with a particular congregation of agents, observers, if they believe that the congregation is a facilitator of the event (proposition 9), but are unable to explain it in terms of the known characteristics of the available agents (as described in proposition 10), may provide an explanation by fulfilling the conditions of proposition 10 by inferring completely new characteristic(s) for one or more of the available agents.

An example of this process is seen when Jack, a fisherman of unknown ability, gets a large catch in a poor fishing creek. There are no agents available which are known to be facilitators of the event, therefore the conditions of proposition 10 are not fulfilled. However, if observers allow themselves to believe that Jack is a good fisherman of sufficient ability to overcome the inhibitive effects of the creek, they will be able to fulfill the conditions of proposition 10 and provide an explanation for the event. But this causal attribution was possible only by making a characteristic attribution to Jack. In probabilities, assume that observers believe that p(large catch) = .40, p(large catch/creek) = .20 and p(large catch/Jack) = ? The inhibitory effect of the creek is, therefore, |p(event/creek) - p(event)| = |.20 - .40| = .20. The facilitative effect that must be attributed to Jack will therefore be at least equal to [p(event) + .20] = [.40 + .20] = .60. So if observers allow themselves to believe that p(event/Jack) ≥ .60, they have a causal explanation for the event which fulfills the conditions of proposition 10.

This avenue of explanation will be attractive to observers because it does not require them to alter any of their prior beliefs. It also is compatible with the requirement of proposition 9, that if Jack and the creek were to "meet" again the outcome would probably be the same.

If observers had been asked about Jack's disposition, fishing ability, rather than about the cause of the event, they would have been able to answer. Although their prior knowledge of Jack contained no information about this characteristic, taking the event into account would allow observers to give an answer. By assuming that Jack caused the event they can infer his disposition. In this case a characteristic attribution is possible only by making a causal explanation.

The processes described in propositions 10 and 11 make it very clear how intimately causal and characteristic attributions can be related. In proposition 11 neither attribution can be done unless the conditions of proposition 10 are brought into place. But that bringing into place simultaneously sets both causal and characteristic attributions.

The explanatory process involved here in proposition 11 involves a major but narrowly focused change in a believe about an agent. From having no belief observers come to believe that an agent has a particular characteristic of sufficient facilitative force to overcome the available inhibitors. This is not an incremental change and it is a change essential to providing attributions. In proposition 10 the change was incremental and it was incidental to the provision of attributions. But the processes in proposition 11 do not change all of the observers' prior beliefs. Agents which are not causally implicated directly, e.g., the fishing creek in the examples, undergo no change. Observers maintain their prior beliefs about the creek throughout. Even characteristics of the causally implicated agent, which are not directly relevant to this event, should go unchanged.

In this proposition, as in earlier ones, simple examples were used but this should not distract readers from considering more complex cases. What additional principles are necessary in order to explain complex cases with many causes?

PROPOSITION 12: Revised Characteristics

When asked to explain the cause of an event which has occurred with a particular congregation of agents, observers, if they believe that the congregation is a facilitator of the event (proposition 9), but are unable to explain it in terms of the known characteristics of available agents (as in Proposition 10), may provide an explanation by fulfilling the conditions of proposition 10 by changing one of their currently available probability statements for an agent.

The proverbial fishing creek can also be used to illustrate the operation of proposition 12. If Jack gets a large catch in a poor fishing creek, and Jack is known prior to the event to be a poor fisherman, observers have an unexplainable event. Jack is a facilitator but not strong enough to overcome the inhibitory creek. One explanation is luck (proposition 9). Another is to revise beliefs about Jack's fishing ability. Observers may conclude that Jack is a better fisherman than they originally believed. Alternately they may decide the creek is not as bad as their prior expectations. They could make adjustments in their beliefs about both

Jack and the creek. Presumably observers will revise their probability statements only to the degree necessary to explain the event.

The explanatory process involved in proposition 12 can involve major but narrowly focused changes in beliefs about the characteristics of agents. By making the assumption that the agent caused the event, the event is explained, but the cost for the observer can be a major change in beliefs. In some cases a small revision will do and incremental change is possible. In other cases the change necessary for the explanation can be major. Observers will presumably try to avoid the latter type. As in proposition 11, changes in characteristics will be confined to those which are directly causally implicated.

Although observers have considerable latitude in the avenues available for explanation in this proposition, it seems likely that they will make their choices according to some general rules. First, it seems likely that observers will prefer to attribute a completely new characteristic rather than change an old one. In other words, they will prefer to operate under proposition 11 rather than proposition 12. Bell, Wicklund, Manko and Larkin (1976) found that attributions tend to flow to that part of the environment about which least is known. The more unknown an agent is, the less likely it is that a characteristic inferred in order to explain an event will contradict a prior belief about the agent. This mechanism suggests that some vaguely understood agents could become repositories of explanations for unexplainable events. The attribution of events to the Olympian gods comes to mind as an example. It also seems likely that if observers are deciding which belief to change they will prefer a small change to a big one. A slight modification in beliefs about Jack's fishing ability is preferable to a large change in belief about the creek. A third factor is the relative strengths of the already held probability statement and the new event. If the originally held belief about the agents' characteristics is strongly held and the event observed is unclear or not very salient, the preferred interpretation will be to maintain the old belief and attribute the event to luck. If the currently held probability statement is vague and weak and the observed event represents very strong evidence, the observer will be very likely to change the probability statement to accommodate the new information. A special case of belief revision will occur if observers initially believe that the presence of a congregation of agents is not a facilitator of the event. As mentioned in proposition 9, one option open to observers is to change this belief and to accept the idea that the congregation is a facilitator. Kassin (1979) has a very good discussion of the roles of expectations and new information upon consensus information, which is very relevant here. The principles described there will also apply to distinctiveness information.

This completes the description of the core model. It assumes that observers base their attributions of causes and characteristics upon stored probability statements. Those probability statements are the basis for observers' beliefs about the enduring characteristics of agents. Attribution processing is seen as a relatively conservative activity in which observers prefer to explain events in terms of presently held beliefs about stable characteristics of agents. Only when this is not possible will new characteristics be assigned to agents or present beliefs be changed in order to provide an explanation. In these processes there is an intimate interaction of causal and characteristic attribution. It is now time to show that the core model provides a single basis for the theoretical ideas of Kelley (1973), Jones and Davis (1965) and some other theorists.

KELLEY'S THEORIES

Kelley's (1973) ideas about attributions are typically presented in two separate models called covariation theory and configuration theory. These will each be explained in terms of the core model which will show that they are intimately connected. They should not be treated as separate models even though they tend to focus on different aspects of attribution processes. The core model will also allow a better understanding of the role of causal and characteristic attributions in Kelley's models. Traditionally Kelley has been thought of as concerned with causal attribution. Although this is true by and large, there are many aspects of characteristic attribution in his model and in some cases confusion about whether causes or characteristics are being discussed.

Covariation Theory

Covariation theory (Kelley, 1973) reduces the attribution situation to one in which only a single actor and a single entity are available when an event occurs. The observer is asked to decide if the event is caused by the actor, the entity, by some combination of the two or by the circumstances of the interaction. The theory states that observers base their attributions upon three kinds of covariation information: consensus, distinctiveness and consistency. Empirical studies (e.g., Jaspars, 1983; McArthur, 1972) give general support to this theory.

The relationship between the core model and covariation theory will be demonstrated by showing that each of the three kinds of covariation information can be defined in terms of the probabilities of the core model. Observers can then scan these probabilities and arrive at a causal attribution. Kelley's theory will be seen to be an expression of and involve elaborations upon, the core model.

Consensus

In covariation theory the observer knows that some actor has made some response in the presence of some entity. Consensus information states whether or not other people usually produce that response in the presence of that same entity. If they do, consensus is high; if they do not, consensus is low. In an example used by McArthur (1972) the event is Paul being enthralled by a particular painting at the art museum. High consensus means that most other people are also enthralled by the painting; low consensus, that most other people are not enthralled. High consensus tends to induce attribution to the entity. Low consensus tends to induce attribution to the actor.

In the core model consensus has to do with the probability of the event given the entity. With high consensus practically everyone makes the same response in the presence of the entity, so the presence of the entity is a good predictor that the event (the actors' response) will occur. In other words, high consensus means, p(event) entity) = high. With low consensus, however, practically no one makes the response in the presence of the entity, or p(event/entity) = low.

But stating consensus information in probabilities in this way is only a first approximation. This kind of statement leaves ambiguity about the meaning of the terms high and low. What is high for one entity/event combination may be low for another. If p(food poisoning/restaurant x) = .25, i.e., one-quarter of all customers get food poisoning, most people would say that this is a high rate. On the other hand, if p(landing safely/airline Y) = .25, i.e., only one quarter of all passengers arrive without serious mishap, most people would say that this is a low rate. The core model provides a basis for removing this ambiguity. The unconditional probability of the event in question provides a standard of comparison which determines whether a probability value is high or low. Most of us have an impression that p(food poisoning) across all eating places is very much lower than .25, so restaurant x's value of .25 seems large. Likewise, most of us feel that p(landing safely) taken across all airlines and all passengers is considerably higher than .25, so .25 represents low consensus in that case. This leads to the following more refined definitions.

HIGH CONSENSUS occurs when:

p(event/entity) > p(event)

LOW CONSENSUS occurs when:

p(event/entity) < p(event)

Stating consensus in this way does not do violation to Kelley's (1973) predictions about how consensus information affects attributions. Kelley said that high consensus tends to induce attributions to the entity and low consensus tends to induce attribution to the actor. The core model agrees. With high consensus, p(event/entity) > p(event), which means the entity is a facilitator of the event and therefore likely to be named as the cause of the event (taking into account the requirements of propositions 9 to 12). With low consensus, p(event/entity) < p(event), so the entity is an inhibitor of the event. As such it is unlikely to be named as the cause, so observers will look for other causal agents. Since in Kelley's covariation theory the only other available agent is the actor, by default the probability of the actor being named the cause is quite high when consensus is low.

Although the core model agrees with Kelley's (1973) predictions about the effects of consensus information upon attributions, it does not agree with the usual interpretation of how the information in consensus data brings this about. This disagreement represents a subtle, but very important, shift in interpretation which has not heretofore been dealt with in the literature, even though other theorists have expressed consensus in probabilistic terms.

Kelley's (1973) explanation of how consensus plays its role will be called the contrast interpretation because it is based upon a contrast between the focal actor and other actors. In this widely accepted interpretation the attention is upon whether or not the focal actor is like other actors. In the example, the low consensus information that Paul is enthralled while nobody else is, can be taken to mean that Paul is different from other actors. From there it can be said that since Paul is different from other actors and is therefore in some sense "unique", it is Paul who is the cause of the event. Alternately, when consensus is high, it suggests that Paul acts like everyone else with this painting, is therefore not unique, and therefore not a viable explanation for this event.

This interpretation depends upon the assumption that consensus information allows observers to decide if the actor is unique or not, but that assumption may not be correct. To say that the actor is unique or not unique is to attribute an enduring characteristic to the actor. It is saying that the actor is habitually like or unlike others. But consensus information does not give this directly. Consensus, whether high or low, states only that people in general react in a predictable way to the entity and that on this occasion the actor did or did not act in the way that most people do. But the actor's behaviour on this occasion may not be diagnostic of the usual behaviour of this actor. To make that assumption on the basis of consensus information is to attribute a characteristic to the actor on the basis of the one observation. Although observers may do this, it is not necessary.

