The goal of the *Handbook of Creativity* is to provide the most comprehensive, definitive, and authoritative single-volume review available in the field of creativity. To this end, the book contains 22 chapters covering a wide range of issues and topics in this field, all written by distinguished leaders. The chapters are intended to be accessible to all readers with an interest in creative thinking. Although the authors are leading behavioral scientists, people in all disciplines will find the coverage of creativity in the arts and sciences to be of interest. The volume's first part sets out the major themes and reviews the history of thinking about creativity. Subsequent parts deal with methods, origins, self and environment, special topics, and conclusions.

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Handbook of
Creativity

Sternberg

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1 The Concept of Creativity: Prospects and Paradigms

ROBERT J. STERNBERG AND TODD I. LUBART

If one wanted to select the best novelist, artist, entrepreneur, or even chief executive officer, one would most likely want someone who is creative. Indeed, today many CEOs are selected not for their pleasant personalities (it's hard to be perceived as pleasant when you may have to fire 20% of the company) or their learning and memory skills (they use computers or subordinates to remember the details for them), but for their creative vision of how to turn a company around.

Creativity is the ability to produce work that is both novel (i.e., original, unexpected) and appropriate (i.e., useful, adaptive concerning task constraints) (Lubart, 1994; Ochse, 1990; Sternberg, 1988a; Sternberg & Lubart, 1991, 1995, 1996). Creativity is a topic of wide scope that is important at both the individual and societal levels for a wide range of task domains. At an individual level, creativity is relevant, for example, when one is solving problems on the job and in daily life. At a societal level, creativity can lead to new scientific findings, new movements in art, new inventions, and new social programs. The economic importance of creativity is clear because new products or services create jobs. Furthermore, individuals, organizations, and societies must adapt existing resources to changing task demands to remain competitive.

CREATIVITY AS A NEGLECTED RESEARCH TOPIC

As the first half of the twentieth century gave way to the second half, Guilford (1950), in his APA Presidential Address, challenged psychologists to pay attention to what he found to be a neglected but extremely important attribute, namely, creativity. Guilford reported that less than 0.2% of the entries in *Psychological Abstracts* up to 1950 focused on creativity.

Interest in creativity research began to grow somewhat in the 1950s, and a few research institutes concerned with creativity were founded. However, several indicators of the volume of work on creativity show that it remained a relatively marginal topic in psychology, at least until recently. We analyzed the number of references to creativity in *Psychological Abstracts* from 1975 to 1994. To conduct this analysis, we searched the computerized PsychLit database of journal articles using the database keywords of *creativity, divergent thinking,* and *creativity measurement.* These terms are assigned by the database to articles whose content concerns primarily the subject of creativity. We also identified additional entries that contained the word stem *creativ*-somewhere in the title or abstract of the article but were not indexed by one of the keywords for creativity. We examined a random subset of these additional entries and found that they did not concern creativity to any notable extent and were best excluded from the set of articles on creativity. The result of our analysis is that approximately 0.5% of the articles indexed in *Psychological Abstracts* from 1975 to 1994 concerned creativity. For comparative purposes, articles on reading accounted for approximately 1.5% of the entries in *Psychological Abstracts* during the same 20-year period.

If we look at introductory psychology textbooks as another index, we find that creativity is barely covered. Whereas intelligence, for example, gets a chapter or a major part of one, creativity gets a few paragraphs, if that. Major psychology departments rarely offer courses on creativity, although such courses are sometimes offered in educational psychology programs.

In terms of academic positions, there are virtually no listings in departments of psychology for positions in the study of creativity. Departments are typically not organized into a division for the study of creativity (unlike, say, divisions studying cognitive, social, or clinical psychology). At the American Psychological Association convention, research on creativity is either placed under "Psychology and the Arts" (Division 10) or can be found scattered among cognitive, social, or clinical divisions. However, it is important to note that the APA has recently begun to give this domain some attention by sponsoring a conference on creativity in 1995 and featuring research on creativity in the *APA Monitor* in August 1995.

With regard to research journals, there are no journals on creativity at the top of most-cited journal lists (unlike, say, perception, learning and memory, interpersonal relations, or personality). There are two less widely circulating psychology journals devoted to creativity. The *Journal of Creative Behavior* was founded in 1967, when interest grew in teaching people to be more creative. An analysis of this journal's content shows that nonempirical articles exceeded empirical ones and creativity enhancement and education were the most frequent topics (Feist & Runco, 1993). The *Creativity Research Journal,* which has a research focus, began only in 1988.

