

- Kahneman, D., and Tversky, A. "Prospect Theory: An Analysis of Decisions Under Risk." *Econometrica*, 1979, 47, 262-291.
- Kunreuther, H. C., and others. *Disaster Insurance Protection: Public Policy Lessons*. New York: Wiley, 1978.
- Lichtenstein, S., and Slovic, P. "Reversals of Preference Between Bids and Choices in Gambling Decisions." *Journal of Experimental Psychology*, 1971, 89, 46-55.
- Lichtenstein, S., and Slovic, P. "Response-Induced Reversals of Preference in Gambling: An Extended Replication in Las Vegas." *Journal of Experimental Psychology*, 1973, 101, 16-20.
- Luce, R. D. "The Choice Axiom After Twenty Years." *Journal of Mathematical Psychology*, 1977, 15, 215-233.
- MacNeil, B. J., Weichselbaum, R., and Pauker, S. G. "Fallacy of the Five Year Survival in Lung Cancer." *New England Journal of Medicine*, 1978, 299, 1397-1401.
- Morris, L., Mazis, M., and Barofsky, I. (Eds.). *Product Labeling and Health Risks*. Banbury Report 6. Cold Spring Harbor, N.Y.: Cold Spring Harbor Laboratory, 1980.
- Payne, J. W., and Braunstein, M. L. "Preferences Among Gambles with Equal Underlying Distributions." *Journal of Experimental Psychology*, 1971, 87, 13-18.
- Raiffa, H. *Decision Analysis: Introductory Lectures on Choice Under Uncertainty*. Reading, Mass.: Addison-Wesley, 1968.
- Robertson, L. S. "The Great Seat Belt Campaign Flop." *Journal of Communication*, 1976, 26, 41-45.
- Schoemaker, P. J. H., and Kunreuther, H. C. "An Experimental Study of Insurance Decisions." *Journal of Risk and Insurance*, 1979, 46, 603-618.
- Slovic, P. "From Shakespeare to Simon: Speculations—and Some Evidence—About Man's Ability to Process Information." *ORI Research Monograph*, 1972, 12, (2).
- Slovic, P. "Choice Between Equally Valued Alternatives." *Journal of Experimental Psychology: Human Perception and Performance*, 1975, 1, 280-287.
- Slovic, P., Fischhoff, B., and Lichtenstein, S. "Accident Probabilities and Seat Belt Usage: A Psychological Perspective." *Accident Analysis and Prevention*, 1978, 10, 281-285.
- Slovic, P., Fischhoff, B., and Lichtenstein, S. "Informing People About Risk." In L. Morris, M. Mazis, and I. Barofsky (Eds.), *Product Labeling and Health Risks*. Banbury Report 6. Cold Spring Harbor, N.Y.: Cold Spring Harbor Laboratory, 1980.
- Slovic, P., Fischhoff, B., Lichtenstein, S., Corrigan, B., and Combs, B. "Preference for Insuring Against Probable Small Losses: Implications for the Theory and Practice of Insurance." *Journal of Risk and Insurance*, 1977, 44, 237-258.
- Slovic, P., and Lichtenstein, S. "The Importance of Variance Preferences in Gambling Decisions." *Journal of Experimental Psychology*, 1968, 78, 646-654.
- Slovic, P., and MacPhillamy, D. J. "Dimensional Commensurability and Cue Utilization in Comparative Judgment." *Organizational Behavior and Human Performance*, 1974, 11, 172-194.
- Tversky, A. "Elimination by Aspects: A Theory of Choice." *Psychological Review*, 1972, 79, 281-299.

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*When faced with a dilemma, seek the right question.*

## *The Problem of the Problem*

*J. W. Getzels*

"The formulation of a problem," said Albert Einstein (Einstein and Infeld, 1938), "if often more essential than its solution, which may be merely a matter of mathematical or experimental skill. To raise new questions, new possibilities, to regard old questions from a new angle, requires creative imagination and marks real advance in science" (p. 92).