The core model interpretation of the role of consensus information will be called the predictive interpretation because it stresses how consensus information can be used to predict events. The predictive interpretation highlights the fact that whether consensus is high or low it always tells the observer how most people act in the presence of the entity. The usual reaction to the entity is given fully, with no assumptions necessary from the observer. With high consensus, it is given that other people usually react the way the actor did; with low consensus it is given that other people usually do not react the way the actor did. Consensus information is therefore a statement about an enduring characteristic of the entity as a predictor of events.

This shift in interpretation also leads to a subtle but important shift in what the terms high and low consensus refer to. In the contrast interpretation high consensus means that this actor is like other actors and low consensus means that this actor is unlike other actors. In the predictive interpretation high consensus means that the entity is a good predictor of the event and low consensus means that the entity is not a good predictor.

This shift in interpretation has important theoretical consequences. It is the foundation which allows the core model to integrate Kelley's, Jones and Davis' and other theories. Failure to make the shift has been a stumbling block which has hindered the success of some other attempts to apply probability to attributions, and to integrate attribution theory.

<u>Distinctiveness</u>

The second kind of covariation information is distinctiveness (Kelley, 1973). Given that the actor has made a response in the presence of the entity, distinctiveness information states whether or not the actor usually makes the same response in the presence of other entities. For the example used earlier, low distinctiveness occurs if Paul is enthralled by paintings in general as well as by the focal painting. High distinctiveness occurs if Paul is seldom enthralled by paintings.

The core model's analysis of distinctiveness is analogous to its analysis of consensus, and so is based upon a predictive interpretation rather than a contrast interpretation. In the contrast version distinctiveness information tells observers something about the entity because the event on this occasion is contrasted to what usually happens when the actor is present. If the event does not usually occur with this actor (high distinctiveness), the entity has caused a unique reaction from the actor and is therefore the cause of the event. With low distinctiveness the actor behaves the same with this as with all entities, the entity is not unique, and therefore the actor is the cause. As with the contrast interpretation of consensus, an assumption about an enduring characteristic of an agent is necessary to make this work. In the predictive interpretation low distinctiveness means that the actor usually makes this response across all entities so the actor is a facilitator of the event and a likely cause. With high distinctiveness the actor is not a good predictor of the event, is an inhibitor, and is unlikely to be named as the cause. These ideas can be stated in probabilities in a way analogous to that for consensus:

HIGH DISTINCTIVENESS occurs when:

$$p(\text{event}/\text{actor}) < p(\text{event})$$

LOW DISTINCTIVENESS occurs when:

$$p(\text{event}/\text{actor}) > p(\text{event})$$

<u>Consistency</u>

This third kind of covariation information tells whether or not the event (response) has occurred on past occasions when the entity and actor have come together (Kelley, 1973). In the example, high consistency means that on past occasions when Paul has viewed this particular painting he has been enthralled. Low consistency means that on past occasions Paul has not been enthralled by this particular painting.

The predictive interpretation of consistency is analogous to the predictive interpretation of consensus and distinctiveness. High consistency means that in the past when this actor and entity have come together the event has usually occurred so the actor and entity are jointly facilitators of the event. Low consistency means that the actor and entity are jointly inhibitors of the event. In probabilities this is as follows:

HIGH CONSISTENCY occurs when:

$$p(\text{event}/\text{actor} \cap \text{entity}) > p(\text{event})$$

LOW CONSISTENCY occurs when:

$$p(\text{event}/\text{actor} \cap \text{entity}) < p(\text{event})$$

The fundamental role that consistency information plays in the core model is described above in proposition 9. Observers must believe that the congregation of agents is a facilitator of the event before they will make attributions to agents alone or in combination. Otherwise they will plead no explanation, luck or chance. In covariation theory, which is confined to one actor and one entity, consistency information represents the facilitory or inhibitive effect of the congregation of agents.

Combinations of Information

Now that the three kinds of covariation information have been stated as probabilities in the core model, the attributions that result from combinations of this information can be predicted and discussed. Given that the three kinds of information can each be in two states (high or low), eight combinations of information are possible. These eight are shown in Table 1. These are the same eight as have been discussed by Hilton and

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Insert Figure 1 about here

Slugoski (1986), Jaspars (1983) and McArthur (1972).

According to the core model in cells 1 to 4, observers will be operating under proposition 10. In all four consistency is high, p(event/actor $\cap$ entity) > p(event), so the congregation of agents is a facilitator of the event and a causal explanation in terms of enduring characteristics is possible. Observers will scan their probability statements to find the strongest available facilitator. In cell 1 the actor is the strongest available facilitator, p(event/actor) > p(event), because the entity is an inhibitor p(event/entity) < p(event). The actor will be named as the cause. For cell 2 the entity is the strongest available facilitator of the event and will be named as the cause. In cell 3 the actor and entity are individually inhibitors of the event but are jointly facilitators. As a consequence they are jointly named as the cause. The core model predictions for these three cells agree with those of Hilton and Slugoski (1986), Jaspars (1983) and McArthur (1972) and their data is generally supportive. In cell 4 both the actor and entity are facilitators of the event but their relative strengths are not specified. As a result, the core model predicts that any of the actor, the entity, or the actor and the entity, could be named as causes. In this cell the core model differs from Hilton and Slugoski (1986) and Jaspars (1983). These theorists had difficulty dealing with cell 4 and give it considerable attention, but never give a truly satisfactory resolution to the issue. The core model makes predictions for this cell and shows why it is difficult to make predictions for it. The core model also states that this cell, with its multiple facilitators, deserves extra theoretical and empirical attention because of its similarity to many real world situations.

In cells 5 to 8 consistency is low. In the core model this means that the congregation of agents is not a predictor of the event and observers will not name agents as the cause. They will operate under proposition 9 and attribute the event to no known cause, to luck or circumstances. Strong attributions to circumstances are usually found empirically in these four cells (Jaspars, 1983; McArthur, 1972).

A few general observations about covariation theory are appropriate here. In cells 1 to 4 observers are given all of the information they need in order to operate under proposition 10 and make causal attributions. No inferences about the characteristics of agents are necessary in order to provide a causal explanation. But actors could, if asked, describe the characteristics of the agents involved by consulting their consensus, distinctiveness and consistency information. If, in empirical tests of attribution theory, observers show some variance in the attributions they make for those cells, most of that variance should come from observers combining their own prior beliefs about the involved agents with the information provided by the experimenter about the agents. That observers do this is amply demonstrated in the literature on the false-consensus effect (Mullen, Atkins, Champion, Edwards, Hardy, Strory and Vanderklok, 1985). In cells 5 to 8, observers will attribute to circumstances and luck because they are operating under proposition 9. High variance should be found in the responses in these cells because observers will be reluctant to admit to no explanation. They will ignore information and distort it in attempts to provide an explanation.

This concludes the analysis of covariation theory using the core model. The logic of covariation theory was seen to be a subset of the logic of the core model but the core also suggests a fundamental change in our understanding of the information content of consensus, distinctiveness and consistency data. The validity of that shift could be empirically tested. The value of the shift is that it allows for theoretical integration, as will be further demonstrated below.

Configuration Theory

According to Kelley (1973) configuration theory applies when observers must make attributions after only a single observation of an event. But Kelley points out that in such circumstances the observers are seldom completely ignorant, they have observed similar events before and have some knowledge of the causal processes involved. It is by using this stored knowledge that observers are able to make attributions.

The core model makes the assumption that this knowledge which is relevant to the interpretation of events is stored by observers as probabilities. In configuration theory these probability statements are used to derive attributions in the same way as they are used in covariation theory, as described in the core model.

Kelley's concept of the schema can be stated in terms of the core model. According to Kelley (1983), schemata are cognitive frameworks into which observers put information in order to organize it into meaningful patterns from which attributions can be made. The core model represents schemata as patterns of probabilities.

Multiple Necessary Causes

In this schema, "Both causes must be present or favorable if the event is to occur" (Kelley, 1973). As Kelley explains it the presence of both causes is also sufficient for the occurrence of the event. In the core model, if the agents involved are A and B, the fact that neither agent is able on its own to cause the event is represented by p(event/A) = p(event/B) = 0. When both agents are present the event always occurs, p(event/A $\cap$ B) = 1.0. Whatever the event, mathematics requires that the unconditional probability of its occurrence is greater than 0.0 and less than 1.0, or, 1.0 > p(event) > 0.0. Combining all of these expressions leads to the following definition.

Agents A and B are MULTIPLE NECESSARY CAUSES of an event when:

p(event/A$\cap$B) = 1.0 > p(event) > p(event/A) = p(event/B) = 0.0

Stating the multiple necessary causes schema in this way shows that it is an extreme case of cell 3 (Table 1) in Kelley's covariation theory. The summary expression for cell 3 is, p(event/A$\cap$E) > p(event) > p(event/A), p(event/E). The schema as formally stated is extreme in its requirements that the event always happens in some circumstances and never happens in others. This extreme pattern is very unlikely in real life. The core model expression for cell 3 gives an expression for this kind of information pattern without the unrealistically extreme requirements. Jaspars' (1983) logical model of causal attribution had, as one of its weaknesses, a dependence on strict logic which led to some problematical, unrealistic predictions. The core model avoids this pitfall.

McArthur (1972) originally pointed out the connection between multiple necessary causes and cell 3. She worked out causal predictions for them, with which the core model agrees. This pattern of data leads observers to believe that the event is caused by the joint presence of the agents. For example, parents of small children sometimes find themselves faced with this kind of situation. Little Billy is a model child, p(trouble/Billy) < p(trouble). Little Mary is also an angel, p(trouble/Mary) < p(trouble). But when Billy and Mary play together there is no end to the mischief they get into, p(trouble/Billy $\cap$ Mary) > p(trouble). Putting these together gives $p(\text{trouble}/\text{Billy} \cap \text{Mary}) > p(\text{trouble}) > p(\text{trouble}/\text{Billy})$, $p(\text{trouble}/\text{Mary})$. The parents' explanation is that Billy and Mary are not bad children (neither has an enduring characteristic called bad); it's just that they are bad influences upon each other (their joint presence is necessary for trouble). The explanation is extracted from the stored probability statements.

Multiple Sufficient Causes

According to Kelley (1973) this schema occurs when more than one cause is present and each is alone sufficient to cause the event. In probabilities, $p(\text{event}/A) = p(\text{event}/B) = 1.0$. Further, because the event always occurs when either is present it will always occur when both are present, $p(\text{event}/A\ B) = 1.0$. The unconditional probability of the event will fall between 0.0 and 1.0, $1.0 > p(\text{event}) > 0.0$. Combining these gives the following definition.

Agents A and B are MULTIPLE SUFFICIENT CAUSES of an event when:

$p(\text{event}/A) = p(\text{event}/B) = p(\text{event}/A \cap B) = 1.0 > p(\text{event})$

Examination of Table 1 will show that this is an extreme case of cell 4 whose summary expression is, $p(\text{event}/A)$, $p(\text{event}/B)$, $p(\text{event}/A \cap B) > p(\text{event})$. The strict logical definition of multiple sufficient causes makes it less useful for attribution theory than the more general pattern given by the core model, for the reasons described above in connection with multiple necessary causes.

Stating cell 4 and the multiple sufficient causes schema in the core model also provides a mechanism for removing some ambiguity. As described by Kelley (1973) and McArthur (1972), observers are left with no mechanism to decide which of the multiple sufficient causes will be named as the cause of the events. The core model, under proposition 10, states that observers will name as the cause the strongest of those available facilitators, that with the highest probability of association with the event.

Compensatory Causes

Kelley (1973) uses an example of task success to demonstrate the idea of compensatory causes. Using an actor and a task as the agents, and success on the task as the event, his model shows that characteristics of the actor and task can trade off with each other to produce the event. Figure 2 shows Kelley's (1973, p. 114) diagram representing this schema. Kelley's diagram and values will be used for illustrative purposes, as he used it. However, whether these particular values are actually used by subjects is an empirical question.