Creativity is important to society, but it traditionally has been one of psychology's orphans. Why? We believe that, historically, the study of creativity has faced at least six major roadblocks: (a) the origins of the study of creativity in a tradition of mysticism and spirituality, which seems indifferent or even possibly counter to the scientific spirit; (b) the impression conveyed by pragmatic, commercial approaches to creativity that its study lacks a basis in psychological theory or verification through psychological research; (c) early work on creativity that was theoretically and methodologically apart from the mainstream of theoretical and empirical psychology, resulting in creativity sometimes being seen as peripheral to the central concerns of the field of psychology as a whole; (d) problems with the definition of and criteria for creativity that seemed to render the phenomenon either elusive or trivial; (e) approaches that have tended to view creativity as an extraordinary result of ordinary structures or processes, so that it has not always seemed necessary to have any separate study of creativity; (f) unidisciplinary approaches to creativity that have tended to view a part of creativity as the whole phenomenon, often resulting in what we believe is a narrow vision of creativity and a perception that creativity is not as encompassing as it truly is.

In this chapter, we will discuss these six roadblocks and, in the course of discussing them, review six approaches, or paradigms, that have been used to understand creativity – mystical, psychoanalytic, pragmatic, psychometric, cognitive, and social-personality. Of course, these approaches do not exhaust all the approaches to creativity, nor is it possible in a short chapter to do full justice even to the six approaches considered. But we believe that the survey of these approaches covers some of the major highlights. We also believe that there is a seventh approach that is likely to be particularly fruitful in future work – that of confluence theories – which we shall also review. These theories utilize various multidisciplinary approaches to creativity and combine some of the elements of, and derive from, uniperspective views.

MYSTICAL APPROACHES TO THE STUDY OF CREATIVITY

The study of creativity has always been tinged – some might say tainted – with associations to mystical beliefs. Perhaps the earliest accounts of creativity were based on divine inter-

vention. The creative person was seen as an empty vessel that a divine being would fill with inspiration. The individual would then pour out the inspired ideas, forming an otherworldly product.

In this vein, Plato argued that a poet is able to create only that which the Muse dictates, and even today people sometimes refer to their own Muse as a source of inspiration. In Plato's view, one person might be inspired to create choral songs, another, epic poems (Rothenberg & Hausman, 1976). Often, mystical sources have been suggested in creators' introspective reports (Ghiselin, 1985). For example, Rudyard Kipling (1937/1985) referred to the "Daemon" that lives in the writer's pen: "My Daemon was with me in the Jungle Books, Kim, and both Puck books, and good care I took to walk delicately, lest he should withdraw. . . . When your Daemon is in charge, do not think consciously. Drift, wait, and obey" (p. 162).

The mystical approaches to the study of creativity have probably made it harder for scientific psychologists to be heard. Many people seem to believe, as they do about love (see Sternberg, 1988a, 1988b), that creativity is something that just doesn't lend itself to scientific study, because it is a spiritual process. We believe that it has been hard for the scientific approach to shake the deep-seated view of some people that, somehow, scientific psychologists are treading where they should not.

PRAGMATIC APPROACHES TO THE STUDY OF CREATIVITY

Equally damaging to the scientific study of creativity, in our view, has been the takeover of the field, in the popular mind, by those who follow what might be referred to as a pragmatic approach. Those taking this approach have been concerned primarily with developing creativity, secondarily with understanding it, but almost not at all with testing the validity of their ideas about it.

Perhaps the foremost proponent of this approach is Edward De Bono, whose work on lateral thinking and other aspects of creativity has had what appears to be considerable commercial success (e.g., De Bono, 1971, 1985, 1992). De Bono's concern is not with theory, but with practice. For example, he suggests using a tool that focuses on the aspects of an idea that are pluses, minuses, and interesting (such as PMI). Or he suggests using the word *po,* derived from hypothesis, suppose, possible, and poetry, to provoke rather than judge ideas. Another tool, that of "thinking hats," has individuals metaphorically wear different hats, such as a white hat for data-based thinking, a red hat for intuitive thinking, a black hat for critical thinking, and a green hat for generative thinking, in order to stimulate seeing things from different points of view.

