The Process of Explanation

Douglas S. Krull and Craig A. Anderson[1]

Department of Psychology, University of Missouri, Columbia, Missouri

People are constantly generating explanations. "Perhaps that 17-car accident on Interstate 35 occurred because people in Austin aren't used to driving on icy roads." "I think Jim was promoted to executive vice president because he's such a good conversationalist." "I can't believe that a good kid like Michelle would have broken that vase on purpose; it must have been an accident." People generate explanations to help them understand their social worlds, as when they explain the apparently altruistic actions of someone they dislike by invoking ulterior motives. People also generate explanations to increase feelings of prediction and control, as when they explain that an assault victim should have known better than to walk through the park alone at night. What cognitive operations are involved when people generate explanations such as these? A variety of different mechanisms have been suggested, from substantially automatic[2] perceptual processes (e.g., McArthur & Baron, 1983) to substantially deliberate and effortful processes (e.g., Pennington & Hastie, 1991). Instead of attempting to show which of these views is correct, our model integrates several different theoretical perspectives.

Two definitions will clarify the discussion. First, the term *event* refers to the incident or condition that is to be explained. For example, people may seek to explain why the moon appears smaller overhead than it does near the horizon. Second, the term *explanation* refers to a judgment about causality, a chaining backward from an event to its cause. This term is similar to but broader than the term *attribution,* in that attribution theory focuses primarily on a subtype of explanation, the causes of events involving people. In contrast, our model is designed to apply to explanations about the actions and characteristics of galaxies, pendulums, zebras, and so on, as well as peoples' behaviors.[3]

Recommended Reading

Abraham, S.C.S. (1988). Seeing the connections in lay causal comprehension. In D.J. Hilton (Ed.), *Contemporary science and natural explanation: Commonsense conceptions of causality* (pp. 175–203). Brighton, England: Harvester Press.

Anderson, C.A., Krull, D.S., & Weiner, B. (1996). (See References)

Kruglanski, A.W. (1989). (See References)

Kunda, Z. (1987). Motivated inference: Self-serving generation and evaluation of causal theories. *Journal of Personality and Social Psychology, 53,* 636–647.

Novick, L.R., Fratianne, A., & Cheng, P.W. (1992). Knowledge-based assumptions in causal attribution. *Social Cognition, 10,* 299–334.

Sedikides, C., & Anderson, C.A. (1992). Causal explanations of defection: A knowledge structure approach. *Personality and Social Psychology Bulletin, 18,* 420–429.

Weiner, B. (1986). *An attributional theory of motivation and emotion.* New York: Springer-Verlag.

A GENERAL MODEL OF THE EXPLANATION PROCESS

As depicted in Figure 1, the explanation process is initiated when an event occurs. The event may be an unexpected personal failure or success. It may be the headline of a newspaper, the peculiar behavior of a pet, or a piece of significant evidence in a trial. Before an event can be explained, however, it must first be noticed.

Noticing the Event

Many factors influence whether a person will notice an event. Event features such as loudness and brightness are important. A silent, unmarked police car is much less likely to attract attention than a marked police car with screeching sirens and flashing lights. Characteristics of the person also play a role. Arthur Conan Doyle's Sherlock Holmes trained himself to notice details (or their absence) that other perceivers would overlook. In addition, the importance or self-relevance of the event to the perceiver will influence its noticeability. For instance, one's name may capture one's attention when equally loud but less self-relevant stimuli do not. Finally, activation of particular cognitive categories or affective states may influence the noticeability of an event (e.g., Higgins, 1989). For example, perceivers more easily recognize success- or failure-related words, respectively, after learning that they have succeeded or failed (Postman & Brown, 1952).