Insert Figure 2 about here

The event (represented by E in the Figure) is the occurrence of a successful outcome when a person of either high, medium or low ability works on a task that is difficult, moderate or easy to do. When a person of medium ability tackles a moderate task, E occurs. The person is successful. When a person of medium ability takes on a difficult task, the event does not occur; the actor is unsuccessful.

In the core model Kelley's diagram serves the purpose of showing the probabilities of events associated with various disposition and constraint labels. These probabilities can be used to attribute causes or characteristics. In Figure 2 the following probabilities are represented. In the column for the difficult task, only one of the three cells has an E in it. In other words, p(E/difficult task) = .33. Analogous logic applies to the other two columns, so that if abbreviations are used to represent difficult, moderate and easy tasks,

$p(E/DT) = .33$ (DT = difficult task)

$p(E/MT) = .66$ (MT = moderate task)

$p(E/ET) = 1.0$ (ET = easy task)

This kind of representation allows observers to do at least two things. First, if they notice that a particular task has a certain probability of success associated with it they can label it as difficult, moderate or easy, thus applying a constraint label. Second, if someone else informs observers that a task is moderate, for example, they can easily attach a probability of success statement and use it later to make attributions.

The labels and probability statements for the dispositions of actors, as represented in the rows of Figure 2, are as follows.

$p(E/LA) = .33$ (LA = low ability)

$p(E/MA) = .66$ (MA = medium ability)

$p(E/HA) = 1.0$ (HA = high ability)

The individual cells in the Figure can also be represented as probabilities.

$p(E/DT \cap HA) = 1.0$

$p(E/DT \cap MA) = 0$

$p(E/DT \cap LA) = 0$

$p(E/MT \cap HA) = 1.0$

$p(E/MT \cap MA) = 1.0$

$p(E/MT \cap LA) = 0$

$p(E/ET \cap HA) = 1.0$

$p(E/ET \cap MA) = 1.0$

$p(E/ET \cap LA) = 1.0$

Finally, looking at all nine cells and their E's, $p(E) = .66$.

The core model assumes that all of these probabilities are stored by observer and can be used to make causal attributions. For example, if observers see a person who is labelled as having high ability succeed on a task which is labelled high difficulty, the following probabilities will be consulted, $p(E/HA) = 1.0 = p(E/HA \cap DT) > p(E) = .66 > p(E/DT) = .33$. Observers will use the processes described in proposition 10 of the core model to conclude that the person's high ability (strongest available facilitator) was the cause of the event. It should also be noted that this pattern of probability is an analogue of cell 1 in Kelley's covariation theory (Table 1).

Kelley (1973) also shows that the compensatory causes schema can be used by observers to infer the characteristics of an unknown agent when the nature of one agent and of the event are known. This process of inferring characteristics goes beyond the purely causal attributions which are the main focus of Kelley's theories. The core model uses the processes described in proposition 11 to explain how these characteristics would be inferred in the compensatory causes schema. For example, suppose an agent of unknown ability succeeds at a difficult task. Observers would infer to the actor the characteristic, ability, of sufficient strength to overcome the available inhibitor, the difficult task. Calculating the probabilities as was done in proposition 11 leads to the conclusion that, p(event/actor) = 1.0. Such actors are labelled "high ability". The facile interaction of causal and characteristic attributions described in proposition 11 holds here, in the compensatory causes schema, as well.

It should also be noted that the observers in this case began with part of the summary expression for cell 1 of covariation theory (Table 1). In order to complete their inference processes they had to add a probability statement to fill out the cell 1 summary expression, namely, provide a place for p(event/A).

Augmentation and Discounting

There are two other important concepts in Kelley's (1973) configuration theory, discounting and augmentation. These are not schemata but rather phenomena which occur because of the way in which attribution processes work. The core model permits a clear analysis of these phenomena and gives some insight into recent research on them.

When Kelley (1973) describes augmentation and discounting it is not clear whether he is referring to these phenomena as they occur during the attribution of cause, the attribution of characteristics, or both. He defines discounting as (Kelley, 1973) "The role of a given cause in producing a given effect is discounted if other plausible causes are also present". From this definition it is not clear if the effect is upon which agent is named as the cause, upon the nature of the characteristic assigned to the agent, or upon both. Augmentation is defined as (Kelley, 1973) "...when there are known to be constraints, costs, sacrifices, or risks involved in taking an action, the action once taken is attributed more to the actor than it would be otherwise." Again, it is not clear whether the term "attributed more" refers to causal attributions, characteristic attributions or to some combination of the two. The discussion which follows will show that causal augmentation and discounting operate on somewhat different principles than do characteristic augmentation and discounting. As a result it is necessary to treat them separately.

Characteristic Augmentation. This concerns processes which determine how strong a characteristic is attributed to an agent. In the core model, characteristic augmentation occurs when observers are unable to explain an event in terms of the known characteristics of available agents, and so infer a new characteristic to one of those agents in order to provide the explanation. Sometimes the new characteristic is completely new, in which case the observer is operating under proposition 11. In other cases the new characteristic is a modification of some characteristic the observer already believed the agent had, in which case the observer is operating under proposition 12. Augmentation occurs because the newly inferred characteristic must have enough facilitative strength to overcome the available inhibitors. The stronger the inhibitors the stronger the inferred characteristic. The details of working this out were demonstrated above in the discussions of propositions 11 and 12. The fundamental idea involved in characteristic augmentation can therefore be expressed in probabilities.

> CHARACTERISTIC AUGMENTATION refers to the fact that when a facilitory characteristic is attributed to an agent in order to explain an event, observers will infer that:
>
> $$|p(\text{event}|\text{AGENT}_f) - p(\text{event})| > |p(\text{event}|\text{AGENT}_i) - p(\text{event})|$$
>
> Where AGENT_f represents either a single facilitory agent or a combination of facilitory agents and AGENT_i represents a single, or combination of, inhibitory agent(s).

Characteristic Discounting. In the core model, characteristic discounting, like characteristic augmentation, occurs when observers are operating under propositions 11 and 12. Observers are inferring new, or modifying old, characteristics in order to provide facilitators of sufficient strength in order to explain the event. Characteristic augmentation has to do with the total amount of facilitative fore which must be inferred in order to overcome the available inhibitors. Characteristic discounting has to do with the way in which that facilitative force is assigned to the available facilitators. If only one facilitator is used in the explanation, all of the necessary facilitative force is assigned to that single agent. If more than one agent is perceived to have a facilitative role, and the necessary facilitative force is distributed equally among them, the amount assigned to any single agent is less than in the case in which there was only one facilitator. The more perceived facilitators there are, the less the facilitative force assigned to any one of them.

The qualification named above, that the available facilitative force be equally distributed across available agents, is an important one. If observers choose not to distribute the facilitative force equally, the concept of discounting as dependent upon the number of facilitators is not necessarily viable. For example, if observers choose to assign all the facilitative force to a particular agent, regardless of the number of other available facilitators, there would be no discounting.

> CHARACTERISTIC DISCOUNTING refers to the fact that when a facilitative force is inferred in order to explain the occurrence of an event, if that facilitative force is equally attributed to the available facilitory agents, the greater the number of facilitory agents to which the force is assigned, the less the facilitative force which will be assigned to any one of them.

This definition of discounting given here states that discounting applies to a rather special case (equal distribution of facilitative force), but in some situations much more complex things may occur. It would be worthwhile to try to develop an understanding of the more general question of how observers assign facilitative force to the available agents as a joint function of both number of agents and the relative distributions to available agents. Perhaps in most cases it is as simple as the discounting principle suggests.

Some understanding of the processes whereby facilitative forces are assigned is provided in empirical results reported by Hull and West (1982) and by Wells and Ronis (1982). In both of these studies the authors took exception to Kelley's (1972) statement that the amount of discounting which occurs depends solely on the number of facilitory agents available. The authors maintain that it is the valence of the available agents which determines the amount of augmentation and discounting. They allow that in many cases the number of agents is correlated with valence, but maintain that the number of agents as an independent variable is irrelevant. For these studies, actors were depicted as choosing amongst packages of gifts. It was thus possible to manipulate independently the total valences of the packages, the valences of the individual gifts, and the number of gifts per package. Observers were asked to make attributions about the actors on the basis of the gift packages which the actors chose. Number of gifts, as an independent variable, had no effects upon attributions. Thus, discounting, defined solely in terms of number of agents (gifts) did not occur. But the value of a given gift, as a proportion of the total value of the package, did affect attributions. For instance, a $12.00 gift which was part of a $24.00 package was perceived to be more liked by the actor (characteristic of the actor) than a $12.00 gift which was part of a $36.00 package. The authors therefore concluded that discounting depends upon the proportion of total valence which is assigned to an agent and does not depend upon sheer number of agents.

The studies of Hull and West (1982) and Wells and Ronis (1982) can be understood in terms of the core model. In their theory, those writers use the term valence in the same sense as it is used in correspondent inference theory (Jones & Davis, 1965). Later in the present paper it will be shown that valence is analogous to the concept of consensus and can therefore be expressed as p(event/entity). It follows that Hull and West (1982) and Wells and Ronis 1982), when they manipulated valence, were simultaneously manipulating probabilities. For example, one might suggest that the probability of an actor choosing the $12.00 gift is less than the probability of the actor choosing the $24.00 gift. So the valences of the gifts can, in principle, be stated in terms of the core model, so that the mechanisms of the core model can be applied. The valence of a single gift is therefore equivalent to its facilitative force, as is the valence of a package of gifts. By assigning dollar values to all the gifts in all conditions, then, the experimenters were strictly controlling the way in which observers distributed the available facilitory force across the available facilitators. So these studies have shown that when distribution of facilitative force is strictly controlled, number of agents is irrelevant. The studies do not address situations in which more leeway is given to observers in how they make their distributions. As suggested above, if observers normally choose equal distribution, discounting expressed as number of agents may be a useful generalisation. Hansen and Hall (1985) did an experiment in which observers had considerable freedom in how they distributed the facilitative and inhibitory forces. They found significant effects of number of agents.

The Hansen and Hall (2985) study did a very clear demonstration of the effects of multiple agents upon characteristic augmentation and discounting. They found in addition, though, that the effects of multiple agents upon augmentation and discounting, are not symmetrical. Interestingly, they explained this lack of symmetry by suggesting that observers bring preconceptions to the experimental situation and that those preconceptions can be expressed as probabilities (proposition 1). In experiment 2 Hansen and Hall (1985) asked observers to respond in terms of probabilities.

This completes the description of characteristic augmentation and discounting in terms of the core model and the analysis leads to a number of insights. Kelley (1973) said that augmentation and discounting are opposing forces. This is true in the sense that augmentation (as he defined it) shows increasing attribution to an agent while discounting (as he defined it) shows decreasing attribution to the agent. The analysis presented here goes beyond this though, to show the fundamental processes behind characteristic augmentation and discounting. Both have to do with the strength of the facilitative effect which is assigned to an agent in order to explain an event. There are two factors which affect the strength of that effect. First, the total inhibitory force which the facilitative effect must overcome. This aspect is addressed in conjunction with characteristic augmentation. The second factor is the way in which observers choose to distribute that total facilitative force across the available agents. This aspect is addressed in conjunction with characteristic discounting. Seen in this light augmentation and discounting are not necessarily contradictory, they are manifestations of two sets of processes which function in a complementary way when observers are operating under propositions 11 and 12.

Now that characteristic augmentation and discounting have been considered, causal augmentation and discounting will be discussed. Kelley (1973) did not make a distinction between the causal and characteristic versions of these phenomena but his definitions are compatible with them all.