DeBono is not alone in this enterprise. Osborn (1953), based on his experiences in advertising agencies, developed the technique of brainstorming to encourage people to solve problems creatively by seeking many possible solutions in an atmosphere that is constructive rather than critical and inhibitory. Gordon (1961) also attempted to stimulate creative thinking by a method called synectics, which primarily involves analogies.

More recently, authors such as Adams (1974/1986) and von Oech (1983) have suggested that people often construct a series of false beliefs that interfere with creative functioning. For example, some people believe that there is only one right answer and that ambiguity must be avoided whenever possible. People can become creative by identifying and removing these mental blocks. Also, von Oech (1986) has suggested that we need to adopt the roles of explorer, artist, judge, and warrior in order to foster our creative productivity.

These approaches have had considerable public visibility, in much the way that Leo Buscaglia has given visibility to the study of love. And they may well be useful. From our

point of view as psychologists, however, these approaches lack any basis in serious psychological theory, as well as serious empirical attempts to validate them. Of course, techniques can work in the absence of psychological theory or validation. But the effect of such approaches is often to leave people associating a phenomenon with commercialization and to see it as less than a serious endeavor for psychological study.

PSYCHODYNAMIC APPROACHES TO THE STUDY OF CREATIVITY

The psychodynamic approach can be considered the first major twentieth-century theoretical approach to the study of creativity. Based on the idea that creativity arises from the tension between conscious reality and unconscious drives, Freud (1908/1959) proposed that writers and artists produce creative work as a way to express their unconscious wishes in a publicly acceptable fashion. These unconscious wishes may concern power, riches, fame, honor, or love (Vernon, 1970). Case studies of eminent creators, such as Leonardo da Vinci (Freud, 1910/1964), were used to support these ideas.

Later, the psychoanalytic approach introduced the concepts of adaptive regression and elaboration for the study of creativity (Kris, 1952). Adaptive regression, the primary process, refers to the intrusion of unmodulated thoughts in consciousness. Unmodulated thoughts can occur during active problem solving, but often occur during sleep, intoxication from drugs, fantasies or daydreams, or psychoses. Elaboration, the secondary process, refers to the reworking and transformation of primary process material through reality-oriented, ego-controlled thinking. Other theorists (e.g., Kubie, 1958) have emphasized that the preconscious, which falls between conscious reality and the encrypted unconscious, is the true source of creativity because thoughts are loose and vague but interpretable. In contrast to Freud, Kubie claimed that unconscious conflicts actually have a negative effect on creativity because they lead to fixated, repetitive thoughts. Recent work has recognized the importance of both primary and secondary process (Noy, 1969; Rothenberg, 1979; Suler, 1980; Werner & Kaplan, 1963).

Although the psychodynamic approach may have offered some insights into creativity, psychodynamic theory was not at the center of the emerging scientific psychology. The early-twentieth-century scientific schools of psychology, such as structuralism, functionalism, and behaviorism, were devoting practically no resources at all to the study of creativity. The Gestaltists studied a portion of creativity – insight – but their study never went much beyond labeling, as opposed to characterizing, the nature of insight.

Further isolating creativity research, the psychodynamic approach and other early work on creativity relied almost exclusively on case studies of eminent creators. This methodology has been criticized because of the difficulty of measuring proposed theoretical constructs (such as primary process thought) and the amount of selection and interpretation that can occur in a case study (Weisberg, 1993). Although there is nothing a priori wrong with case-study methods, the emerging scientific psychology valued controlled, experimental methods. Thus, both theoretical and methodological issues served to isolate the study of creativity from mainstream psychology.

PSYCHOMETRIC APPROACHES TO THE STUDY OF CREATIVITY

When we think of creativity, eminent artists or scientists such as Michelangelo or Einstein immediately come to mind. However, these highly creative people are rare and difficult to study in the psychological laboratory. In his APA address, Guilford (1950) noted that the rarity of these individuals had limited research on creativity. He proposed that creativity could be studied in everyday subjects and with a psychometric approach, using paper-and-

pencil tasks. One of these was the Unusual Uses Test, in which an examinee thinks of as many uses for a common object (such as a brick) as possible. Many researchers adopted Guilford's suggestion, and "divergent-thinking" tasks quickly became the main instruments for measuring creative thinking. The tests were a convenient way of comparing people on a standard "creativity" scale.

