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# Creativity

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## *Cognitive, Personal, Developmental, and Social Aspects*

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*Although many psychologists have expressed an interest in the phenomenon of creativity, psychological research on this topic did not rapidly expand until after J. P. Guilford claimed, in his 1950 APA presidential address, that this topic deserved far more attention than it was then receiving. This article reviews the progress psychologists have made in understanding creativity since Guilford's call to arms. Research progress has taken place on 4 fronts: the cognitive processes involved in the creative act, the distinctive characteristics of the creative person, the development and manifestation of creativity across the individual life span, and the social environments most strongly associated with creative activity. Although some important questions remain unanswered, psychologists now know more than ever before about how individuals achieve this special and significant form of optimal human functioning.*

**C**reativity is certainly among the most important and pervasive of all human activities. Homes and offices are filled with furniture, appliances, and other conveniences that are the products of human inventiveness. People amuse themselves with the comics in the daily paper, take novels with them to while away the hours on a plane or at the beach, go to movie theaters to see the latest blockbusters, watch television shows and commercials, play games on the computer, attend concerts from classical and jazz to rock and soul, visit museums that display the artistic artifacts of cultures and civilizations—again all implicitly bearing ample testimony to the consequences of the creative mind. The buildings people enter, the cars they drive, the clothes they wear—even the music they hear in elevators—are all exemplars of some form of creativity. The only way to escape this phenomenon is to walk stark naked deep within some primeval forest, and even then a person must take care not to hum a single tune, not to recall even one line of poetry, or not to even to look up in the sky for fear of seeing some jet or its contrail.

Not surprisingly, creativity is seen as a good attribute for people to possess. Teachers expect their students to display some creativity in their science projects and term papers. Executives at high-tech firms expect their research and development units to devise new products and their marketing units to conceive novel strategies to promote those products. At a more personal level, creativity is often seen as a sign of mental health and emotional well-being. In fact, various art and music therapies have emerged that

promote psychological adjustment and growth through creative expression. In a nutshell, creativity can be counted among those very special ways that human beings can display optimal functioning.

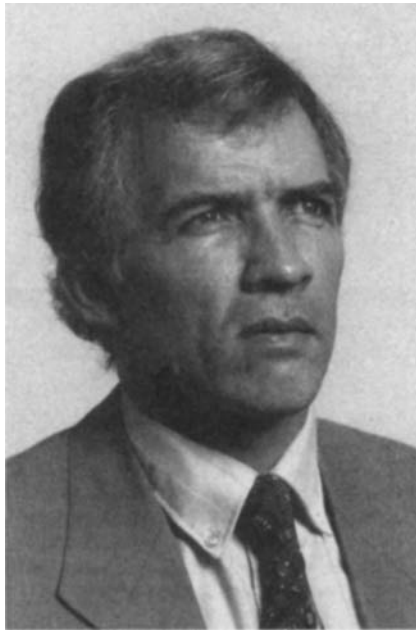
Despite the significant and omnipresent nature of creativity, psychologists have seldom if ever viewed it as a central research topic (Sternberg & Lubart, 1996). For example, of all the numerous recipients of APA's Award for Distinguished Scientific Contributions since 1956, only one, J. P. Guilford, can be credited with devoting a substantial part of his career to the psychological study of creativity. To be sure, other recipients of this high honor have addressed this topic as a side excursion of their primary investigations. Examples include figures as diverse as Wolfgang Köhler, Carl Rogers, B. F. Skinner, Jerome Bruner, James E. Birren, Herbert A. Simon, Donald T. Campbell, and David C. McClelland. Nevertheless, probably only Guilford can be said to enjoy simultaneous prominence in psychological science in general and in the more specialized domain of creativity research. Indeed, in his classic 1950 presidential address before the American Psychological Association, Guilford made a plea on behalf of making creativity a more focal point of psychological inquiry (Guilford, 1950). Fortunately, many psychologists responded to the call, and creativity research really boomed in the 1960s and early 1970s. Moreover, after a slight lull of a decade or so, psychologists have shown a renewed interest in the phenomenon. Although not yet a mainstream research topic, psychologists now know far more about creativity than ever before. That knowledge reveals a great deal about antecedents, correlates, and consequences of this particular form of optimal human functioning. In fact, this literature has now become so vast and rich that this article can accomplish no more than a review of the mere highlights.

### **Overview**

The literature on creativity spans several of the core sub-disciplines of psychology. This breadth is immediately apparent in the four main topics discussed below: cognitive processes, personal characteristics, life span development, and social context.