Causal Discounting. This phenomenon, as the name suggests, occurs when observes are trying to decide which agent is to be named as the cause of an event, when they are operating under proposition 10. In that situation, one or more facilitators are available whose characteristics are of appropriate nature and force to explain the event. Observers do not have to infer any new information in order to provide an explanation.

Under proposition 10 observers scan their available probability statements in order to find the strongest available facilitator. If there is only one facilitator and its facilitative force is strong enough to overcome the available inhibitors, that one facilitator will be named as the cause by almost all observers. If there is more than one facilitator, but one of them is clearly much more facilitative than the others (and is of sufficient strength to overcome the available inhibitors), that stronger one will also be named as the cause by most observers. In these two cases most observers will be in agreement about the cause and their aggregated data will show very strong causal attribution to one particular agent. If observers were asked how sure they were about their attributions, they would probably indicate high confidence. If, however, an event occurred and there was more than one facilitative agent available, and those agents had approximately the same facilitative forces, observers would have a difficult time deciding which agent to name. Each observer's choice would be heavily influenced by transient factors such as momentary salience. Relatively small individual differences in observer's beliefs about which agents were most and least facilitative would also lead to differences in responses. As a consequence, when the responses of observers were aggregated, there would be no clear attribution to any one agent as the cause. If asked, observers would indicate low confidence in their attributions.

> CAUSAL DISCOUNTING refers to the fact that the fewer the number of available facilitators of an event, of approximately equal facilitative force, the more likely any one of the agents is to be named as the cause of the event.

Causal discounting is another phenomenon from configuration theory which has an analogue in covariation theory. In Table 1 it can be seen that cells 1 and 2 each has a single strongest available facilitator; in cell 1 it is the actor, in cell 2 it is the entity. In each of those cells attribution to that single strong facilitator will be high. In cell 4, however, there are two available facilitators, the actor and the entity. If they are close in strength there will be some attribution to each so that the attributions to these tied agents will be less than to the single agents in cells 1 and 2. Thus, causal discounting is demonstrated. Another variant of causal discounting can be found entirely within cell 4. Although actor and entity are both facilitators in cell 4, they are not necessarily tied in strength. If one is stronger, it will be named as the cause of the event (strongest available facilitator, proposition 10). Its attributions will therefore be stronger than if actor and entity were tied as the strongest available facilitators in cell 4. Again, causal discounting is demonstrated. Cell 4 is not restricted in principle to only two facilitators. Cell 4 might have any number, so the amount of variation in degree of discounting and in variations upon the kind of discounting, which are possible, seems large. These many possibilities in cell 4 would probably be worth empirical investigation.

Recently Ledds, Abelson and Gross (1984) have criticized attribution theory but the present discussion of causal discounting, along with some other aspects of the core model, serve to reduce the validity of their points. Leddo _et al_ (1984) collected data showing that with some scenarios, and given the appropriate response format, observers will prefer to make attributions to more than one agent rather than to a single agent. They maintain that this phenomenon is more readily handled by knowledge structure theory than by the concepts of attribution theory. But their concept of attribution theory was a version using only a single facilitative agent. The present discussion of causal discounting, with its focus on cell 4, shows quite clearly that the core model, and therefore attribution theory in general, provides a framework for dealing with events which have mulitiple causes. Work by Jaspars (1983) and Hilton and Slugoski (1986), which will be discussed below, also give serious treatment to cell 4. Attribution theory does have a framework for dealing with multiple attributions and this should be an important area of research since real world attributions are probably rife with it.

Causal discounting has a restriction on its occurrence analogous to that found in characteristic discounting. Above it was shown that the definition of characteristic discounting, in terms of number of facilitators, was valid only in situations in which observers were spreading the necessary facilitative force equally across available facilitators. The discussion went on to show that characteristic discounting, when defined in that way, was a phenomenon associated with a much more fundamental issue. That more fundamental issue concerns the way in which observers distribute the necessary facilitative force across available facilitators when they have the freedom to do so. By analogy, causal discounting, when defined in terms of number of agents, applies only in situations in which there is more than one facilitator available and the facilitators are of approximately the same facilitative force. Causal discounting, when defined in this way, is a phenomenon associated with a much more fundamental issue. That issue concerns the way in which observers attribute cause when there are multiple facilitators available and they are of varied facilitative strength. This fundamental issue deserves research attention.

Causal Augmentation. This concept is not as easily derived from Kelley's (1973) definition of augmentation as causal discounting was derived from Kelley's (1973) definition of discounting. Recall that characteristic discounting concerns how observers distribute the necessary facilitative force across available facilitators and that characteristic augmentation concerns how the strength of the inhibitors to be overcome determines what the strength of that necessary total facilitative force will be. By analogy, causal discounting concerns the decision about which of the available facilitators will be named as the cause, so causal augmentation concerns the question of whether or not the available facilitators have sufficient facilitative force to overcome the available inhibitors.

The issue of whether or not the available facilitators have enough facilitative force to overcome the available inhibitors was discussed in the core model in proposition 10. Under this proposition, observers have beliefs about the characteristics of at least some of the available agents. If observers find that the available facilitators have enough facilitative force they will name one or more of them as the cause. If they find that they do not, they move to another explanation mode under another proposition. They will infer new characteristics, change existing beliefs about characteristics or decide no explanation is possible (luck). Causal augmentation is a phenomenon associated with this fundamental process. The following definition therefore follows.

> CAUSAL AUGMENTATION refers to the fact that the stronger the inhibitory force to be overcome when an event occurs, the stronger must be the facilitory force of the agent(s) which is (are) named as the cause of the event.

This definition is really a restatement of one of the basic principles stated in proposition 10, that an agent will not be named as the cause of an event unless it has sufficient facilitory force to overcome the available inhibitors.

Now that the various kinds of augmentation and discounting have been defined, their relationships to each other can be summarized. This can best be done by describing a sequence of processes which occur during attribution and indicating the points at which each of the phenomena can occur. When faced with an event to be explained, observers (among other things) will determine if the known characteristics of available facilitators have sufficient facilitative force to overcome the inhibitive force of the available inhibitors (causal augmentation). If they do, observers will then determine which of the available facilitators will be named as the cause (causal discounting). If the available facilitators are not of sufficient potency to overcome the available inhibitors, observers may decide to infer new or revised characteristics to the available agents in order to explain the event. They must first decide how much total facilitative force must be attributed in order to overcome the available inhibitors (characteristic augmentation). They must then decide how that total force will be distributed across the available facilitators (characteristic discounting).

Because the core model is expressed in terms of probabilities and gives some importance to symmetry around p(event), it suggests that there must be several variants on the processes just described. For instance, characteristic discounting draws our attention to the process of inferring new or revised facilitative characteristics to agents in order to provide explanations for events. But observers might just as well infer new or revised inhibitory characteristics to the available inhibitors in order to provide the explanation. They might also alter or add, simultaneously, both facilitory and inhibitory characteristics. Processes analogous to augmentation and discounting might also occur when observers are asked to explain why an event did <u>not</u> occur. All of these possibilities could be worked out theoretically and empirical predictions made and tested.

This completes the discussion of augmentation and discounting. the core model shows that these terms can be subdivided into causal and characteristic versions. These clarified versions refer to processes described in the propositions of the core model. Characteristic augmentation and discounting occur under propositions 11 and 12 when observers must infer new or changed characteristics in order to explain an event and are associated, respectively, with deciding how much facilitative force must be attributed and how that force will be distributed across the available agents. Causal augmentation and discounting occur when observers are operating under proposition 10 and have knowledge of the available agents. Causal augmentation and discounting are associated respectively, with deciding if the available facilitators can overcome the available inhibitors and if so, which of the available facilitators will be named as the cause. The core model's interpretation of these terms is consistent with available data and suggests that there are other analogous concepts which should be theoretically developed and empirically tested.

Conclusions Concerning Kelley's Theories

Both of Kelley's (1973) theories have now been explained in terms of the core model and the following general conclusions can be drawn from that explanation. The basic concepts of Kelley's two theories can be expressed in the relatively elegant and precise probabilities of the core model. Since the core model shows the facile interaction of cause and characteristic attributions while keeping their separate integrities intact, the roles of the two kinds of attribution in Kelley's theories were clarified. Covariation theory is concerned entirely with the attribution of cause, given that observers have adequate information (proposition 10). Configuration theory is concerned with both causal and characteristic attribution and falls mainly under propositions 11 and 12. Expressing both theories in terms of the core model allowed the demonstration of many correspondences between the two theories which had not been noticed before. It also demonstrates that the two theories are so intimately interconnected that they should not be treated as separate theories. Finally, the core model clarified some recent research issues and suggested areas of possible future research. It is now time to show the relationship between Kelley's theories and corespondent inference theory by showing how the latter fits into the core model.

CORRESPONDENT INFERENCE THEORY

The purpose of this third major part of this paper is to show that correspondent inference theory (CIT) can be reformulated in terms of the core model and that it has a great deal of overlap with Kelley's (1973) attribution theories. CIT (Jones & Davis, 1965; Jones & McGillis, 1976), like Kelley's theories, has had a tremendous impact upon attribution theory and research (Harvey & Weary, 1984). Although the theories (CIT and Kelley's) are based on the work of Heider (1958), they are superficially quite dissimilar. At no time has a clear and intimate connection between them been shown. Jones & McGilles (1976) drew many parallels between them and demonstrated a number of correspondences, but their analyses also demonstrated a number of problems (including some apparent contradictions), which will have to be overcome if the theories are to be truly integrated. Howard (1985) has given an excellent critique of the Jones and McGillis (1976) paper. The analysis presented here, based on the core model, will overcome the problems described by Jones & McGillis (1976) and by Howard (1985) and will show that the two theories are based on the same fundamental logic and are so intimately interrelated that they need not be treated as separate theories. Some aspects of the theories are complementary and represent different developments on the core logic, but there are no contradictions.

CIT has to do with the processes whereby observers come to believe that a particular individual has a particular disposition, given that the individual has chosen to act in a particular way when faced with a particular set of options (Jones & Davis, 1965). If the individual chooses a desirable option (i.e., the one that most people would choose) it tells observers little except that the individual is like other people. If the individual chooses an undesirable option, observers infer that the individual is different from other people and has a strong disposition to choose that particular option. Observers can further diagnose the actor by looking at the effects (consequences) of the chosen and foregone actions. If only one effect differed as a function of which action was chosen, observers can feel quite confident that it was that single effect which swayed the individual and that the individual has a disposition associated with that effect. If, however, there are several effects which differ as a result of choosing one act over the other, observers cannot be sure which effect swayed the actor, and so will be less confident about what disposition to assign the individual. In summary, observers more confidently assign a disposition to an actor when the actor chooses an undesirable act which has few differential (non-common) effects.

The first step in showing the relationships between CIT, Kelley's theory and the core model will be to show that certain basic terms can be applied to them all. Although the shades of meaning attached to these terms by Kelley's theory and CIT may be different, the meaning given by the core model will be broad enough to encompass both of these others and is consistent with available empirical data.

The terms actor, event, and disposition are used in about the same way by the different theories. The actor is the person observed and about whom attributions may be made. In Kelley's theory and CIT the term event refers to some human behaviour which will be explained by observers. In the core model the event can be a human action but it can be other kinds of occurrences as well. In order to show the connection between the different theories, the focus here will be on human activities as events. A disposition is a characteristic which observers may infer an individual to have in order to explain the occurrence of events. Observers may also have beliefs about actors' dispositions before observing the event.