This is true not only in science but in all activities calling for thought. Max Wertheimer (1945) generalized Einstein's point as follows: "The function of thinking is not just solving an actual problem but discovering, envisaging, going into deeper questions. Often in great discoveries the most important thing is that a certain question is found. Envisaging, putting the productive question is often a more important, often a greater achievement than the solution of a set question" (p. 123).

Need questions be found? Is not the world already teeming with problems and dilemmas at home and in business, in economics and education, in art and in science, and in fact wherever we look, including into ourselves? The world is, of course, teeming with conflicts and dilemmas. But the conflicts and dilemmas do not present themselves automatically as problems capable of res-

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olution or even of sensible contemplation. They must be specified and formulated in fruitful and often radical ways if they are to be moved toward productive termination.

Henry Moore (1955) describes the process of problem finding in art in these words: "I sometimes begin drawing with no preconceived problem to solve, with only a desire to use pencil on paper and only make lines, tones, and styles with no conscious aim. But as my mind takes in what is so produced, a point arrives where some idea becomes conscious and crystallizes, and then control and ordering begin to take place" (p. 77).

What Moore is describing is the finding and formulating of a problem. Prior to its emergence, there is no structure and no task; there is nothing to solve. After the problem is posed, the skill of the artist takes over; control and ordering begin. The crucial step is how the formless situation where there is no problem (or there is only an indeterminate dilemma where the problem is moot) is transformed into a situation where a problem—in this case, a creative problem—emerges for solution. The question that is asked is the forerunner of the quality of the solution that will be attained. Transforming the dilemma into a fruitful problem—putting the right question, as the saying goes—may be no less an intellectual achievement than attaining the effective solution once the productive problem is posed.

The same dilemma may give rise to the formulation of diverse and even contradictory problems—problems that lead to different and sometimes opposite lines of inquiry and resolution. This is the case not only in imaginative art, where presumably anything goes, but in the so-called exact sciences. Consider as one illustration this report of a recent advance in medical research in leukemia: "Perhaps the most remarkable progress has been made by a group of researchers lead by Professor Leo Sachs. . . . Somehow in leukemia the body becomes infected by cells that refuse to age and die naturally the way normal healthy cells do. These harmful cells thus remain trapped in a perpetual state of youth. Current treatment tries to kill these hostile cells by poisoning them. Unfortunately, the drugs are so toxic, they usually also kill the perfectly healthy cells, often causing death by the potent side effects. So Professor Sachs posed a new question. *Would it be possible to find a drug that would make the leukemic cells mature and simply die?* Professor Sachs's fresh approach was soon to pay dividends in opening a wide range of previously unforeseen possibilities" (Graver, 1979, p. 7). The first formulation of the problem led to seeking a poison to kill the infected cells as the resolution of the dilemma; the second, to seeking an elixir to vivify the infected cells.

Consider, finally, the following situation as paradigmatic of the crucial distinction between dilemma and problem and of the relation between the quality of the problem that is formulated and the quality of the solution that is attained: An automobile is traveling on a deserted country road and blows a tire. The occupants of the automobile go to the trunk and discover that there is no jack. They define their dilemma by posing the problem: "Where can we get

a jack?" They look about, see some empty barns but no habitation, and recall that, several miles back they had passed a service station. They decide to walk back to the station to get a jack. While they are gone, an automobile coming from the other direction also blows a tire. The occupants of this automobile go to the trunk and discover that there is no jack. They define their dilemma by posing the problem: "How can we raise the automobile?" They look about and see, adjacent to the road, a barn with a pulley for lifting bales of hay to the loft. They move the automobile to the barn, raise it on the pulley, change the tire, and drive off, while the occupants of the first car are still trudging toward the service station.

The casual comment could be, "What a clever solution!" The more fundamental observation would be, "What a clever question!" For the quality of the solution that was attained was a function of the quality of the question that was formulated. The same dilemma faced the occupants of both cars, but those in the first car transformed the dilemma into the problem of getting a jack, which led to one course of action. Those in the second car transformed the same dilemma into a different problem, that of raising the car, which pointed to another course of action. And this—finding and formulating the problem—made all the difference in the quality of the solutions that were reached by the two groups to the identical dilemma.