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### **Cognitive Processes**

The creative act is often portrayed as a mysterious and even mystical process, more akin to divine inspiration than to mundane thought. This view dates back to the ancient Greeks, who believed that creativity required the intervention of the muses. One of the principal goals of psychological studies has been to try to remove this mystery, replacing it with a deeper scientific understanding. For example, Sigmund Freud and other psychoanalytic thinkers attempted to accomplish this end by explicating creativity in terms of primary-process thinking (Gedo, 1997). However, with the advent of contemporary cognitive science, psychology has come much closer to appreciating the mental processes that must participate in the creative act. Recent developments in four areas of research—insightful problem solving, creative cognition, expertise acquisition, and computer simulation—deserve special mention.

**Insightful problem solving.** The Gestalt psychologists were the first psychologists to study creativity through the process of insight. Cognitive psychologists have built upon this early tradition by developing new experimental methodologies and theoretical models (Sternberg & Davidson, 1995). By manipulating priming stimuli, assessing feeling-of-knowing states, using protocol analysis, and applying other techniques, psychologists better understand how creative insights emerge during the incubation period. Especially striking is the empirical demonstration of intuitive information processing as a regular manifestation of the *cognitive unconscious* (e.g., Bowers, Farvolden, & Mermigis, 1995; Schooler & Melcher, 1995). The magic behind the sudden, unexpected, and seemingly unprepared inspiration has now been replaced by the lawful operation of subliminal stimulation and spreading activation.

**Creative cognition.** One of the more significant events in recent cognitive psychology is the emergence of the *creative cognition approach* (Smith, Ward, & Finke, 1995). According to this research program, creativity is a mental phenomenon that results from the application of ordinary cognitive processes (see also Ward, Smith, & Vaid, 1997). In addition, just as laboratory experiments have provided tremendous insights into human cognition, the same methodology can be applied to the study of creative thought. Particularly provocative are the experimental studies showing how visual imagery can function in the origination of creative ideas (Finke, Ward, & Smith, 1992). Another exciting feature of these experiments is the use of open-ended problems that demand genuine creativity, in contrast to much laboratory research that relies on problems that have fixed solutions. Nevertheless, these investigations concur with those on insightful problem solving in one fundamental message: The optimal functioning embodied by creativity entails ordinary cognitive processes, and hence creative thought is accessible to almost anyone.

**Expertise acquisition.** Recent research has amply demonstrated that exceptional talents are less born than made (Ericsson, 1996). Whether the domain is competitive sports, chess, or music performance, it usually requires about a decade of extensive deliberate practice before a person can attain world-class proficiency. Furthermore, evidence increasingly shows that to a certain extent, creativity demands a comparable level of systematic training and practice. Even the creative genius cannot escape this inherently laborious period of apprenticeship (Hayes, 1989; Simonton, 1991b). Creative individuals do not produce new ideas *de novo*, but rather those ideas must arise from a large set of well-developed skills and a rich body of domain-relevant knowledge. Like the work on creative cognition, this conception of creative expertise has rather egalitarian implications regarding the ability of anyone to acquire this form of optimal functioning (see Howe, Davidson, & Sloboda, 1998).

**Computer simulation.** A final development that has great promise is the increased use of computers to test explicit cognitive models of the creative process (Boden, 1991; Johnson-Laird, 1993). For instance, Newell and Simon's (1972) classic theory of human problem solving has inspired the emergence of several "discovery programs" that purport to uncover laws and principles from empirical data—often using the same raw data to make the same discoveries made by eminent scientists (Langley, Simon, Bradshaw, & Zythow, 1987; Shrager & Langley, 1990). Other computer programs have endeavored to reproduce creative behavior in art, literature, and music, sometimes with remarkable success (Boden, 1991). Additional strategies that have promising futures are genetic algorithms and genetic programming (Martindale, 1995). Although originally designed by computer scientists to solve practical problems, it is becoming increasingly apparent that these programs may eventually provide valuable theoretical models of how the creative process operates in the human mind (Simonton, 1999b).

In the long term, as the simulations of these computer models become ever more convincing, psychologists may eventually understand how best to increase the creative potential of all human beings.

### **Personal Characteristics**

Psychologists have long been interested in the individual attributes that enable some persons to display more creativity than others do. The empirical literature, both classic and current, falls naturally under two headings: intelligence and personality.