CIT, as stated by Jones & Davis (1965) and Jones and McGillis (1976) does not give an official theoretical role to the concept entity, but it can be found embedded in their logic. It is essential to show this if the connection of CIT to Kelley and the core model is to be demonstrated. In Kelley's (1973) theory an entity is usually some specific, non-human object such as a dog or a painting, or perhaps a human other than the actor, e.g., a comedian. In the core model entity can be used in this way but can also include a combination of such single entities, e.g., a cocktail party. In the core model then, an entity can be the situation which the actor faces, but the focus may be upon some particular aspect of it, such as a painting. In CIT the actor is depicted as facing a choice situation, as having to choose one of two or more actions. It is this choice situation which represents the entity in CIT. This concept is entirely consistent with the expanded meaning of the term used in the core model. Kelley used a less enriched meaning of the term because he was primarily interested in how people assign causes to agents, and it is easier to develop this logic if the agents in question are discrete. Jones and Davis were interested in explaining how people assign dispositions to actors, given actors' fairly complex choices, so their concept needed to be more enriched. The core model shows that these two concepts are not incompatible; they are just complementary articulations of the same reality.

Fundamental Concepts

Now that the basic terms of the various theories have been shown to be parallel, it is possible to explain the important concepts of CIT in terms of the core model and Kelley. The two most fundamental concepts of CIT are desirability and number of non-common effects (Jones & Davis, 1965). These two concepts operate at different places in the attribution process. Earlier, in the discussion of proposition 11 it was shown that the attribution of cause and the attribution of characteristics operate in very intimate interaction, even though their separate roles are discernible. Here in CIT the same thing will be found to occur. Desirability, one basic concept, will be shown to operate to determine causal attributions. It will lead observers to decide if the actor is the cause of the event. The second basic concept, number of non-common effects, will determine characteristic attributions. It leads observers to decide which disposition should be assigned to the actor, given that the actor is the cause of the event.

Desirability/Valence

One of the basic tenets of CIT is that the more desirable the action chosen by the actor, the less likely a disposition will be assigned to the actor (Jones & Davis, 1965). Later Jones and McGillis (1976) refined the concept of desirability and renamed it valence.

The concept of valence is captured in Kelley's (1973) concept of consensus, and when this connection is established it can be seen that Kelley, CIT and the core model all use the same logic. As Kassin (1979) pointed out, acts which lead to events of positive valence are more likely to be chosen by people than are acts which lead to events of negative valence. So, across all actors and entities, the probability of positive valence acts is greater than the probability of negative valence acts. Bearing in mind that in CIT the act is chosen in the face of a choice situation which corresponds to Kelley's concept of entity, and that the act chosen is the event, an act has positive valence when, p(event/entity) = high; and an act has negative valence when p(event/entity) = low. Inserting p(event) into these expressions to give points of reference leads to the following definitions:

An act/event has POSITIVE VALENCE when:

p(event/entity) > p(event)

An act/(event) has NEGATIVE VALENCE when

p(event/entity) < p(event

These probabilistic definitions of positive and negative valence correspond to the probabilistic definitions of high and low consensus derived for covariation theory earlier.

The attributional logic of valence and consensus is also the same. When consensus is high the entity is a facilitator of the event and observers tend to attribute the event to the entity rather than the actor. When valence is positive the choice situation is a facilitator of the event (the actor is seen to be constrained by the circumstances to perform the act) and CIT suggests (as does the core model and Kelley) that the actor will be unlikely to be named as the cause of the event, given the presence of the circumstances as a facilitator. When consensus is low the entity is an inhibitor of the event and so is unlikely to be named as the cause of the event. As an alternative the actor is a likely possibility. When valence is negative, the choice situation is an inhibitor of the event (the actor is seen to be constrained by the circumstances *not* to perform the act) and so CIT suggests (along with the core model and Kelley) that the actor is likely to be named as the cause. If the actor is unknown it will be necessary to assign a facilitory disposition to the actor in order for the actor to be seen as the cause.

It should be noted that when valence is positive observers are operating under proposition 10 of the core model. A causal explanation is sought by scanning for the strongest available facilitator. The entity (choice situation) is found to be just such a facilitator and would be named as the cause if observers were asked. Since the actor does not play any role in this causal explanation, observers will not need to infer any dispositions to the actor in order to explain the event. If asked about the actor's disposition, observers will therefore give a weak response if any. This state of affairs is part of what is captured in cell 2 (Table 1) of Kelley's covariation theory. In that cell the entity is the strongest available facilitator. In cell 2, though, there is prior knowledge of a disposition for the actor (he/she is an inhibitor), while in CIT the actor is merely unknown.

When valence is negative observers are operating under proposition 11 of the core model. The entity is an inhibitor and there are no available facilitators. Observers therefore infer a facilitative disposition to the actor in order to provide a causal explanation. They will name that disposition if asked. These kinds of processes were also assumed to be operative in Kelley's (1973) description of compensatory causes (configuration theory). In terms of covariation theory observers are working with cell 1 (Table 1). They are filling out the information pattern by providing a probability statement for the actor: Given the correspondence to proposition 11 it follows that the more negative the valence of the chosen behaviour (i.e., the more strongly the choice situation inhibits the behaviour), the stronger the facilitative disposition which will have to be assigned to the actor in order to explain the event. These processes also apply under characteristic augmentation.

CIT identifies at least two other factors (in-role/out-of-role behaviour and freedom) which influence attributions, which can be seen to operate upon the same basis as valence, although this is not made explicit. Jones and Davis (1965) state that in-role behaviour is explained by the presence of role demands so it is not used to attribute dispositions to actors. In-role behaviours have higher positive valence than out-of-role behaviours and are thus connected to valence and consensus. Jones and Davis (1965) and Jones and McGillis (1976) state that observers will not attribution dispositions to actors unless they perceive that the actors have freedom to make action choices. A person without freedom is constrained by the situation, all people would act in that way in that circumstance. This is high consensus so the action is attributed to the situation and no dispositions are assigned to the actor. In short, valence/desirability is the most fully articulated concept from CIT which corresponds to Kelley's consensus. However, there are other concepts which also correspond and the core model handles all of those connections.

Number of Non-Common Effects

The theory involving non-common effects has to do with the attribution of characteristics. This contrasts to the role of valence which has to do primarily with the attribution of cause. If the actor is not seen as the cause of the event, dispositions will not be assigned to the actor. If the actor is seen as the cause, a disposition can be assigned and observers must decide which disposition it will be. If only one effect differs between the chosen and unchosen acts, observers can feel quite confident that the actor has a disposition associated with that effect. If there are multiple effects which differ between the acts, observers will have a more difficult time deciding which effect swayed the actor and therefore which disposition the actor has. An underlying assumption of this logic is that there is a one-to-one correspondence between effects and dispositions. For each effect that the observer knows about there is, apparently, a disposition that can be assigned to the actor.

The operation of non-common effects can be stated in probabilistic terms. Observers will have some impression of the desirability of most of the effects that might follow from an actor's choice. For instance, in

Jones and Davis's (1965) example of Miss Adams' choice of a marriage partner, some of the effects considered were wealth, social position and children. Observers will have some impression of how desirable each effect is, although that impression will undoubtedly be heavily influenced by the observer's own particular experience. As described above, desirability and valence can be expressed as probabilities. The probability that the effect would be chosen, across all actors and all choice situations (entities), will correspond to the valence of that effect. High probability means high valence; low probability, low valence. The human behaviour of choosing a particular effect is an event, so the valence of an effect can be expressed as, p(event).

Given this line of logic it is possible to link the valences of effects to the valences of actions. In CIT each action choice which the actor has is depicted as having more than one effect associated with it. The valence of a given action, then, will be given by the sum of the valnces of the effects associated with that action. It is thus seen that valences and non-common effects are intimately linked.

As CIT points out, non-common effects play a role in determining which disposition an actor is seen to have. If there is more than one non-common effect observers must decide which one (and its associated disposition) is responsible for the act. It seems likely that observers will consider the valences of the chosen non-common effects when making this decision. The more positive the valence of the effect the more likely it will be implicated. Jones and Davis (1965) give an exmple of someone who goes into debt (negative valence) in order to own an automobile (positive valence). Observers are more likely to conclude that the actor has a desire to own a car than that the actor has a desire to go into debt.

The role of the valences of non-common effects in the choice of disposition labels contrasts to the role of valence in the attribution of cause. Observers are most likely to assign a causal role to the actor, and therefore a disposition label, when the actor chooses the act which has a low valence. But, given this decision, observers will name as the disposition the one which is associated with the non-common effect of highest valence.

This completes the discussion of the two basic concepts of CIT, valence and number of non-common effects. It has been shown that these concepts can be explained in terms of the core model and that valence has a direct analogue in Kelley's theory. In addition an elegant connection between valence and non-common effects was demonstrated using the probabilities of the core model.

Later Developments

Jones and McGillis (1976) made a major attempt to refine CIT, to expand upon it and to show its connection to Kelley's covariation theory. Their discussion focused primarily upon target-based expectancies, category based expectancies and the search for a contrast effect. Each of these developments will be described here and explained in terms of the core model and Kelley's theory.

Category-Based Expectancy

According to Jones and McGillis (1976, p. 393), "A category based expectancy derives from the perceiver's knowledge that the target person is a member of a paraticular class, category or reference group." In other words, given that an actor is a member of some group, the observer expects the actor to emit a particular kind of behaviour, to choose a particular act, to produce some particular event. The stereotype is the classic example of this. Jones and McGillis (1976) also state that category-based expectancies tend to be probabilistic. This provides a direct link to the core model.

In the core model category-based expectancies are expressed as probabilities. If the observer expects a certain act (event), given that the actor is a member of some group, this can be expressed as, p(event/actor) = x. Note that in this interpretation the behavioural expectation is clearly attached to the actor even though that expectation comes ultimately from the actor's group membership. If it happens that, p(event/actor) $\neq$ p(event), observers will perceive the actor to have a disposition, as defined in proposition 2. This gives the following definitions.

A CATEGORY BASED EXPECTANCY is information stored by observers in the form:

$$p(event/actor) = x$$

A category based expectancy will be a DISPOSITION when:

p(event/actor) $\neq$ p(event)

<u>Target Based Expectancy</u>

According to Jones and McGillis (1976) target based expectancies are based upon knowledge about the specific individual actor. Because of their beliefs about the actor's past, observers expect the actor to behave in a particular way. Jones and McGillis (1976) also state that target based expectancies are probabilistic in nature.

The core model expression for target based expectancies is therefore analogous to that for category based expectations.

A TARGET BASED EXPECTANCY is information stored by observers in the form:

$$p(event/actor) = x$$

A target based expectancy will be a DISPOSITION when:

$$p(event/actor) \neq p(event)$$

Thus it is seen that in the core model both category based and target based expectancies are probability statements attached to the actor which can represent dispositions. These alternate sources of expectations about actors will be combined in some way by observers to produce an overall expectancy about the actor's behaviour. The dynamics of this combination process, for example, the relative strength of influence of stereotyped beliefs and actor specific information, has been a subject of controversy for some time (see, for instance, Weber and Crocker, 1983). Kassin (1979) presents a thorough discussion of the same type of issue as it applies to expectations based not upon the actor but upon the entity (consensus). These parallel areas of research might benefit from cross fertilization.

The core model's version of how these expectancies translate into the concepts of Kelley's theories does not agree entirely with that of Jones and McGillis (1976). They agree upon target based expectancies. The core model's version allows for a complete integration of the two theories; Jones and McGillis's (1976) did not.