Despite the manifest role of problems in initiating thought and the function that new problems have in guiding thought toward new solutions, very little is known about how problems are found and formulated. Although there are numerous theoretical statements, a plethora of psychometric instruments, and quite literally thousands of empirical studies on problem solving (that is, on the problem of the solution), there is hardly any work of a similar nature on problem posing or what might be called the problem of the problem.

The assumption seems to have been that only answers and solutions count and that only their attainment requires thought and deserves empirical study. To cite one example, although the journal *Cognitive Science* informs potential contributors that it publishes articles "on such topics as the representation of knowledge, language processing, image processing, question answering, inference, learning, problem solving, and planning" (see "Information to Authors"), it characteristically fails to mention question asking or problem posing, as if questions and problems could be picked up at will. The consequence has been that little conceptual attention (De Bono, 1978; Dewey, 1933; Reitman, 1965) and less empirical inquiry have been directed to the meaning and variety of problems. With the exception of the studies to be sketched here, there has been hardly any systematic exploration of the process of finding and formulating problems, that is, of the problem of the problem.

### Problems: Presented, Discovered, Created

At first glance, it does not seem sensible to raise a question about what is meant by a problem. We have faced problems since our earliest days, and

there is almost no one who does not have a problem. The term is so familiar that, even in the large technical literature on problem solving, it is ordinarily taken for granted that everyone knows what is meant by a problem.

When the term is dealt with at all, it is usually defined so as to conform to what presumably everyone already knows. Thus, Norman R. F. Maier (1970) says, "A problem exists when a response to a given situation is blocked" (p. 203). Similarly, Karl Duncker (1945) says, "A problem arises when a living creature has a goal but does not know how the goal is to be reached" (p. 1). Recently, McDermott (1978) put it simply: "A problem is just a difficult action" (p. 71).

This seems reasonable enough: A problem is a difficulty, an obstacle to a goal. Yet, somehow this description does not quite fit what Einstein and Wertheimer were referring to or what Moore and the leukemia researchers seemed to mean by a problem. It is surely not what Dewey (1938) was referring to when he said, "A problem represents a partial transformation of a problematic situation into a determinate situation" (p. 108). Nor is it what *Webster's* (1968) means when it says that a problem is "a question raised or to be raised for inquiry, consideration, discussion, decision, or solution" (p. 1807). Here, as in the case of the scientist who seeks a problem to work on or the artist who constructs a still-life problem, the problem is not an obstacle but in a very real sense the goal itself.

To realize the different—indeed, the contradictory—phenomena that can be subsumed under the single term *problem*, one need only compare two definitions: "A problem exists when a response to a given situation is blocked," and a problem is "a question raised or to be raised for inquiry." At one extreme, the word *problem* can refer to an undesired situation that one wishes to avoid or mitigate; at the other, it can refer to a desirable situation that one strives to find or create. It is no contradiction for the graduate student who seeks a dissertation topic to say that his or her problem is to find a problem.

It is possible to classify problems by three factors: whether the problem already exists, who propounds it, and whether it has a known formulation, a known method of solution, or a known solution. From this point of view, ten types of problems can be identified:

1. The problem is given (is known) and there is a standard method for solving it, known to the would-be problem solver (for example, experimental subject, student) and to others (for example, experimenter, teacher), guaranteeing a solution in a finite number of steps.
2. The problem is given but no method for solving it is known to the problem solver, although it is known to others.
3. The problem is given but no method for solving it is known to the problem solver or to others.
4. The problem itself exists but remains to be identified (become known) by the problem solver, although it is known to others.

5. The problem exists but remains to be identified by the problem solver and by the others.
6. The problem exists but remains to be identified (as in 4 and 5) and there is a standard method for solving it, once the problem is discovered known to the problem solver and to the others (as in 1).
7. The problem exists but remains to be identified, and no standard method for solving it is known to the problem solver, although known to others (as in 2).
8. The problem exists but remains to be identified, and no method for solving it is known to the problem solver or to others (as in 3).
9. The problem does not yet exist but is invented or conceived, and a method for solving it is known or becomes known once the problem is formulated.
10. The problem does not yet exist but is invented or conceived, and a method for solving it is not known (Libby, n.d.).