Similarly, the noticeability of potential causes influences the likelihood that they will be adopted as explanations of events. Stimuli that are particularly novel, visually dominant, unusual, or relevant to one's goals are more likely to be assigned a causal role than less attention-grabbing stimuli. For instance, perceivers are more likely to attribute causality to actors who are salient than to those who are

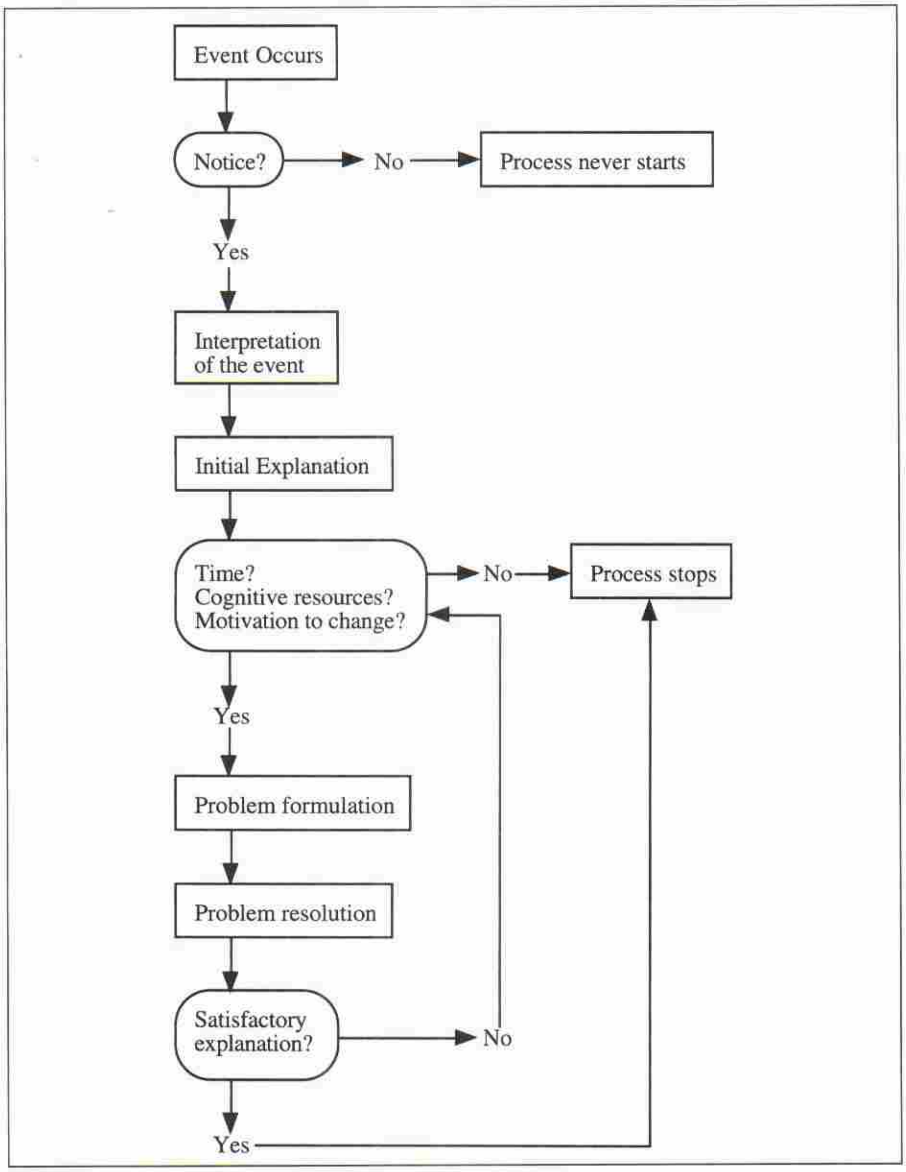

Fig. 1. A general model of the explanation process. Adapted from Anderson, Krull, and Weiner (1996).

not (e.g., Taylor & Fiske, 1978; Zebrowitz, 1990).