<u>Target Based Expectancies/Distinctiveness</u>

Jones and McGillis (1976) and the core model agree that target based expectancies correspond to distinctiveness information in Kelley's theory. It has already been shown that target based expectancies are of the form $p(event/actor) = x$ and that when $x \neq p(event)$ the expectancy is a disposition. It was earlier shown that distinctiveness information is of the form p(event/actor) = x. So in the core model the two correspond exactly. Jones and McGillis (1976) also develop a clear rationale for this correspondence.

Category Based Expectancies/Distinctiveness

The core model suggests that category based expectancies are equivalent to distinctiveness, but Jones and McGillis ()1976) maintain that they are equivalent to consensus. In the core model, category based expectancies are of the form, p(event/actor) = x and earlier it was shown that distinctiveness information also has this form. Jones and McGillis (1976) however assume that because consensus information involves a reference group, and so do category based expectations, they are therefore equivalent. They state that when actors violate a category based expectancy, i.e., they act in a way which is unexpected for their social group, this constitutes low consensus and leads to attribution to the actors. When actors conform to category based expectancies it constitutes high consensus and does not lead to attribution to the actors.

This difference in interpretation is based primarily on the distinction between the contrast and predictive interpretations of covariation information which was described earlier. Jones and McGillis (1976) are using the contrast interpretation which says that the essential information in consensus data is the contrast between the way the focal actor behaves and the way other actors behave. Given this, it makes sense to say that the degree to which the focal actor conforms to expectancies which are based upon category membership, represents consensus information. The core model, however, uses the predictive interpretation of covariation information which says that consensus has to do with, p(event/entity). Category based expectancies have nothing to do with this. The predictive interpretation says that distinctiveness information has to do with, p(event/actor). As explained above, category based expectancies are in this form.

Since category based expectancies concern, p(event/actor) they correspond to distinctiveness information in Kelley's theory. When events confirm category based expectancies (the actors do what observers believe they have done in the past) there is low distinctiveness and a tendency to attribute to the actors. When events contradict category based expectancies (the actors do not do what observers believe the actors have done in the past) there is high distinctiveness and a tendency not to attribute to the actors.

This proposition that category based and target based expectancies provide the same basic kind of information is supported by data reported by Jones and McGillis (1976). They describe studies in which the two kinds of expectancies were manipulated independently. The results showed that the two kinds of manipulations had identical effects upon experimental outcomes.

Consistency Information in CIT

The core model and Jones and McGillis (1976) also disagree on the role of consistency information in CIT. Jones and McGillis (1976) maintain that target based expectancies constitute consistency information. The core model suggests that CIT, as stated to date, has no concept which corresponds to consistency, but that observers do make assumptions about it.

The core model does not accept the Jones and McGillis (1976) proposition that target based expectancies correspond to consistency information. This is primarily because of the precision provided by the expression of concepts using probabilities. In the core model consistency information, p(event/actor $\cap$ entity), is an expectation which does involve the target actor, but it is an expectation based on BOTH the actor and the entity. Target based expectancies; defined by the core model to be, p(event/actor); are expectancies based upon only the actor.

Although CIT does not have a concept analogous to consistency, the core model suggests that observers will make assumptions about this kind of information. Proposition 9 suggests that observers will not make attributions about the enduring dispositions of actors unless they believe that the behaviour exhibited in the focal event would also occur on other occasions when the actor and entity meet. It follows from this that if the observers are not given consistency information, but are asked to make disposition attributions, they will assume consistency into the situation while making their attributions. Jones and McGillis (1976) do not explicitly make this kind of prediction. An empirical test of it could be carried out by replicating the classic astronaut and submariner experiment (Jones, Davis & Gergen, 1961) and asking subjects to report their impressions of how the actors would behave on future occasions if put into the same situations.

The Contrast Effect

The contrast effect was originally defined by Jones and McGillis (1976) but the core model gives considerable insight into its nature and its relationship to other theoretical ideas, including Kelley's. Although the concept is fundamentally valid, the attempts to demonstrate it empirically described by Jones and McGillis (1976) were based upon a misinterpretation of its nature. The core model describes this misinterpretation, and delineates what is valid and invalid.

According to Jones and McGillis (1976), "A contrast effect is defined by comparing an expectancy confirmation case to an expectancy disconfirmation case. There is contrast when the disconfirming behaviour leads to a more extreme inference than the confirming behaviour." Jones and McGillis (1976) give an example involving a self-made financier and a postal clerk. If the self-made financier makes a pro-union statement, this is quite unexpected. If the postal clerk makes a similar statement it is not so unexpected, it may even be expected. By Jones and McGillis's (1976) definition of the contrast effect more liberal attitudes will be attributed to the self-made financier (unexpected behaviour, high contrast) than to the postal clerk (expected behaviour, low contrast). Note that the contrast here comes from category-based expectancies (the actors' membership in occupational groups). Since category based expectancies are actor based expectancies, in this example we have contrast in actor based expectancies leading to differences in attributions about the disposition of actors.

Jones and McGillis (1976) stated that they derived the idea of the contrast effect from earlier work described in Jones and Davis (1965). As described there the contrast effect has to do with the desirability of the act chosen. Choice of the undesirable act (unexpected, high contrast) leads to stronger attributions to the actor than does choice of the desirable act (expected, low contrast). This set of ideas was discussed above, in the present paper, under Desirability/Valence. There it was shown that valence is an expectation based upon the presence of the entity. It was also shown that this logic is found in the core model and Kelley and there is ample empirical evidence to support it (Jones and Davis, 1965; Jones and McGillis, 1976). It should be noted that in these valid examples of the contrast, the contrast is in expectancies about the entity and this leads to differences in attributions of dispositions to the actor.

However, the later attempts to demonstrate the contrast effect, which Jones and McGillis (1976) describe, involved contrasts using actor based expectancies. The example they gave of the postal clerk and the self-made financier is a case in point. In addition, a study by Jones and Harris (1967) which tried to demonstrate the contrast effect used acts which were expected or unexpected given that the actor was a northerner or a southerner (an actor based contrast). In a McGillis (1974) attempt the expectations were based upon the role of the actor. In a Jones and Berglas (1976) attempt expectations were based upon knowledge of the profession of the actor or upon some previous statement by the actor.

The core model shows why contrasts involving actor-based expectancies (distinctiveness information) will not lead to the contrast effect in attributions of disposition to the actor. When contrast is high it means that p(event/actor) = very low, and therefore, less than p(event). In other words the actor is an inhibitor of the event and unlikely to be named as a cause. This is Kelley's (1973) high distinctiveness situation. When contrast is low it means that p(event/actor) = very high > p(event). In other words the actor is a facilitator of the event and is very likely to be named as the cause and an appropriate disposition attributed if necessary. This is Kelley's (1973) low distinctiveness situation. The core model therefore predicts that for actor based contrasts the opposite of Jones and McGillis (1976) contrast effect will occur. The higher the contrast the weaker the attribution of a disposition to the actor. This was what was found in the attempts to demonstrate contrast by Jones and Berglas (1976), Jones and Harris (1967) and by McGillis (1974).

The contrast effect arising from situation-based expectancies is analogous to processes already described above, including proposition 11, compensatory causes, schema, characteristic augmentation and valence. In addition contrast can be seen as part of an attempt by observers to fill out the available information in order to fill cell 1 (Table 1) in Kelley's covariation theory. Incidentally, Kelley's (1973) augmentation also appears at another point in CIT. On page 227, Jones and Davis (1965) state that "...Inferences concerning the intention to achieve desirable effects will increase in correspondence to the extent that costs are incurred, pain is endured or, in general, negative outcomes are involved." Although Jones and McGillis (1976) seemed to be aware of this latter correspondence to augmentation they did not mention the connection between this and the contrast effect.

The ill-fated attempts to demonstrate the contrast effect using category-based expectancies were not unreasonable, given the theoretical framework in use by Jones, McGillis and their colleagues. Jones and McGillis (1976) state that category-based expectancies are equivalent to consensus information. It has just been demonstrated that the contrast effects based upon consensus, p(event/entity), is valid. It is therefore a natural extension to seek to show the effect using category based expectancies. Unfortunately category based expectancies are related to distinctiveness, not consensus.

The idea of a contrast effect arising from category based expectancies has validity, but not in the way articulated by Jones and McGillis (1976). As stated earlier, category based expectations are a form of actor based expectancy. When there is high contrast arising from actor-based expectancies it means that p(event/actor) = very low < p(event) and that the actor is an inhibitor of the event. Given this observers are likely to attribute the event to the entity. When there is low actor-based contrast, p(event/actor) = very high > p(event), the actor is a facilitator of the event and likely to be named as the cause. Therefore the entity is unlikely to be named. It follows that where there is actor-based contrast it leads to a contrast effect in attributions to the entity. This prediction of the core model could be tested by replicating the attempts to demonstrate the contrast effects which were discussed earlier, and including in the experimental design a measure of attributions to the entity. The propositions of the core model are stated in terms of agents rather than in terms of actors or entities in order to allow the principles of attribution to be applied to entity attributions as well as actor attributions. The general rule here is that when an event is unexpectedly given observers' beliefs about one agent, it tends to enhance attributions of causes and characteristics to other available agents.

<u>The Core, Kelley and CIT</u>

Now that Kelley's (1973) theories and those of CIT (Jones and Davis, 1965; Jones and McGillis, 1976) have both been explained in terms of the core model, it is appropriate to summarize the connections between all of these models.

Proposition 9 of the core model describes observers' requirement that the focal event be predictable, given the available congregation of agents, if stable causal and characteristic attributions are to be made. Only cells 5 to 8 (Table 1) of Kelley's covariation theory apply to situations in which such predictability does not occur. All the rest of the work by Kelley, Jones, Davis and McGillis involves situations with predictability and therefore does not fall under proposition 9.

Proposition 10 of the core model involves situations in which observers have sufficient information to explain an event prior to the occurrence of the event. It is the observers' preferred mode of operation. Characteristic attributions can be read off of the available probability statements and causal attributions are derived by comparing the magnitudes of available probability statements. The first four cells (Table 1) of Kelley's covariation theory give a clear description of the basic processes involved here using the concepts consensus, distinctiveness and consistency. However, CIT does have a place for these concepts since the operation of valence is analogous to that of consensus and the operation of target based and category based expectancies is analogous to that of distinctiveness. CIT does not articulate a theoretical role for consistency information but the core model suggests that actors make assumptions about it. Causal discounting and augmentation, refinements of Kelley's concepts of discounting and augmentation, operate under this proposition as well. In the CIT situation of high valence observers are in proposition 10 and are able to provide a causal explanation without having full covariation information.

Proposition 11 of the core model involves situations in which observers have insufficient information and must infer causal attributions if they are to provide characteristic attributions and _vice versa_. The mechanics of the processes involved are described under characteristic augmentation and discounting, derived from Kelley's theory and the compensatory causes schema directly from Kelley's configuration theory. The contrast effect from CIT, as refined by the core model, describes essentially the same processes. The condition of low valence in CIT also comes here. None of the theoretical statements from Kelley or CIT that fall under proposition 11 discuss the role of consistency information. The core assumes that observers will make inferences about consistency, however, in all operations under proposition 11, or allow themselves to fall under proposition 9.

Two characteristics of the core model are primarily responsible for its ability to elegantly integrate all of these important concepts from Kelley and CIT. The first is the use of the predictive, as opposed to the contrast based interpretation of covariation information. This comes directly from the use of probabilities to describe the information. Without the predictive interpretation the errors of some past attempts to integrate the theories would have been repeated. The second characteristic of the core model of great importance is its articulation of the propositions and a statement of how the propositions are related to each other. This theoretical framework provides a coherent understanding of when and how these various processes will be used. Although most of these processes were identified years ago there has hitherto been no elegant way to organize them.