This typology does not, of course, exhaust the possibilities. However, enough has been said to suggest the principle of a wide variety of problems and the heuristic value of differentiating among them. For present purposes, it will suffice to distinguish three classes of problem situation: presented problem situations, discovered problem situations, and created problem situations.

In a presented problem situation—or, to be precise, in one instance of it—the problem exists, and it is propounded to the problem solver. A teacher teaches that the area of a rectangle is side  $a$  times side  $b$ , and the pupil is required to solve the problem: What is the area of a rectangle when  $a$  is 3 and  $b$  is 4? Here, the problem is given—it is presented—and in the particular instance, it has a known formulation, a known method of solution, and a solution known to others if not yet to the problem solver.

Consider now the discovered problem situation—or, again, one instance of it. Here, the problem also exists, but it is discovered by oneself rather than propounded by another, and it may or may not have a known formulation, known method of solution, or known solution. Roentgen saw a fogged photographic plate as others had before him, but, while the others had seen it only as a nuisance, he asked, "Why is the plate fogged?"—a self-initiated problem that led to the discovery of the X ray and a revolution in atomic science. Here, the problem was not presented to the problem solver by another; he discovered the problem himself and even took pleasure in doing so. This is clearly different from the presented problem situation.

Consider, finally, the created problem situation. Here, the problem does not exist until someone invents or creates it. Maier invents a series of problems to test problem-solving abilities. The scientist conceives of the problem of investigating the nature and speed of light. The artist creates a still-life problem where no such problem existed before. It makes no sense to think of these situations as obstacles that one meets through accident, misfortune, ignorance, or ineptitude. Quite the contrary; these are situations that one

strives to formulate and bring into being. Indeed, a well-formulated problem is at once the result of knowledge, a stimulus to more knowledge, and, most important, knowledge itself (Henle, 1971). In Polanyi's (1958) words: "To see a problem is a definite addition to knowledge, as much as it is to see a tree, or to see a mathematical proof—or a joke. . . . To recognize a problem which can be solved and is worth solving is in fact a discovery in its own right" (p. 120).

The portion of human activity that is held in highest esteem—pure science, fine art, technological invention, systematic philosophy—is devoted as much to discovering, creating, and formulating problems as it is to solving them. This behavior is not undertaken only in order to overcome obstacles because they are a threat to personal well-being; often, the problems are sought out even at the cost of well-being, sometimes at the risk of life itself.

Galileo raised questions about the accepted cosmology of his time despite the threat of being burned at the stake for it. Matisse set himself the problem of painting grass red and roses green despite the derision of the public and established artists, who called him a wild beast. Geneticists persisted in posing the problem of what would happen if one genetic stuff were combined with another, as in recombinant DNA, despite the possibility of a catastrophic outcome. At a different level, perhaps most remarkable of all, a four-year-old asks spontaneously, "Why does it get lighter outside when we put the light out inside?" (Henle, 1971, p. 123) and enjoys the problem he has posed, as in fact he has a right to.

As Bunge (1967, pp. 165–167) points out, all animals have the capacity for taking notice of problems as obstacles to a goal; machines, too, can be programmed to sense problems as obstacles. But, as human beings, we not only sense problems as obstacles standing in our way but also go out of our way to discover and create new problems. We are not only problem solvers but also problem finders, "problemizing" beings who, besides solving the problems posed by our natural and social habitats, feel a need for and pleasure in posing problems.

From the earliest wonder and play of the child to the highest advances of art and science, this engagement of human beings with the problematic makes human thought uniquely human. The deeper the problems found, posed, and ultimately solved, the greater the human achievement. Put in the terms of our taxonomy, the production of discovered or created problems is often a more significant accomplishment than the production of solutions to presented problems. It is in this sense that the concentration of empirical inquiry on the problem of the solution and the concurrent neglect of the problem of the problem are so puzzling.