Interpreting the Event

After perceivers notice an event, they must decide what it is that they have noticed. This interpretation is influenced by the perceivers' expectations. However, this influence of expectations is difficult to recognize. People may often think that they do not "call 'em as they see 'em," but "call 'em as they are" (Ross & Nisbett, 1991, p. 82). Events tend to be interpreted in the direction of perceivers' expectations, although contrast effects (in which events are interpreted as being less like perceivers' expectations than is actually the case) may also occur under certain conditions. Thus, perceivers may be more likely to interpret a shove as hostile if the actor is black rather than white, a facial expression as fear if it occurs in the presence of a charging rhinoceros, and a blind date as "warm" if he or she had previously been described that way (e.g., Manis, Nelson, & Shedler, 1988; Martin, Seta, & Crelia, 1990; Sagar & Schofield, 1980).

Initial Explanation

After interpreting an event, the person generates an initial explanation. When you see a rapidly traveling baseball strike a window and break it, how is it that you immediately recognize the baseball as the cause of the broken window? Your prior experience tells you that windows are comparatively fragile, and that baseballs are not. In addition, you know that the arrival of the baseball was spatially and temporally contiguous with the breaking of the window. Thus, the combination of prior knowledge about windows and baseballs with the application of the perceptual causal principles of spatial and temporal contiguity produces the initial explanation immediately. The use of such perceptual causal principles may be the most automatic mechanism by which explanations are generated, and may well be the first type of explanation process to emerge developmentally (e.g., White, 1988).

Explanations may also be generated in a very automatic manner when an event activates a knowledge structure (e.g., explanation prototype, schema, script, intuitive causal theory) that contains an explanation about why the event occurs. Thus, when people learn that an outspoken ambassador was found dead shortly before an important and controversial meeting with a foreign diplomat, the possibility of foul play might immediately pop into their heads. In this example, the event simply activates a stored explanation. In other instances, a more general rule or theory may be used to generate an explanation. For example, people who learn that an individual defected from a war-torn and poverty-stricken country to a prosperous one might well select the difference between the countries as the explanation for the individual's defection. In contrast, if another individual emigrates in the opposite direction, aspects of that individual's personality might be invoked in explaining the event. In both cases, people use their intuitive theory that most people desire to move from unfavorable situations to favorable ones, and that only atypical people move from favorable situations to unfavorable ones.

Of course, in many cases, a prepackaged knowledge structure, complete with a single explanation, is not available. Many events require the effortful gathering of information to test alternative explanations. For example, when explaining a plane crash, one needs to know about weather conditions, aircraft maintenance records, and the pilot's actions. In explaining a death by gunshot wounds, a jury needs to know about motives, alibis, and means. In many such cases, a variety of constraints become important.

Constraints

After an initial explanation is generated (or if an explanation cannot be reached quickly and easily), constraints play a significant role. If insufficient cognitive or informational resources are available, or if the explainer is unmotivated to continue either because the event is unimportant or because the initial explanation is satisfactory, the process stops (e.g., Kruglanski, 1989). In this case, the initial explanation is adopted. Of course, in many instances people desire to continue, either because they do not like the initial explanation or because the event is important and accuracy is crucial. If sufficient time and cognitive resources are available, a more effortful problem-based process begins.

Problem-Based Explanation

Problem-based explanation is what people typically think of when they think about the explanation process. Problem-based explanation may make use of processes based on perceptions and knowledge structures, but it is more effortful and deliberate. This type of explanation is more likely to occur to the extent that the event is unexpected or puzzling, the event is very important, or the data to be considered are too difficult or too substantial for the explainer to generate a "top of the head" explanation. The juror's task is a prototypical example of problem-based explanation. Sitting on a jury is a novel task for most people, the amount of information may be substantial and challenging, legal jargon or aspects of the case may be perplexing, and yet accuracy is at a premium. When people are faced with such a challenging task, their first step is to formulate the problem.