OTHER THEORISTS

Now that the two most influential theories have been analysed using the core model, some others will be examined as well. It would be impossible to deal with all of the available theorists so some selection has been necessary. Several that are either current and/or deal with attributions as probabilities will be discussed.

Jaspars

Jaspars and his colleagues have recently provided useful insights into the issues raised by Kelley's (1973) covariation theory of attribution

(Hewstone & Jaspars, 1984; Jaspars, 1983; Jaspars, Hewstone & Fincham, 1983). The general framework of these ideas can be brought in under the core model so that the relationship of these insights to other aspects of attribution theory can be shown.

Logical Model of Attributions

Jaspars and his colleagues developed and then abandoned what they called a logical model of attributions (Jaspars et al, 1983) which was based upon a restatement of Kelley's (1973) original covariation theory. The three kinds of covariation information were treated as logical propositions which showed whether or not a particular agent (person, stimulus, or circumstances) is a sufficient or necessary condition for the occurrence of the event in question. For example, Jaspars and his colleagues proposed that low consensus (the event does not occur in the presence of other actors), indicates that the event does not generalize over actors and the focal actor is therefore a necessary (and sufficient) condition for the occurrence of the event. The focal actor is therefore likely to be named as the cause of the event. This kind of logic was developed for each of the eight cells shown in Table 1 of the present paper, and predictions of attributions made. This approach, based upon a very clear analysis of Kelley's (1973) ideas was abandoned by Jaspars (1983) because of insufficient empirical support. Jaspars (1983) states that although the model usually predicts the most frequent attribution made for each of the eight cells, observers make many attributions besides the modal ones. In addition, for the cell with high consensus, low distinctiveness and high consistency (cell 4 in Table 1 of the present paper), the logical model predicts that no attributions will occur, yet observers make attributions in predictable patterns for this cell. Hilton and Slugoski (1986) also had problems dealing with this cell theoretically.

The core model concurs with this analysis of the logical model suggests two additional reasons why it was inadequate. The first was its use of strict dichotomies in the description of covariation information. The second is the use of the contrast based interpretation of covariation information.

The logical model (Jaspars, 1983) used a dichotomous interpretation of covariation information and this seriously restricted its predictive accuracy. For instance, the terms necessary and sufficient were used in the strict sense that the event always occurs in the presence of the agent and never occurs in its absence. This tendency to dichotomize is shared by other theorists as well, Kelley (1973) and McArthur (1972) treat covariation information as either high or low. Although it can be argued that this artificiality is used for illustrative purposes only, and that the principles thus described also apply to the intermediate cases, it can happen that the dichotomous conceptualization of variables truly restricts a theory. This is seen in the case of the high consensus, low distinctiveness and high consistency cell (cell 4) which Jaspars (1983) cites as a particularly difficult one for logical theory. Because the logical model does not allow any deviations from the strict logic of necessary and sufficient causes, and the clear categorizations which go with them, the logical model predicts no attributions in this cell since all agents and combinations of agents are, logically speaking, sufficient causes of the event - a prediction not borne out empirically. The failure of the logical model to predict anything but the modal response in the other seven cells arises from this same basic problem. The core model attempts to deal with this problem by using probabilities which allow for all degrees of intermediate cases. It thus predicts a variety of attributions for cell 4 which are supported by Hilton and Slugoski's (1986), Jaspars' (1983) and by McArthur's (1972) data. In addition, the core model, by allowing that observers may bring their own ideas to the experimental study and ignore the data provided by the experimenter, presents an avenue of explanation for other deviations from predictions which do occur.

A second weakness of the logical model is its use of a contrast based interpretation of covariation information. For example, the logical model states that low consensus means that the event does not generalize over actors and that the focal actor is therefore a necessary and sufficient cause of the event. But this interpretation is not possible unless one assumes that the event <u>never</u> occurs in the absence of the focal actor and <u>always</u> occurs in his/her presence. But this is an assumption about enduring characteristics of the actor which is not given directly in low consensus information. Low consensus says only that <u>on this occasion</u> the event occurred in the presence of the actor and that the event does not usually occur in the presence of other actors. The general problems of the contrast based interpretation are more fully discussed above.

<u>Probabilities in Attribution</u>

Jaspars and his colleagues (Jaspars et al, 1983) twice raised the possibility of using probabilities to express covariation information but in both cases they did not take the idea very far. One reason for this may be that they translated covariation information into probabilities in a way different from that of the core model. For instance, in the core model consensus has to do with, p(event/entity) while in Jaspar's version it is, p(event/entity AND circumstances). The implications of these alternate expressions of covariation information might bear theoretical fruit if they were carefully explored.

Subjective Scaling Model

Having abandoned the logical model of attributions for the reasons discussed above, Jaspars (1983) proposed what he called a subjective scaling model as a substitute. As an explanatory example Jaspars (1983) said that when a person succeeds at a task it shows that the person's ability is at least equal to the ability required for successful completion of the task. Thus the person dominates the task. Coupled with this, high consensus would mean that all people dominate the task, low consensus would mean that only the focal person dominates the task. All three kinds of covariation information could be expressed as dominance relationships and those dominance relationships can be used to make attributions. Jaspars (1983) uses a graph to show the dominance relationships.

This idea that dominance relationships between agents plays a role in the attribution process has a parallel in the core model. In proposition 11 the relative strengths of inhibitors and facilitators are discussed. For example, the disposition, fishing ability, must be of sufficient facilitative force to overcome the inhibitory effects of the poor fishing creek. In the core model the relative dominance of these agents is expressed and by the use of probabilities. Thus, Jaspars(1983) independently developed an idea found in the core model.

The Social Dimensions of Attribution

Hewstone and Jaspars (1984) have developed some ideas on the social dimensions of attribution. They decry the neglect of the role that social factors play in attributions and present theory and data in an attempt to mount a general understanding of these factors. They point out four important social dimensions of attributions; observers categorize others and are members of social categories themselves, the social context in which an attribution is made influences that attribution, social cognitions are systems of beliefs shared by and jointly constructed by groups of people, most of the acts about which observers in the natural world must make attributions are social acts.

Although these are certainly important issues, pursuing them does not make the insights provided by Kelley (1973), Jones and Davis (1965), Jones and McGillis (1976), Hilton and Slugowski (1986), the subjective scaling model (Jaspars, 1983) and the core model, irrelevant. The activities whereby individuals process information inside their own heads in order to develop attributions are something worth understanding in their own right, as are the social processes which influence these individual cognitive processes.

Overall, it seems that the core model is quite compatible with the work of Jaspars and his colleagues. The core model helps us understand why Jaspars' (1983) logical model and the attempts by Jaspars and his colleagues (Jaspars et al, 1983) to use probabilities to understand attributions, were not developed. The core model is very compatible with Jaspars' (1983) ideas about how dominance relationships play a role in attributions. Finally the core model, like many other attribution theories is complementary to Hewstone and Jaspars' (1984) ideas about the social dimensions of attributions.

Reeder and Brewer

Reeder and Brewer (1979) have developed some theory which is also compatible with the core model.

The primary focus of Reeder and Brewer (1979) is situations in which attributions act in asymmetrical ways. For example, people of high ability can be seen as the cause of behaviours which require high ability or low ability, while people of low ability are seen as capable of low ability behaviours but not of high ability behaviours. Reeder and Brewer (1979) explain this kind of phenomenon by proposing that observers apply particular kinds of schemata when making attributions. They suggest that these schemata are based upon observers' tendency to organize behaviours and dispositions along parallel continua so that for each point on the behaviour continuum there is a corresponding point on the disposition continuum. When behaviours are seen, observers will place them on their behaviour continua, and the dispositions which occur at the corresponding points on their disposition continua will be inferred to apply to the actor. For any given point on a disposition continuum, however, there will usually be several points on the behaviour continuum which correspond to it. So a range of behaviours can be indicative of any given disposition. Further, a single behaviour might not be unambiguously diagnostic. For example, the behaviour of being very friendly might indicate the disposition "friendly", or the disposition "manipulative". Reeder and Brewer (1979) represent these continua in a figure and use straight lines to represent the range of behaviours associated with a disposition.

These ranges of behaviour discussed by Reeder and Brewer can also be represented a probabilities, and thus the core model can be applied. Observers can be assumed to believe that if a given disposition is present the probabilities of certain behaviours are at certain values. For example, if someone has the disposition, honest, the probability of that person stealing a car is very low, while the probability of that person returning a found wallet is very high. The correspondence between statements and the core model's definition of a disposition, p(event/actor), is clear. One might even go so far as to suggest that the range of behaviour probabilities for a given disposition can be represented by a normal curve. If this step is taken it becomes possible to represent the process of inferring dispositions using signal detection theory (Swets, 1964). Given that a behavioural event has occurred, what is the probability that it represents disposition A, disposition B, or whatever disposition?

Reeder and Brewer (1979) also developed a concept of schema which can also be represented using probabilities. These schema are refinements upon their ideas about disposition and behaviour continua. For example, their partially restrictive schema is symmetrical about some modal behaviour. This might be represented by the symmetrical normal distribution. Their hierarchically restrictive schema, which is used to explain those cases in which attributions are made in an asymmetrical way, could be represented by a skewed distribution. Such probability distributions would fit very nicely with the earlier proposal to apply signal detection theory in this theoretical framework.

This brief description has shown that the essential ideas in Reeder and Brewer's (1979) paper can be linked to the probabilities of the core model. Some speculations for further theoretical development were also proposed.

Bayes' Theorem and Attribution

Ajzen and Fishbein (1975) have developed a probability model of attribution process which uses Bayes' theorem, and when compared to the core model brings to the fore some interesting theoretical issues. It is beyond the scope of the present paper to develop in detail any of the issues which can be raised by looking strictly at the mathematical nature of probabilities. However, the role of belief revision in attribution will be discussed.

Ajzen and Fishbein (1975) state that the process of making attributions is equivalent to the process of revising beliefs given that new information has been obtained. Bayes' theorem is a mathematical expression for describing how people's beliefs should change given that they have been given some new information. Since all of the components of Bayes' theorem are stated as probabilities, the process of making attributions is a process of using probabilities. This idea is quite powerful as is shown by their application of it to Kelley's (1973) theory, Jones and Davis' (1965) theory and a number of other attribution phenomena.

Without using probabilities the core model does give some insight into Ajzen and Fishbein's (1975) statement that causal attribution corresponds to a revision in belief about the actor. The core model shows that in some circumstances this is true and in others it is not, but, interestingly, Bayes' theorem only applies in those cases in which attribution is not equivalent to revision.

Ajzen and Fishbein's (1975) statement that attribution equals revision is based upon an elegant bringing together of their own analyses and some statements made by Jones and Davis (1965). In their own analysis Ajzen and Fishbein (1975) show in a very convincing fashion that Kelley's (1973) concepts of consensus. distinctiveness and consistency can be expressed as likelihood ratios and that attributions can be predicted using likelihood ratios. They go on to show that there is a mathematical relationship between the likelihood ratio and the amount of belief revision that occurs when Bayes' theorem is applied. This ties in neatly with Jones and Davis'

(1965) statements that belief revision occurs during the process of attribution.

The core model states that belief revision is an essential part of attribution only under certain conditions, when observers are operating under propositions 11 and 12. In those conditions the available information is not capable of explaining the event so revisions to beliefs about characteristics, or the assumption of completely new characteristics, is essential to making causal attributions. However, propositions 11 and 12 also showed that the characteristics inferred during these processes are quite different from those originally believed by the observers. The type and magnitude of the newly inferred characteristics are determined by the type and magnitude of available inhibitors. By contrast, in the Ajzen and Fishbein (1975) model the size of the changes are incremental, as dictated by Bayes' theorem. The belief change is very heavily dependent upon past beliefs about the agent. The model does not easily allow the strength of the available inhibitors to play a role. So, in the core model, Ajzen and Fishbein's (1975) idea that belief revisions are essential to causal attributions apply only to certain circumstances, but the magnitudes of those revisions, as predicted by Bayes' theorem, will usually be underestimates.