### Investigating the Created Problem

Over a period of some years, a number of colleagues and students and I have been attempting to investigate the nature of problems and the process of

finding and formulating them. We began with problem posing in art along lines raised by Moore's account, and we proceeded to more ordinary problems, including problems in cognition and interpersonal relations.

The first study was part of a longitudinal investigation of creative thinking, using students from the School of the Art Institute of Chicago (Getzels and Csikszentmihalyi, 1976). We began in the usual psychological mode by administering a variety of biographical, perceptual, cognitive, and personality instruments, comparing the responses of the art students with the responses of other students, and correlating the observations with grade point averages in studio courses and with other criteria of creative performance.

Initially, we were exhilarated by the results. We found significant differences in character between the art students and the other students and significant correlations between the characteristics of the art students and their creative performance. As an instance, the correlation between low economic values on the Allport-Vernon-Lindzey Study of Values and the grade point average of male fine art students in studio courses was .47.

But when the first exhilaration was over and we stepped back to survey the results, we were struck by the thought that we had not come much closer to understanding, or even describing, creative production. We knew something more about the correlates of creative performance than we did when we started, but we knew nothing much more about our own problem, the processes underlying creative performance. To be sure, there was a .47 correlation between values and creative achievement, but what did that say about the way in which creative achievement was attained?

Instead of observing how a creative solution or imaginative work was achieved starting with its inception as a dilemma or problem and concluding with its outcome as a product, we had fallen into the familiar trap of correlating a readily obtainable independent variable (in this case, a personal characteristic) with an already available dependent variable (in this case, a grade point average). If we were to explore creative thinking in art, which was our intent, it remained necessary to observe how the creative product—a drawing or painting, say—was achieved, from the beginning to the conclusion, and how the quality of the process was related to the quality of the product.

Our initial observations and conversations with the artists as they worked at their easels were fascinating but bewildering. Some artists worked impulsively; others, reflectively. Some artists daubed flecks of color on the canvas with a brush, while others smeared heavy smudges of paint with a trowel. One artist said that he painted because it was the only thing he could do; another, because he wanted to develop a new vision of man. Nothing we saw or heard was related to the creative quality of the product. However—and this was crucial—we also observed that students in advertising or industrial art ordinarily began with a specific assignment, a problem as specific as drawing an illustration for a cornflake box, while students in fine art usually began with only a blank canvas before them; they had to find or create the problem that they

were to work on themselves. In effect, advertising or industrial artists work in the context of presented problems, while fine artists work in the context of discovered or created problems.

The investigation made evident phenomenally what had been proposed conceptually, namely, that problem posing is a critical phase of the creative thought process. It was imperative to observe not only how an artistic problem is worked on toward solution but also how the artistic problem, to repeat Wertheimer's term, is *found*.

To observe how one solves a problem, we administer one or more of the numerous standard instruments and methods devised for this purpose (the Kohs Blocks, the Vygotsky, Piaget's tasks, or the Wechsler or Binet), watch the performance, and draw inferences about the process and quality of the problem solving from what is done and what is said. But, suppose we want to observe how one finds a problem—how one discovers, invents, poses, or formulates a problem. What can be done? We searched diligently, but we were unable to locate any standard instruments or methods, so we had to devise a way of observing and evaluating the phenomena of problem finding just as ways had to be devised for problem solving.

Once we formulated our problem in these terms, a procedure suggested itself. We furnished a studio at the Art Institute school with two tables, an easel, a drawing board, paper, and a variety of dry media. On one table, we placed a collection of some thirty objects used at the school to construct still-life problems. Then, we asked thirty-one fine arts students to use one or more of the objects on the first table to create a still-life problem on the second table and to produce a drawing of the still-life problem that they had created.