**Intelligence.** Many investigators have been interested in the extent to which creativity requires superior intelligence, a tradition that dates back to the pioneer work of Galton (1869) and Terman (1925). Using performance on standard IQ tests as the gauge of intellectual capacity, the early research indicated that a certain threshold level of intelligence was required for the manifestation of creativity but that beyond that threshold, intelligence bore a minimal relation with creative behavior (Barron & Harrington, 1981). More critical was the realization that the simplistic, exclusive, and unidimensional concept of intelligence had to be replaced by a more complex, inclusive, and multidimensional conception. Examples include Guilford's (1967) structure-of-intellect model, Sternberg's (1985) triarchic theory of intelligence, and Gardner's (1983) theory of multiple intelligences. The last theory is especially provocative insofar as it includes abilities that are not a standard part of psychometric tests (e.g., musical, bodily-kinesthetic, interpersonal, and intrapersonal intelligences). Moreover, each intelligence is associated with a specific manifestation of creativity, such as painting, choreography, or psychology (Gardner, 1993).

**Personality.** It has been long recognized that creativity is as much a dispositional as an intellectual phenomenon (e.g., Dellas & Gaier, 1970). This was made quite apparent, for example, in the early research on the creative personality conducted at the Institute for Personality Assessment and Research at the University of California, Berkeley (e.g., Barron, 1969; MacKinnon, 1978). Although interest in the dispositional correlates of creativity waned somewhat with the arrival of the cognitive revolution, personality research has seen a revival in recent years. As a result, researchers have now compiled a fairly secure profile of the creative personality (e.g., Martindale, 1989; Simonton, 1999a). In particular, such persons are disposed to be independent, nonconformist, unconventional, even bohemian, and they are likely to have wide interests, greater openness to new experiences, a more conspicuous behavioral and cognitive flexibility, and more risk-taking boldness.

Particularly fascinating is what the research has contributed to the long-standing mad-genius controversy. There is now sufficient evidence showing that creativity often tends to be associated with a certain amount of psychopathology (e.g., Eysenck, 1995; Jamison, 1993; Ludwig, 1995). At the same time, this association is not equivalent to the claim that creative individuals must necessarily suffer from mental disorders. On the contrary,

research has shown that (a) numerous creators, even of the highest order, have no apparent tendencies toward psychopathology; (b) the incidence rates vary according to the domain of creative activity, with some domains showing rather low rates; (c) those creators who seemingly exhibit symptoms usually possess compensatory characteristics that enable them to control and even channel their proclivities into productive activities; and (d) many characteristics that appear abnormal may actually prove quite adaptive to the individual's lifelong adjustment (see, e.g., Barron, 1969; Csikszentmihalyi, 1997; Ludwig, 1995; Rothenberg, 1990). In fact, the creative personality often provides a fine illustration of how supposed psychological weaknesses can sometimes be converted into a form of optimal functioning.

### **Life Span Development**

Creativity is more than a cognitive and dispositional attribution in which individuals may vary. It is also an activity that develops over the course of the human life span. Researchers into the developmental psychology of creativity have focused on two aspects of this longitudinal transformation. First, investigators have examined what childhood and adolescent experiences appear to be associated with the development of creative potential. Second, researchers have scrutinized how that potential is actualized during the course of the creator's adulthood and final years. Many of the studies in either category have concentrated on the development of individuals who have attained some acclaim for their creative achievements, albeit there is no shortage of inquiries into the emergence of more everyday forms of creative behavior.

**The acquisition of creative potential.** A very large inventory of developmental antecedents has been documented over the past several decades of research (Simonton, 1987). A great number of these influences concern the family environments and circumstances that seem to most favor the emergence of creative personalities. These factors include birth order, early parental loss, marginality, and the availability of mentors and role models. Other developmental variables refer to an individual's experience and performance in primary, secondary, and higher education. Perhaps the most remarkable generalization to be drawn from both sets of developmental influences is that exceptional creativity does not always emerge from the most nurturant environments (e.g., Eisenstadt, 1978; Goertzel, Goertzel, & Goertzel, 1978; Simonton, 1984). On the contrary, creative potential seems to require a certain exposure to (a) diversifying experiences that help weaken the constraints imposed by conventional socialization and (b) challenging experiences that help strengthen a person's capacity to persevere in the face of obstacles (Simonton, 1994). These developmental inputs may be especially important for artistic forms of creative behavior. In any case, it is startling testimony to the adaptive powers of the human being that some of the most adverse childhoods can give birth to the most creative adulthoods.

One other major movement in the recent literature deserves mention. Back in 1869, Galton first introduced the notion that exceptional creativity might have a genetic

foundation. With the advent of modern behavioral genetics, this possibility has received increased attention (Lykken, 1998; Simonton, 1999c; Waller, Bouchard, Lykken, Tellegen, & Blacker, 1993). Although it is still too early to tell exactly how much individual variation in creativity owes its existence to genetic endowment, there is no doubt that certain intellectual and dispositional traits required for creativity display respectable heritability coefficients (Bouchard, 1994; Eysenck, 1995). It is becoming increasingly clear that the acquisition of creative potential requires the simultaneous contribution of both nature and nurture.