The core model proposes that under some circumstances, proposition 10, belief revision is not essential to causal attribution. Under proposition 10 observers' prior beliefs are fully capable of explaining the event. Observers scan their available probabilities and find an agent whose known characteristics are capable of causing the event in question. No revision in belief about the characteristics of that agent are necessary in order to provide a causal explanation. But, although a revision is not necessary in order to provide a causal explanation, a revision may occur. The event has just occurred in the presence of the available agents and so the probabilities of the event, given each of the agents, will be revised upward in order to reflect this new bit of information. This one bit of information will usually make a small revision in probabilities and it is not unreasonable to suggest that this revision will follow the predictions of Bayes' theorem. The core model therefore suggests an interesting state of affairs. In some cases belief revision is necessary for causal attributions to occur. In such cases the belief revisions will not be of the magnitude predicted by Bayes' theorem. In other cases belief revisions are unnecessary for causal attributions. For such cases the revisions which do occur probably can be predicted by Bayes' theorem.

In summary, the relationship between the core model and Ajzen and Fishbein's (1975) model is as follows: The core model is capable of explaining the phenomena which Ajzen and Fishbein explain using their model in their 1975 paper. The core model also helps us understand some of the boundary conditions of Ajzen and Fishbein's (1975) fundamental assumption that attribution requires belief revision. Very careful work using probabilities will be necessary to work out the detailed correspondences between the two models. The detailed work may further our understanding of attributions but is beyond the scope of the present paper.

Hilton and Slugoski

Hilton and Slugoski (1986) have recently presented an insightful theoretical analysis which can be usefully linked to the core model. The core model and Hilton and Slugoski agree upon a number of points but the core model suggests some boundary conditions of their theoretical ideas.

Hilton and Slugoski's(1986) greatest contribution is their convincing argument that the general knowledge and beliefs about the world which observers bring to the attribution process should be seriously studied. They focus primarily on the idea that scripted behaviours (Schank and Abelson, 1977) will elicit different kinds of attributions than nonscripted behaviours. The idea that observers' own knowledge influences attributions is not new (see, for instance, the long line of studies on the false consensus effect, Mullen et al, 1985), but Hilton and Slugoski do make an original and convincing advocacy. There are two related points here. The first is that this "world knowledge" of observers can contaminate attribution experiments. In a great many attribution studies, particularly those concerned with theory, experimenters present observers with information which they believe manipulates variables of interest. If the experiment does not turn out as predicted experimenters cannot tell if these unexpected results are due to a fault in the theory or due to observers ignoring or modifying the information provided. All attribution studies should have some sort of pre-testing to determine observers' original beliefs. The second point is that observers use their world knowledge when they make attributions in the real world (as opposed to the psychology lab). This world knowledge is therefore a valid object of study in its own right and Hilton and Slugoski's (1986) work therefore addresses an important issue.

Another issue which Hilton and Slugoski(1986) bring to the fore is that of multiple plausible causes. Their theory attempts to explain how observers choose one cause as "the" cause amongst the many plausible ones available in real life situations. Although the core model provides a parsimonious explanation (choose the strongest available facilitator, see proposition 10) the Hilton and Slugoski (1986) discussion of this is a rich and insightful contribution which should lead to some future research.

Hilton and Slugoski (1986) make a strong case for, and attempt to provide, improved response formats for collecting data in attribution research. As will be seen below, their particular version has problems of its own, but it is very definitely a step in the right direction, primarily because it provides observers with more flexibility in how they can respond.

Hilton and Slugoski (1986) use some ideas from the prediction-based model of covariations but they never completely abandon the contrast based model. For example, their adherence to the contrast-based explanation is clearly shown on page 77 when they are discussing consensus. They say, "Specifically, it is suggested that low consensus information (hardly anyone else does it), throws the target person into focus as abnormal,..." But the target person is abnormal only if the abnormal behaviour shown on this occasion is characteristic of the target persons' enduring behavioural repertoire. As explained above, this kind of information is not given directly by consensus. But, on page 78 Hilton and Slugoski say that low consensus information provides information about the target person and also about the entity. Their discussion shows that they are aware of the point made by the core model that consensus gives information about the entity, but have not been able to integrate it with the old idea that consensus information tells the observer something important about enduring characteristics of the actor. Given this their theoretical ideas on page 78 are quite cumbersome, with special cases for low and high consensus and for low and high distinctiveness. The core model by developing the prediction based model provides a more elegant analysis.

Hilton and Slugoski (1986) show a bias towards the consideration of unusual events. This bias is, perhaps, due to the fact that they were strongly influenced by the work of Hart and Honore (1958), who were primarily interested in causal attributions in legal situations. Given that for most people events receiving legal attention (robberies, fraud, murder, etc.) are unusual, this bias is understandable. But it does bias Hilton and Slugoski (1986) to base their analysis upon abnormal events such as railway crashes and script deviant behaviours. As a consequence, they are moved to conclude on page 85 that, "...a scripted action such as, 'Mary bought something on her visit to the supermarket' should produce no contrastive attribution at all, because there is no abnormal condition to focus on." This suggestion that observers cannot and/or will not make attributions about scripted events is rather strong when one considers how many everyday behaviours, which we explain to ourselves, are scripted. This exclusion of so much everyday behaviour from consideration by Hilton and Slugoski (1986) is surprising given that they also emphasize the virtue of considering the everyday knowledge of observers in attribution theory.

This bias toward abnormal cases weakness Hilton and Slugoski's (1986) proposed response format for subjects in attribution studies. Their primary contribution in this respect is that they have increased the number of response categories. But they include the word "special" in every category. Observers are asked if it was something special about the stimulus; the person or the circumstances which caused the event. However, excluding causal agents which are not special is unwise, given the number of daily events caused by unspecial agents. This weakness is exacerbated by Hilton and Slugoski's (1986) failure to make a distinction between causal attributions and characteristic attributions. When an observer is asked if the event was caused by something special about the agent, the observer must decide two things. First, "Was the event caused by the agent?" Second, "Was the characteristic of the agent, which led to the action, special, or was it non-special?" In their second empirical study (data is in their Table 5, p. 87) the results of having to answer these two questions, simultaneously, can be seen. In the script deviation case, not tipping, observers conclude that something special is going on (why else the script deviation?) They are thus able to attribute cause to something "special" about the agent. In the case of the scripted action, however, there is a problem. The actor has gone to the supermarket and bought something. Observers, seeing nothing special here, will shy away from indicating that an agent caused the act and that the responsible characteristic of that agent is special (as the response wording requires). Observers will prefer to use what Hilton and Slugoski (1986) call the null option here because they want to avoid saying that it was a special characteristic of the agent which caused the event. Hilton and Slugoski (1986) are saying that observers choose the null option because they want to avoid making a causal attribution to any of the agents. This conflict could be resolved with an empirical study. I would predict that given the supermarket vignette, but response categories without the word "special", observers would provide causal attributions very similar to those found in the tipping vignette. I find nothing surprising about a person going to the supermarket and buying something, but I would be surprised to find that observers are unable to make causal attributions about it.

In summary, Hilton and Slugoski (1986) provide some valuable insights but seen within the context of the core model some of their limitations become apparent. Their advocacy of the study of observers' real world knowledge and of situations involving multiple plausible causes using improved response formats is timely and well mounted. However their partial retention of the contrast based interpretation of covariation information and their emphasis on unusual events, put limitations on their studies.

CONCLUSIONS

This paper has described a core model of attribution processes, stated in terms of probabilities. This model provides a vehicle for integrating other attribution theories, for clarifying many of the concepts of attribution theory and for generating empirical research.

Two mechanisms are primarily responsible for the ability of this model to integrate a wide variety of attribution theory. First, the demonstration that most of the basic concepts of attribution theory can be stated in probabilities allowed disparate vocabularies to be put upon a common basis. It became clear that in many cases the different theories which superficially seemed to be discussing different things, were actually discussing the same things. Second, the core model provides an overall conceptual scheme linking the various individual concepts. For example the idea that observers prefer to explain in terms of prior beliefs gives a rationale for the relationship between propositions 10 and 11, and therefore between Kelley's theories and CIT. This integration has shown that the traditionally separate theories need no longer be treated as separate. It also showed that there are virtually no contradictions between the theories. Past attempts at integration typically showed apparent contradictions. Further, the core model, by its integration, does not invalidate the ideas contained in the other theories. It links and clarifies them, but also acknowledges their validity.

The core model has been able to provide some improvement in the clarity of the concepts used in attribution theory because it has reduced those concepts to the precise vocabulary of probabilities. The most important such clarification was the distinction between contrast based and predictive based definitions of covariation information. This insight oiled the integration of the theories and was very useful for clarifying why some past attempts at integration were not taken very far. It also showed limitations to past attempts to express attribution theory as probabilities. A second clarification was the distinction, expressed in probabilities, between causal and characteristic attributions. The precise language of probabilities allowed the development of clearer ideas about such things as augmentation and how causal and characteristic attributions interact intimately, but with discernible independence.

The core model is also promising as a generator of empirical research. Some of that research may arise from its comments upon other theories. For example, the core model states that when observers are operating under CIT they will spontaneously make assumptions about consistency, even though CIT has no theoretical role for consistency. This suggestion could be empirically checked. Some of the research can arise from the propositions of the core model by itself, without reference to other theories. For example, the core model by expressing its propositions in terms of agents, rather than in terms of actors and/or entities, suggests that attributions to the two kinds of agents follow the same rules. Therefore if there is a contrast effect upon attributions made to actors there should also be a contained in the other theories. It links and clarifies them, but also acknowledges their validity.

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Further theoretical work needs to be done to extend the basics of the core model, described here, into new areas. This could include the analysis of other theories, the development of completely new concepts, or further refinement of what is presented here. The core model promises to generate a both theoretical and empirical work.

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Figure Captions

Figure 1 Eight combinations of covariation information expressed as probabilities in the core model.

Figure 2 The compensatory causes schema (based uopn Kelley, 1973, p. 114)

Figure 1

Cell #	Cs	D	Cy	Summary Expression	Att.
1	L	L	H	p(event/A),p(event/A∩E) > p(event) > p(event/E)	A
2	H	H	H	p(event/E), p(event/A∩E) > p(event) > p(event/A)	E
3	L	H	H	p(event/A∩E) > p(event) > p(event/A), p(event/E)	A+E
4	H	L	H	p(event/A), p(event/E), p(event/A∩E) > p(event)	A,E,A+E
5	L	L	L	p(event/A) > p(event) > p(event/A∩E), p(event/E)	Luck
6	H	H	L	p(event/E) > p(event) > p(event/A∩E), p(event/A)	Luck
7	L	H	L	p(event) > p(event/A∩E), p(event/A), p(event/E)	Luck
8	H	L	L	p(event/A), p(event/E) > p(event) > p(event/A∩E)	Luck

A - actor
Att. - attributions
Cs - consensus
Cy - consistency
D - distinctiveness
E - entity
H - high
L - low

low consensus - p(event/E) < p(event)
high consensus - p(event/E) > p(event
low distinctiveness - p(event/A) > p(event)
high distinctiveness - p(event/A) < p(event)
low consistency - p(event/A∩E) < p(event)
high consistency - p(event/A∩E) > p(event)

ABILITY	DIFFICULT	MODERATE	EASY
HIGH	E	E	E
MEDIUM		E	E
LOW			E

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