Building on Guilford's work, Torrance (1974) developed the Torrance Tests of Creative Thinking. These tests consist of several relatively simple verbal and figural tasks that involve divergent thinking plus other problem-solving skills. The tests can be scored for fluency (total number of relevant responses), flexibility (number of different categories of relevant responses), originality (the statistical rarity of the responses), and elaboration (amount of detail in the responses). Some of the subtests from the Torrance battery include the following:

1. Asking questions: The examinee writes out all the questions he or she can think of, based on a drawing of a scene.
2. Product improvement: The examinee lists ways to change a toy monkey so that children will have more fun playing with it.
3. Unusual uses: The examinee lists interesting and unusual uses of a cardboard box.
4. Circles: The examinee expands empty circles into different drawings and titles them.

The psychometric revolution of measuring creativity had both positive and negative effects on the field. On the positive side, the tests facilitated research by providing a brief, easy-to-administer, objectively scorable assessment device. Furthermore, research was now possible with everyday people (i.e., noneminent samples). On the negative side, first, some researchers criticized brief paper-and-pencil tests as trivial, inadequate measures of creativity (see essays in Sternberg, 1986); more significant productions, such as actual drawings or writing samples, should be used in addition or, better, instead. Second, other critics suggested that fluency, flexibility, originality, and elaboration scores failed to capture the concept of creativity (see Amabile, 1983). In fact, the definition and criteria for creativity are a matter of ongoing debate, and relying on the objectively defined statistical rarity of a response with regard to all the responses of a subject population is only one of many options. Other possibilities include using a consensus of judges regarding a product's creativity. Third, some researchers rejected the assumption that noneminent samples could shed light on eminent levels of creativity, which was the ultimate goal of many studies of creativity. Thus, a certain malaise developed and continues to accompany the paper-and-pencil assessment of creativity. Some psychologists, at least, avoided this measurement quagmire in favor of less problematic research topics.

COGNITIVE APPROACHES TO THE STUDY OF CREATIVITY

The cognitive approach to creativity seeks to understand the mental representations and processes underlying creative thought. There have been studies with both human subjects and computer simulations of creative thought. Approaches based on the study of human subjects are perhaps prototypically exemplified by the work of Finke, Ward, and Smith (1992; see also contributions to Smith, Ward, & Finke, 1995; Sternberg & Davidson, 1995). Finke and his colleagues have proposed what they call the Geneplore model, according to which there are two main processing phases in creative thought: a generative phase and an exploratory phase. In the generative phase, an individual constructs mental representations referred to as preinventive structures, which have properties promoting creative discoveries. In the exploratory phase, these properties are used to come up with creative ideas. A number of mental processes may enter into these phases of creative invention, including the processes of retrieval, association, synthesis, transformation, analogical transfer, and cate-

gorical reduction (i.e., mentally reducing objects or elements to more primitive categorical descriptions). In a typical experimental test based on the model (see, e.g., Finke, 1990), subjects will be shown parts of objects, such as a circle, a cube, a parallelogram, and a cylinder. On a given trial, three parts will be named, and subjects will be asked to imagine combining the parts to produce a practical object or device. For example, subjects might imagine a tool, a weapon, or a piece of furniture. The objects thus produced are then rated by judges for their practicality and originality.

Weisberg (1986, 1993) proposes that creativity involves essentially ordinary cognitive processes yielding extraordinary products. Using case studies of eminent creators and laboratory research, such as studies with Duncker's (1945) candle problem, which requires subjects to attach a candle to a wall using only objects available in a picture (candle, box of tacks, and book of matches), Weisberg attempts to show that the insights depend on subjects using conventional cognitive processes (such as analogical transfer) applied to knowledge already stored in memory.

Computer simulation approaches, reviewed by Boden (1992, 1994), have as their goal the production of creative thought by a computer in a manner that simulates what people do. Langley, Simon, Bradshaw, and Zytkow (1987), for example, developed a set of programs that rediscover basic scientific laws. These computational models rely on heuristics – problem-solving guidelines – for searching a data set or conceptual space and finding hidden relationships between input variables. The initial program, called BACON, uses heuristics such as "If the value of two numerical terms increase together, consider their ratio" to search data for patterns. One of BACON's accomplishments has been to examine observational data available to Kepler on the orbits of planets and to rediscover Kepler's third law of planetary motion. Further programs have extended the search heuristics, the ability to transform data sets, and the ability to reason with qualitative data and scientific concepts. There are also models concerning an artistic domain. For example, Johnson-Laird (1988) developed a jazz improvisation program in which novel deviations from the basic jazz chord sequences are guided by harmonic constraints (or tacit principles of jazz) and random choice when several allowable directions for the improvisation exist.