### **The actualization of creative potential.**

Many investigators have been fascinated with how creativity is manifested during the course of a person's career (e.g., Gardner, 1993; Root-Bernstein, Bernstein, & Garnier, 1993). Especially notable is the *evolving systems approach* of Howard Gruber (1989) and his colleagues. Taking advantage of laboratory notebooks, sketchbooks, diaries, and other archival sources, these researchers have examined how creative ideas emerge and develop in a complex and dynamic interaction between the creator's personal vision and the sociocultural milieu in which that creativity must take place (see Wallace & Gruber, 1989). A distinctive feature of these inquiries is their emphasis on the qualitative and idiographic case-study method, an approach that permits an in-depth understanding of how creativity works in individual lives.

However, large-sample quantitative and nomothetic investigations on this topic are also abundant. The question that has received the most attention has been the relation between creativity and age (Simonton, 1988). Sometimes this issue is addressed by gauging how performance on psychometric measures of creativity changes across the adult life span (e.g., McCrae, Arenberg, & Costa, 1987), but the more common approach is to assess how the output of creative products changes as a function of age (e.g., Lehman, 1953; Lindauer, 1993b). Because this research has consistently found that creativity is a curvilinear (inverted backward J) function of age, one might conclude that older individuals would not be creative. However, the empirical and theoretical literature shows that such a pessimistic conclusion is unjustified (Csikszentmihalyi, 1997; Dennis, 1966; Simonton, 1991a, 1997a). Numerous factors operate that help maintain creative output throughout the life span. Indeed, it is actually possible for creators to display a qualitative and quantitative resurgence of creativity in their final years (Lindauer, 1993a; Simonton, 1989). Considering these findings, the picture for creativity in the later years of life is optimistic rather than pessimistic. Given that the 21st century will see a huge generation of "baby boomers" entering their golden years, this particular generalization about optimal functioning will acquire even more importance.

### **Social Context**

The original research on creativity tended to adopt an excessively individualistic perspective. Creativity was viewed as a process that took place in the mind of a single individual who possessed the appropriate personal charac-

teristics and developmental experiences. Beginning in the late 1970s, however, more psychologists began to recognize that creativity takes place in a social context (e.g., Harrington, 1990). Indeed, in the 1980s, an explicit social psychology of creativity emerged to supplement the cognitive, differential, and developmental perspectives (e.g., Amabile, 1983). The methods adopted in this burgeoning field range from laboratory experiments and field observations to content analytical and historiometric studies. These investigations have also looked at a diversity of external conditions, with perhaps the greatest emphasis on the interpersonal, disciplinary, and sociocultural environments.

**Interpersonal environment.** Although there has long existed the popular image of the lone genius, it is clear that much creativity takes place in interpersonal settings. The student may be expected to display creativity on a term paper or essay exam, or the worker may be expected to exhibit some creativity on the job. The particular nature of the interpersonal expectations may then serve to either enhance or inhibit the amount of creativity shown by the individual. A good illustration of the possibilities may be found in the research of Amabile and her associates (e.g., Amabile, 1996) on the repercussions of rewards, evaluation, surveillance, and other circumstances. Particularly valuable are their inquiries into the impact of intrinsic and extrinsic incentives for performing a task. Creativity usually appears more favored when individuals perform a task for inherent enjoyment rather than for some external reason that has little to do with the task itself. However, circumstances also occur in which the extrinsic motivation can contribute to the amplification of individual creativity (Amabile, 1996; Eisenberger & Cameron, 1996). This research has obvious implications for how to best nurture creativity in both schools and the workplace.

Before advancing to the next variety of social context, I should at least mention the current status of research on brainstorming. This technique was first introduced as a way of stimulating the production of creative ideas in problem-solving groups (Osborn, 1963). In a sense, brainstorming purports to generate creativity from an interpersonal rather than an intrapersonal process. Brainstorming has become a very popular approach in industrial and organizational settings (Farr, 1990). Unfortunately, although the research literature is not uniform in its assessment of the method's validity, it is clear that brainstorming has utility only with rather specific types of instructions and guidance (e.g., Diehl & Stroebe, 1987). At present, it is impossible to say whether this method will be rendered more effective by the current research on electronic brainstorming in which the interactions occur through computer mediation (e.g., Roy, Gauvin, & Limayem, 1996).