We observed what they did in creating the still-life problem and in producing the drawing, and we interviewed them about what they had done and how they felt in the situation. In this way, we were able to differentiate the process of problem finding among thirty-one artists along a number of dimensions—for example, the number or breadth of objects examined, the depth of exploration of each object, the uniqueness of the objects used. The procedure for examining the central issue, namely, the relation between the quality of the problem finding and the quality of the completed drawing, was quite simple. We ranked the thirty-one artists on the quality of their problem finding before they began the actual drawing, arranged an exhibition of finished drawings, and asked five recognized artist critics who had served in a similar capacity in real exhibitions to rank the drawings on their quality as original work. The relation between the two sets of rankings was significantly positive; to be precise, the correlation was .54.

The full details of the investigation are given elsewhere (Getzels and Csikszentmihalyi, 1976). No more will be said about it here, except for a word about the longitudinal phase. Five to six years after the students had graduated from art school—that is, about seven years after the problem-posing observations were made—we correlated these rankings with the relative suc-

cess of the former students as professional artists. The correlation was .30, significant at the .05 level. When two other ratings of problem formulation (one collected during the drawing stage, the other by interview) were added to pre-drawing ratings, the correlation rose to .41.

The results of this study were so encouraging that the model was applied in a variety of more common contexts, including cognition, interpersonal relations, students' perception of school problems, and, more recently, the role of problem formulation in administrative decision making. Only the first four studies can be dealt with here.

Patricia Arlin (1974) showed that the differential formulation of problems is not an aberrant variable; instead, it is systematically related to other aspects of human thought: The higher the stage of cognitive development in Piaget's terms, the higher the quality of the problem that is formulated. Donald Schwartz (1974) moved the inquiry from artistic and cognitive to social and affective aspects of behavior. He showed that the same interpersonal dilemma is transformed by some individuals into one problem and by other individuals into another problem. Further, there is a hierarchy of formulations, ranging from egocentric to socially sensitive problems. That is, some individuals consistently formulate interpersonal dilemmas as problems from their own point of view, and other individuals consistently formulate the same dilemmas as problems that take the points of view of the other person involved into account. Jonathan Smilansky (1977) investigated the content of problems perceived by students in characteristic school dilemmas and the form in which the problems were articulated. Not only did the content of the problems vary but, what was more important, the form in which the problems were put could vary, even when the content was the same. It ranged from egocentric formulations at one extreme to socially sensitive formulations at the other. There were systematic relations between the content and form of the problems and certain personal characteristics of those who were formulating the problems.

A study still in progress is investigating how administrative dilemmas are formulated as problems for decision (see Getzels, 1980). Although one must beware of analogies, the processes often seem very close to those observed in the preceding studies and to the paradigmatic instance of the dilemma of the flat tire, which was formulated as different problems that led to different policies and courses of action.

Asked to describe a difficult decision that he had to make, one superintendent of schools gave this account: One school in his district had become overcrowded, and the larger building to replace it would not be completed for two years. In the meantime, seventeen mobile classrooms filled the playground and the parking lot, but they were insufficient for the expected influx of children in the fall.

The dilemma was obvious—overcrowding. Discussion among the principal, superintendent, and president of the board of education centered on two problems: whether to get more mobile classrooms and where to put them, or whether to move the excess children to other, less crowded schools and how to

transport them there. Typically, one dilemma was transformed into two different problems. The decision was left up to the superintendent, and it was to depend on the problem that lent itself to the easiest solution. As the superintendent tells it, in due course it occurred to him that the problem was really not whether to get more mobile classrooms and where to put them or whether to get rid of the excess children and how to transport them, but simply how to get more space.

Once this problem was formulated, the solution proved not at all difficult. It was possible to build a temporary classroom structure that could later be converted to commercial use, and this is what was done. The similarity of this situation to the paradigmatic instance is self-evident: Get a jack or raise the car; more mobile classrooms or more space!

Although it seems more normal to go from a dilemma to formulating a problem for solution, the interviews revealed that the administrator must often proceed in the opposite direction, following an already formulated problem brought to him for solution back to the dilemma that someone else had transformed into the problem that the administrator is required to solve.