Problem Formulation

Problem formulation is controlled by a guiding knowledge structure that contains information about the event, possible explanations for the event, types of information needed to evaluate the explanations, and the probable implications of these explanations for oneself and for other people who may eventually be told of the final explanation. This knowledge structure may recruit relevant information from memory, may direct a search for information in the immediate environment, and may suggest more effortful search procedures for relevant information, such as consulting other people or going to the library (e.g., Anderson & Slusher, 1986).

Several guiding knowledge structures may be relevant to a given event. The similarity of a knowledge structure to the event strongly influences whether it is selected, but characteristics of the explainer and situation also play a role. Chronically or temporarily accessible knowledge structures are more likely to be selected than less accessible ones (e.g., Higgins, 1989). Similarly, the goals of the explainer influence which guiding knowledge structure is used. One type of knowledge structure may be selected when the goal is accuracy; another may be selected when the explainer desires to reach an explanation quickly. Political candidates who expect their explanations to be made public may recruit knowledge structures that contain information about how to create a favorable impression.

Frequently, people desire to believe a particular explanation. This desire can itself influence which guiding knowledge structure is selected. For instance, students who desire to believe that their poor grades in a psychology course are due to the instructor's incompetence might selectively search for information that supports this explanation. Upon finding such information, they might readily adopt the "incompetent instructor" explanation despite the fact that information that supports the "unmotivated student" explanation might also be available.

Although some aspects of problem formulation may be very complex and resource intensive, other aspects may take place more automatically. Indeed, such automatic effects make it especially valuable to have people with different perspectives working together to generate explanations. One cannot easily correct for biases that one's own cognitive system unconsciously introduces, but different individuals have different biases, and so the biases of one individual may be compensated for by those of another.

Of course, biases can also be introduced by effortful processes.

For instance, research demonstrates that people often seek information that is consistent with their hypotheses, rather than seeking disconfirming information (e.g., Klayman & Ha, 1987; Snyder & Swann, 1978). Consequently, even the information available for their consideration may be biased.

Problem Resolution

In the problem resolution stage, the information collected during problem formulation is integrated into a "best" explanation. The potential explanations of the event identified in the problem formulation stage are evaluated using the available evidence. The most well supported explanation is adopted as a tentative explanation of the event.

Read and Miller's model of social perception (e.g., Read & Miller, 1993) provides an excellent mechanism by which the best explanation might be selected. They propose that after concepts related to an event are activated, the activated information and possible explanations are evaluated repeatedly using principles of explanatory coherence (e.g., breadth, parsimony). For example, suppose Robert is hired as an executive vice president of Smith-Lincoln Investments, Inc., immediately after finishing his M.B.A. Several explanations are possible. Perhaps Robert was hired because he is an extremely talented business professional, or perhaps Robert was hired because he is well liked by a powerful partner in the company. As the explainer considers these and other possible explanations, some pieces of information might support one explanation (e.g., Robert graduated at the top of his class), some might support another (e.g., Robert is the favorite nephew of Smith-Lincoln's most important client), and some might support both or neither. As this information is evaluated and new concepts are activated, some possible explanations will be discarded (e.g., because they conflict with the available information, because they are unparsimonious) until a coherent explanation is reached. Note, however, that the quality of an explanation is relative; people may be willing to accept a poor explanation if no better explanation is available.

Satisfaction

At least one additional judgment is then made: The explainer must decide whether the best explanation produced in the problem resolution stage is satisfactory. (This judgment could be construed as a part of problem resolution, but for the purpose of clarity, we discuss it separately.) If this explanation is unsatisfactory, either because none of the explanatory possibilities sufficiently fits the information or because other goals of the explainer are not met, then the explainer cycles back to the constraint step. If time, resources, and the motivation to achieve a better explanation are sufficient, then the problem may be reformulated. Additional explanatory possibilities may be generated and additional information may be gathered, or the explainer may simply reexecute the process with relaxed standards. Problem resolution is engaged in once again, and a new "best" explanation is produced. This explanation must also undergo the satisfaction test. As in the Rolling Stones song, if ". . . I can't get no satisfaction," then "I try, and I try, and I try, and I try . . . ." Eventually, either the explainer arrives at a satisfactory explanation or the cognitive or motivational constraints cause the cycling to stop.