SOCIAL-PERSONALITY APPROACHES TO THE STUDY OF CREATIVITY

Developing in parallel with the cognitive approach, work in the social-personality approach has focused on personality variables, motivational variables, and the sociocultural environment as sources of creativity. Researchers such as Amabile (1983), Barron (1968, 1969), Eysenck (1993), Gough (1979), and MacKinnon (1965) have noted that certain personality traits often characterize creative people. Through correlational studies and research contrasting high- and low-creativity samples (at both eminent and everyday levels), a large set of potentially relevant traits has been identified (Barron & Harrington, 1981). These traits include independence of judgment, self-confidence, attraction to complexity, aesthetic orientation, and risk taking.

Proposals regarding self-actualization and creativity can also be considered within the personality tradition. According to Maslow (1968), boldness, courage, freedom, spontaneity, self-acceptance, and other traits lead a person to realize his or her full potential. Rogers (1954) described the tendency toward self-actualization as having motivational force and being promoted by a supportive, evaluation-free environment.

Focusing on motivation for creativity, a number of theorists have hypothesized the relevance of intrinsic motivation (Amabile, 1983; Crutchfield, 1962; Golann, 1962), need for order (Barron, 1963), need for achievement (McClelland, Atkinson, Clark, & Lowell, 1953),

and other motives. Amabile (1983; Hennessey & Amabile, 1988) and her colleagues have conducted seminal research on the importance of intrinsic motivation. Studies using motivational training and other techniques have manipulated motivation and observed effects on creative performance tasks, such as writing poems and making collages.

Creativity may not only require motivation, but also generate it. Research has shown that when creative students are taught and their achievements are then assessed in a way that values their creative abilities, their academic performance improves (Sternberg, Ferrari, Clinkenbeard, & Grigorenko, 1996). Given the chance to be creative, students who might otherwise lose interest in school instruction might find that it instead captures their interest.

Finally, the relevance of the social environment to creativity has also been an active area of research. At the societal level, Simonton (1984, 1988, 1994a, 1994b) has conducted numerous studies in which eminent levels of creativity over large spans of time in diverse cultures have been statistically linked to environmental variables such as cultural diversity, war, availability of role models, availability of resources (such as financial support), and number of competitors in a domain. Cross-cultural comparisons (e.g., Lubart, 1990) and anthropological case studies (e.g., Maduro, 1976; Silver, 1981) have demonstrated cultural variability in the expression of creativity. Moreover, they have shown that cultures differ simply in the amount that they value the creative enterprise.

The cognitive and social-personality approaches have each provided valuable insights into creativity. However, if you look for research that investigates both cognitive and social-personality variables at the same time, you will find only a handful of studies. The cognitive work on creativity has tended to ignore or downplay the personality and social system, and the social-personality approaches have tended to have little or nothing to say about the mental representations and processes underlying creativity.

This disciplinary subsumption may have been due, at least in part, to the organizational structure of psychology departments and psychology journals. In many psychology departments, cognitive and social psychologists seek to maintain their separate identities because of resource considerations (e.g., funding and faculty positions). Furthermore, apart from the two journals specializing in creativity research, most of the prominent journals are unidisciplinary in approach. Cognitive psychology journals take cognitive work and social psychology journals take research with social-personality variables.

Looking beyond the field of psychology, Wehner, Csikszentmihalyi, and Magyari-Beck (1991) examined 100 recent doctoral dissertations on creativity. They found a "parochial isolation" of the various studies concerning creativity. There were relevant dissertations from psychology, education, business, history, history of science, and other fields, such as sociology and political science. However, the different fields tended to use different terms and to focus on different aspects of what seemed to be the same basic phenomenon. For example, business dissertations used the term *innovation* and tended to look at the organizational level, whereas psychology dissertations used the term *creativity* and looked at the level of the individual. Wehner, Csikszentmihalyi, and Magyari-Beck (1991) describe the situation with creativity research in terms of the fable of the blind men and the elephant: "We touch different parts of the same beast and derive distorted pictures of the whole from what we know: 'The elephant is like a snake,' says the one who only holds its tail; 'The elephant is like a wall,' says the one who touches its flanks" (p. 270).