A number of administrators said that this in fact might be the more common circumstance; surely, it was the more difficult one. Once someone has transformed a dilemma into a problem, it is hard (or even impossible) for him to perceive the dilemma as any other problem; a solution that is not responsive to the problem as already formulated is either no solution or the wrong solution. One principal gives this account: One of her teachers came to the office and said, "Johnny has been disruptive again, and he is old enough now to be expelled. How shall we go about expelling him?" The principal responded, "Yes, I know Johnny has been a nuisance. But maybe the question is, how can we go about getting him some help for what is troubling him again?" In the principal's words, "The teacher flounced out of my office into the teachers' lounge and announced, 'Whenever I go to that woman with a real problem to be taken care of, she never does anything about it.'"

An unanticipated but surprisingly common issue regarding dilemmas, problems, and decisions was brought to light by these interviews. Not one administrator did not try to articulate the experience that some of the most critical decisions that he had had to make came in response to manifest problems that may have had ulterior latent purposes. That is, underlying the apparent problem with which the administrator is confronted and that he is asked to solve, there may be a covert meaning that he must recognize if the fundamental dilemma is to be dealt with effectively.

A superintendent gives the following account: One new teacher had a reputation for being a superb instructor but abrasive in relations with administrators. On the first day of school, a half-hour before the first period, the teacher walked into the principal's office and made a request: "I like to sit on a high stool when I teach. Could you get one for me?" On its face, this seemed like an absurd request to make in the tumult of a new school year.

Yet, the principal was quite sure later that if he had reacted only to the manifest problem, which at first he had been tempted to do, he would have made a serious mistake. He decided instead that, consciously or unconsciously, the teacher was testing the new teacher-administrator relationship: Would the new administrator be like all the others, or would the teacher receive assistance, even if the request seemed eccentric? The principal secured a stool in time for the teacher's first class, and during his entire tenure at the school, the teacher who had been abrasive was the principal's staunchest supporter.

There are latent meanings and unspoken purposes behind a great many of the manifest problems brought to administrators: a test, as in the present case; an excuse to establish contact; an appeal for help with a personal dilemma. Little is known about the symbolism of the problems presented to administrators, which, like slips of the tongue or apparent accidents, can represent dilemmas whose problems remain to be discovered.

### Conclusion

Before we conclude, it will be necessary to spell out several caveats. Problems and solutions are not as discontinuous as the necessarily schematic account presented here may have implied. They meld into one another, and the problem can be altered in the very process of solution; to emphasize the formulation of problems is not to diminish the importance of their solution. With respect to the observations of how the problems were formulated, as in the observation of how problems are solved, it was assumed that the observable behavior and the inferred underlying processes are in some wise isomorphic. And, of course, despite assurances from the majority of those whom we observed that their behavior under observation did not differ from their behavior in the usual situation, it must not be forgotten that the observations depended on experiments, questionnaires, and interviews, with their unavoidable constraints.

Nonetheless, allowing even for these caveats, a number of things may be said with some assurance, or at least they can be posed as reasonable issues for further inquiry. The discovery and formulation of problems can be studied empirically. There are individual differences in the discovery and formulation of problems as there are in the attainment of solutions to problems that have already been formulated. There is a positive relation between the quality of a problem that is found and the quality of the solution that is attained. Perhaps most importantly, the problem of the problem is well worth investigating not only as an addendum to problem solving, which is typically what has been done when it was done at all, but as a fruitful conceptual and empirical issue in its own right.

The difference between the imaginative scholar and the pedant is not that the one is better informed than the other—quite often, the contrary is the case. Nor is the difference between the creative scientist and the technician

that the one is more methodologically proficient than the other—again, quite often, the contrary is the case. The difference between the original artist and the copyist is not that the one is a more skilled craftsman than the other—here, too, the contrary is quite often the case.

Rather, it seems that the one (the pedant, the technician, the copyist) is content or able only to apply his knowledge, skill, or talent to situations where the problems have already been formulated, while the other (the scholar, the scientist, the artist) is impelled and able to apply his knowledge, skill, or talent to situations in which he himself must find and formulate the problem. To return to the taxonomy sketched earlier, the former works in the context of presented problem situations; the latter, in the context of discovered or created problem situations.