CONCLUSION

The generation of explanations is an important and ubiquitous process. It is of interest to researchers, practitioners, and laypeople alike. How do people explain their successes and failures, or the successes and failures of others? How do people make sense of the behavior of others and of major positive or negative events with which they come into contact either directly or indirectly on a daily basis? What influences people toward particular conclusions about the actions of politicians, defendants, groups, or nations? The vast array of domains in which explanation processes have been investigated attests to their importance in everyday life.

There can be no doubt that there is considerable room for advancement in the study of explanation processes. Numerous questions about, for example, automaticity, the interplay of motivation and cognition, and the stages at which a variety of personal and situational influences exert the greatest impact await additional investigation and theory development. We hope that our attempts at integration will serve as useful starting points for additional research, and will serve to increase collaboration and lead to important advances across the various areas that can all be sheltered under the "explanation" umbrella.

Acknowledgments—We wish to thank Jody C. Dill, Karen E. Dill, Lori A. Krull, and several reviewers for their valuable comments on this manuscript.

Notes

1. Address correspondence to either Douglas S. Krull, Department of Psychology, BEP 353, Northern Kentucky University, Highland Heights, KY 41099, or Craig A. Anderson, Department of Psychology, University of Missouri, Columbia, MO 65211; e-mail: krull@nku.edu or psycaa@showme.missouri.edu.

2. We view automatic and controlled processes as endpoints of a con-

tinuum, rather than dichotomous categories. For discussions of automaticity and its characteristics, see Bargh (1989, 1996).

3. It should be noted that there may be important differences in how people explain social and nonsocial events. For example, the actions of people may be produced and guided by internal motivations, but such internal explanations are typically not invoked for the actions of baseballs, electrons, or hurricanes. For a relevant discussion, see Ostrom (1984).

References

Anderson, C.A., Krull, D.S., & Weiner, B. (1996). Explanations: Processes and consequences. In E.T. Higgins & A.W. Kruglanski (Eds.), *Social psychology: Handbook of basic principles* (pp. 271–296). New York: Guilford Press.

Anderson, C.A., & Slusher, M.P. (1986). Relocating motivational effects: An examination of the cognition-motivation debate on attributions for success and failure. *Social Cognition, 4,* 270–292.

Bargh, J.A. (1989). Conditional automaticity: Varieties of automatic influence in social perception and cognition. In J.S. Uleman & J.A. Bargh (Eds.), *Unintended thought* (pp. 3–51). New York: Guilford Press.

Bargh, J.A. (1996). Automaticity in social psychology. In E.T. Higgins & A.W. Kruglanski (Eds.), *Social psychology: Handbook of basic principles* (pp. 169–183). New York: Guilford Press.

Higgins, E.T. (1989). Knowledge accessibility and activation: Subjectivity and suffering from unconscious sources. In J.S. Uleman & J.A. Bargh (Eds.), *Unintended thought* (pp. 75–123). New York: Guilford Press.

Klayman, J., & Ha, Y.-W. (1987). Confirmation, disconfirmation, and information in hypothesis testing. *Psychology Review, 94,* 211–228.

Kruglanski, A.W. (1989). *Lay epistemics and human knowledge: Cognitive and motivational bases.* New York: Plenum Press.

Manis, M., Nelson, T.E., & Shedler, J. (1988). Stereotypes and social judgment: Extremity, assimilation, and contrast. *Journal of Personality and Social Psychology, 55,* 28–36.

Martin, L.L., Seta, J.J., & Crelia, R.A. (1990). Assimilation and contrast as a function of people's willingness and ability to expend effort in forming an impression. *Journal of Personality and Social Psychology, 59,* 27–37.