Were it the case that an understanding of creativity required a multidisciplinary approach, the result of a unidisciplinary approach might be that we would view a part of the whole as the whole, but at the same time, have an incomplete explanation of the phenomenon we are seeking to explain, leaving dissatisfied those who do not subscribe to the particular discipline doing the explaining. We believe that traditionally this has been the case for creativity.

Recently, theorists have begun to develop confluence approaches to creativity, which we will now discuss.

CONFLUENCE APPROACHES TO THE STUDY OF CREATIVITY

Many recent works on creativity hypothesize that multiple components must converge for creativity to occur (Amabile, 1983, 1996; Csikszentmihalyi, 1988; Gardner, 1993; Gruber, 1989; Lubart, 1994; Mumford & Gustafson, 1988; Perkins, 1981; Simonton, 1988; Sternberg, 1985a, 1985b, 1996; Sternberg & Lubart, 1991, 1995; Weisberg, 1993; Woodman & Schoenfeldt, 1989). Sternberg (1985b), for example, examined laypersons' and experts' conceptions of the creative person. People's implicit theories contain a combination of cognitive and personality elements, such as "connects ideas," "sees similarities and differences," "has flexibility," "has aesthetic taste," "is unorthodox," "is motivated," "is inquisitive," and "questions societal norms."

At the level of explicit theories, Amabile (1983) describes creativity as the confluence of intrinsic motivation, domain-relevant knowledge and abilities, and creativity-relevant skills. The creativity-relevant skills include (a) a cognitive style that involves coping with complexities and breaking one's mental set during problem solving, (b) knowledge of heuristics for generating novel ideas, such as trying a counterintuitive approach, and (c) a work style characterized by concentrated effort, an ability to set aside problems, and high energy.

Gruber and his colleagues (1981, 1988; Gruber & Davis, 1988) have proposed a developmental evolving-systems model for understanding creativity. A person's purpose, knowledge, and affect grow over time, amplify deviations that an individual encounters, and lead to creative products. Developmental changes in the knowledge system have been documented in cases such as Charles Darwin's thoughts on evolution. Purpose refers to a set of interrelated goals, which also develop and guide an individual's behavior. Finally, the affect or mood system encompasses the influence of joy or frustration on the projects undertaken.

Csikszentmihalyi (1988, 1996) takes a different "systems" approach and highlights the interaction of the individual, domain, and field. An individual draws upon information in a domain and transforms or extends it via cognitive processes, personality traits, and motivation. The field, consisting of people who control or influence a domain (e.g., art critics and gallery owners), evaluates and selects new ideas. The domain, a culturally defined symbol system, preserves and transmits creative products to other individuals and future generations. Gardner (1993) has conducted case studies which suggest that the development of creative projects may stem from an anomaly within a system (e.g., tension between competing critics in a field) or moderate asynchronies between the individual, domain, and field (e.g., unusual individual talent for a domain).

A final confluence theory considered here is Sternberg and Lubart's (1991, 1992, 1995, 1996) investment theory of creativity, according to which creative people are ones who are willing and able to "buy low and sell high" in the realm of ideas (see also Rubenson & Runco, 1992, for use of concepts from economic theory). Buying low means pursuing ideas that are unknown or out of favor but that have growth potential. Often, when these ideas are first presented, they encounter resistance. The creative individual persists in the face of this resistance and eventually sells high, moving on to the next new or unpopular idea.

Preliminary research within the investment framework has yielded support for this model (Lubart & Sternberg, 1995). This research has used tasks such as (a) writing short stories with unusual titles (e.g., "The Octopus' Sneakers"), (b) drawing pictures with unusual themes (e.g., the Earth from an insect's point of view), (c) devising creative advertisements for boring products (e.g., cuff links), and (d) solving unusual scientific problems (e.g., how we could tell if someone had been on the moon within the past month). This research

showed creative performance to be moderately domain-specific and to be predicted by a combination of certain resources, as described next.

According to the investment theory, creativity requires a confluence of six distinct but interrelated resources: intellectual abilities, knowledge, styles of thinking, personality, motivation, and environment.

Three intellectual abilities are particularly important (Sternberg, 1985a): (a) the synthetic ability to see problems in new ways and to escape the bounds of conventional thinking, (b) the analytic ability to recognize which of one's ideas are worth pursuing and which are not, and (c) the practical-contextual ability to know how to persuade others of – to sell other people on – the value of one's ideas. The confluence of these three abilities is also important. Analytic ability used in the absence of the other two abilities results in powerful critical but not creative thinking. Synthetic ability in the absence of the other two results in new ideas that are not subjected to the scrutiny required, first, to evaluate their promise and, second, to make them work. And practical-contextual ability in the absence of the other two may result in the transmittal of ideas not because the ideas are good, but rather because they have been well and powerfully presented.