At the root of an answer is a question. At the core of an effective solution is a productive problem. It is this that makes the problem of the problem such an important subject for systematic inquiry. In describing what impels the creative scientist, Albert Einstein (Einstein and Infeld, 1938) made this distinction between a scientist and a detective, although both seek solutions to problems: "For the detective, the crime is given, the problem posed: Who killed Cock Robin? The scientist must at least in part commit his own crime" (p. 76). Gertrude Stein made the same point more generally, albeit more obliquely: "The whole question of questions and not answers is very interesting. Suppose no one asked a question. What would the answer be?"

## References

- Arlin, P. K. "Problem Finding: The Relation Between Cognitive Process Variables and Problem-Finding Performance." Unpublished doctoral dissertation, University of Chicago, 1974.
- Bunge, M. *Scientific Research I: The Search for System*. New York: Springer-Verlag, 1967.
- De Bono, E. *Opportunities*. London: Associated Business Programmes, 1978.
- Dewey, J. *How We Think*. New York: D. C. Heath, 1933.
- Dewey, J. *Logic: The Theory of Inquiry*. New York: Henry Holt, 1938.
- Duncker, K. "On Problem Solving." *Psychological Monographs*, 1945, 58 (5) (entire issue).
- Einstein, A., and Infeld, L. *The Evolution of Physics*. New York: Simon & Schuster, 1938.
- Getzels, J. W. "Creative Thinking, Problem Solving, and Instruction." In E. R. Hilgard (Ed.), *Theories of Learning and Instruction*. The 63rd yearbook of the National Society for the Study of Education, Part I. Chicago: University of Chicago Press, 1964.
- Getzels, J. W. "Problem Finding and the Inventiveness of Solution." *Journal of Creative Behavior*, 1975, 9, 12-18.
- Getzels, J. W. "Problem Finding: A Theoretical Note." *Cognitive Science*, 1979, 3, 167-172.
- Getzels, J. W. "Alternative Directions for Research in Educational Administration." In R. H. Farquhar and I. E. Housego (Eds.), *Canadian and Comparative Educational Administration*. Vancouver: Educational Extension, University of British Columbia, 1980.
- Getzels, J. W., and Csikszentmihalyi, M. "Scientific Creativity." *Science Journal*, 1967, 3, 80-84.
- Getzels, J. W., and Csikszentmihalyi, M. *The Creative Vision: A Longitudinal Study of Problem Finding in Art*. New York: Wiley, 1976.
- Griver, S. "Coming Close to Curing Leukemia." *Israel Digest*, 1979, 22, 7.

- Henle, M. "The Snail Beneath the Shell." *Abraxas*, 1971, 1, 119-133.
- Libby, W. L. "Tools for Discovery of Problems and Their Solutions (Heuristics)." Unpublished paper, Center for Programs in Government Administration, University of Chicago, n.d.
- Maiier, N. R. F. *Problem Solving and Creativity in Individuals and Groups*. Belmont, Calif.: Brooks/Cole, 1970.
- McDermott, D. "Planning and Acting." *Cognitive Science*, 1978, 2, 71-109.
- Moore, H. "Notes on Sculpture." In B. Ghiselin (Ed.), *The Creative Process*. New York: Mentor Books, 1955.
- Polanyi, M. *Personal Knowledge*. Chicago: University of Chicago Press, 1958.
- Reitman, W. R. *Cognition and Thought*. New York: Wiley, 1965.
- Schwartz, D. M. "A Study of Interpersonal Problem Posing." Unpublished doctoral dissertation, University of Chicago, 1974.
- Smilansky, J. "Problem Posing Ability and the Nature of Problems Students See in School." Unpublished doctoral dissertation, University of Chicago, 1977.
- Webster's Third New International Dictionary of the English Language, Unabridged*. Springfield, Mass.: G. & C. Merriam, 1968.
- Wertheimer, M. *Productive Thinking*. New York: Harper & Row, 1945.

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