McArthur, L.Z., & Baron, R. (1983). Toward an ecological theory of social perception. *Psychological Review, 90,* 215–238.

Ostrom, T.M. (1984). The sovereignty of social cognition. In R.S. Wyer, Jr., & T.K. Srull (Eds.), *Handbook of social cognition* (Vol. 1, pp. 1–38). Hillsdale, NJ: Erlbaum.

Pennington, N., & Hastie, R. (1991). A cognitive theory of juror decision making: The story model. *Cardozo Law Review, 13,* 519–557.

Postman, L., & Brown, D.R. (1952). The perceptual consequences of success and failure. *Journal of Abnormal and Social Psychology, 47,* 213–221.

Read, S.J., & Miller, L.C. (1993). Rapist or "regular guy": Explanatory coherence in the construction of mental models of others. *Personality and Social Psychology Bulletin, 19,* 526–540.

Ross, L., & Nisbett, R.E. (1991). *The person and the situation: Perspectives of social psychology.* New York: McGraw-Hill.

Sagar, H.A., & Schofield, J.W. (1980). Racial and behavioral cues in black and white children's perceptions of ambiguously aggressive acts. *Journal of Personality and Social Psychology, 39,* 590–598.

Snyder, M., & Swann, W.B. (1978). Hypothesis-testing processes in social interaction. *Journal of Personality and Social Psychology, 36,* 1202–1212.

Taylor, S.E., & Fiske, S.T. (1978). Salience, attention, and attribution: Top of the head phenomena. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 11, pp. 249–288). New York: Academic Press.

White, P.A. (1988). Causal processing: Origins and development. *Psychological Bulletin, 104,* 36–52.

Zebrowitz, L.A. (1990). *Social perception.* Pacific Grove, CA: Brooks-Cole.

Young Infants' Perception of Object Unity: Implications for Development of Attentional and Cognitive Skills

Scott P. Johnson[1]

Department of Psychology, Lancaster University, Lancaster, England

When we look at the world around us, we do not experience the surroundings as an unorganized patchwork of colors and shapes, but rather as occupied by segregated objects, each characterized by individual boundaries and surfaces. The fact that objects often occlude one another and commonly go in and out of sight seems to pose us little difficulty. We assume that most objects are continuous over space and time, that they do not generally disappear and reappear, and that one object does not necessarily end at another's boundary. This subjective experience is due to our facility at using the wide variety of visual cues available to us, as well as commonsense notions of object permanence.

How is it that even though infants are born with no visual experience, they are, after some span of time, able to visually parse the optic array into segregated objects? Some theories addressing this question have stressed innate core principles that specify the fundamental object properties such as object identity and spatiotemporal continuity (Spelke, 1990). Others have proposed that a protracted period of experience in observing and manipulating objects is necessary for development of these skills (Piaget, 1936/1952, 1937/1954). The studies reported here suggest that both of these views are incorrect. There is little evidence that in-

Recommended Reading

Kellman, P.J. (1993). Kinematic foundations of infant visual perception. In C.E. Granrud (Ed.), *Visual perception and cognition in infancy* (pp. 121–173). Hillsdale, NJ: Erlbaum.

Spelke, E.S., & Van de Walle, G.A. (1993). Perceiving and reasoning about objects: Insights from infants. In N. Eilan, R. McCarthy, & B. Brewer (Eds.), *Spatial representation: Problems in philosophy and psychology* (pp. 132–161). Cambridge, MA: Blackwell.

Yonas, A., & Granrud, C.E. (1985). The development of sensitivity to kinetic, binocular, and pictorial depth information in human infants. In D.J. Ingle, M. Jeannerod, & D.N. Lee (Eds.), *Brain mechanisms and spatial vision* (pp. 113–145). Dordrecht, Netherlands: Martinus Nijhoff.