With regard to knowledge, on the one hand, one needs to know enough about a field to move it forward. One cannot move beyond where a field is if one doesn't know where it is. On the other hand, knowledge about a field can result in a closed and entrenched perspective, leading to a person's not moving beyond the way in which he or she has seen problems in the past (Frensch & Sternberg, 1989).

With regard to thinking styles, a legislative style is particularly important for creativity (Sternberg, 1988, 1997), that is, a preference for thinking in novel ways of one's own choosing. This preference needs to be distinguished from the ability to think creatively: Someone may like to think along new lines, but not think well, or vice versa. To become a major creative thinker, it also helps if one is able to think globally as well as locally, distinguishing the forest from the trees and thereby recognizing which questions are important and which ones are not.

Numerous research investigations (summarized in Lubart, 1994, and Sternberg & Lubart, 1991, 1995) have supported the importance of certain personality attributes for creative functioning. These attributes include, but are not limited to, self-efficacy and a willingness to overcome obstacles, take sensible risks, and tolerate ambiguity. In particular, buying low and selling high typically means defying the crowd, so that one has to be willing to stand up to conventions if one wants to think and act in creative ways.

Intrinsic, task-focused motivation is also essential to creativity. The research of Amabile (1983, 1996) and others has shown the importance of such motivation for creative work, and has suggested that people rarely do truly creative work in an area unless they really love what they are doing and focus on the work rather than on the potential rewards.

Finally, one needs an environment that is supportive and rewarding of creative ideas. One could have all of the internal resources needed in order to think creatively, but without some environmental support (such as a forum for proposing those ideas), the creativity that one has might never be displayed.

With regard to the confluence of components, creativity is hypothesized to involve more than a simple sum of a person's attained level of functioning on each component. First, there may be thresholds for some components (e.g., knowledge) below which creativity is not possible, regardless of the levels attained on other components. Second, partial compensation may occur in which a strength on one component (e.g., motivation) counteracts a weakness on another component (e.g., environment). Third, interactions may also occur between components, such as intelligence and motivation, in which high levels on both could multiplicatively enhance creativity.

In general, confluence theories of creativity offer the possibility of accounting for diverse aspects of creativity (Lubart, 1994). For example, analyses of scientific and artistic achievements suggest that the median creativity of work in a domain tends to fall toward the lower end of the distribution and that the upper (high-creativity) tail extends quite far. This pattern can be explained as the need for simultaneous multiple components in order for the highest levels of creativity to be achieved. As another example, the partial domain-specificity of creativity, which is often observed, can be explained through the mixture of some relatively domain-specific components for creativity, such as knowledge, and other more domain-general components, such as the personality trait of perseverance.

CONCLUSION

Few resources have been invested in the study of creativity, relative to its importance both to the field of psychology and to the world. We have sought to understand what we perceive as a serious underinvestment and suggest several reasons why this underinvestment might have occurred:

1. The origins of the study of creativity were based in a tradition of mysticism and spirituality, which has seemed indifferent and possibly runs counter to the scientific spirit.
2. Pragmatic approaches to creativity have given some the impression that the study of creativity is driven by a kind of commercialism that, while it may be successful in its own way, lacks a basis in psychological theory and verification through psychological research.
3. Early work on creativity was theoretically and methodologically adrift from the mainstream of scientific psychology, resulting in creativity sometimes being seen as peripheral to the central concerns of the field of psychology as a whole.
4. Problems with the definition of and criteria for creativity caused research difficulties. Paper-and-pencil tests of creativity resolved some of these problems but led to criticisms that the phenomenon had been trivialized.
5. Single approaches have tended to view creativity as an extraordinary result of ordinary structures or processes, so that it has not always seemed necessary to have any separate study of creativity. In effect, these approaches have subsumed creativity under them, as a special case of what is already being studied.
6. Unidisciplinary approaches to creativity have tended to view a part of the phenomenon (e.g., the cognitive processes of creativity, the personality traits of creative persons) as the whole phenomenon, often resulting in what we believe is a narrow, unsatisfying vision of creativity.

NOTE

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