**Disciplinary environment.** Most creators do not function in isolation from other creators, but rather their creativity takes place within a particular artistic, scientific, or intellectual discipline. For example, in the systems view put forward by Csikszentmihalyi (1990), creativity requires the dynamic interaction between three subsystems, only one of which entails the individual creator. The second subsystem is the domain, which consists of the set of rules,

the repertoire of techniques, and any other abstract attributes that define a particular mode of creativity (e.g., the paradigm that guides normal science, according to Kuhn, 1970). The third subsystem is the field, which consists of those persons who work within the same domain, and thus have their creativity governed by the same domain-specific guidelines. These colleagues are essential to the realization of individual creativity, according to the systems view, because creativity does not exist until those making up the field decide to recognize that a given creative product represents an original contribution to the domain.

Once psychologists recognize that creativity emerges out of an interaction of individual, field, and domain, then the phenomenon becomes far more complex. One illustration of this complexity may be found in Martindale's (1990) research on stylistic change in the arts, especially in poetic literature. Although the poet wants to reach as wide a public as possible, Martindale argued that the most important audience for poetry is fellow writers (as well as a few select critics), who play the major part in evaluating whether an author's poetry qualifies as creative. That evaluation is based on two considerations. First, the poetry must conform to the stylistic rules of the time, rules that define the acceptable form and content for that particular domain of creativity. Second, the poetry must be original, rather than merely rehashing what has already been said. In the early history of a particular style, poets can attain this second end by ever more extensive use of what Martindale called "primordial thought" (i.e., primary-process thinking in psychoanalytic terms), but as time goes on, originality can only be obtained by stretching, even outright violating, the various rules of the game. After a few generations, the stylistic conventions begin to break down, and the domain loses its coherence—which means it becomes increasingly difficult for anyone to judge what is good and bad among contemporary poems. Fortunately, a new style usually emerges, with distinctive sets of form and content prescriptions, and the whole cyclical process begins once again. Martindale has empirically documented this progression not just in poetry, but in most other forms of creativity as well, including music and painting.

Needless to say, once psychologists acknowledge that creativity is a systemic rather than a totally individualistic phenomenon, it becomes far more difficult to study using the more commonplace methods of psychology. Experimental studies of human problem solving become far less enlightening to the extent that the laboratory cubical isolates the person from a disciplinary domain and field. Psychometric inquiries into the creative personality are likewise rendered less insightful to the degree that the creator has been unrooted from his or her disciplinary matrix. To circumvent these limitations, psychologists have adopted a number of strategies. Some, like Martindale (1990), have taken advantage of archival data to study the interplay between creators and their disciplines (see also Simonton, 1992b). Others have engaged in some form of participant observation, such as Dunbar's (1995) provocative in situ examination of scientific discovery in biomedical research laboratories. Although these alternative meth-

ods are much more arduous than the more commonplace experimental and psychometric investigations, they have contributed findings that could not be acquired in any other way. In particular, such investigations have amply proven that creativity cannot be divorced from its disciplinary context.

**Sociocultural environment.** Beyond the realm of interpersonal and disciplinary interactions, there exists the larger external milieu. Sociologists and anthropologists have long argued that creativity is mostly if not entirely a sociocultural phenomenon (e.g., Kroeber, 1944), but only in the past couple of decades have psychologists begun to scrutinize the extent to which creative achievements depend on the impersonal and pervasive zeitgeist (Simonton, 1984). Two findings warrant special mention here:

1. It has become increasingly clear that certain political environments affect the degree of creativity manifested by the corresponding population. Some of these political influences operate directly on the adult creator, such as when warfare depresses the output of creative ideas (Simonton, 1984). Other political effects function during the developmental stages of an individual's life, either encouraging or discouraging the acquisition of creative potential. Thus, on the one hand, growing up in times of anarchy, when the political world is plagued by assassinations, coups d'état, and military mutinies, tends to be antithetical to creative development (e.g., Simonton, 1976). On the other hand, growing up when a civilization is fragmented into a large number of peacefully coexisting independent states tends to be conducive to the development of creative potential (e.g., Simonton, 1975). In fact, nationalistic revolts against the oppressive rule of empire states tends to have a positive consequence for the amount of creativity in the following generations (Kroeber, 1944; Simonton, 1975; Sorokin, 1947/1969). Many nations have experienced golden ages after winning independence from foreign domination, with ancient Greece providing a classic example.

2. The rationale for the last mentioned consequence may be that nationalistic rebellion encourages cultural heterogeneity rather than homogeneity (Simonton, 1994). Rather than everyone having to speak the same language, read the same books, follow the same laws, and so on, individuals are left with more options. This suggests that cultural diversity may facilitate creativity, and there is evidence that this is the case. Creative activity in a civilization tends to increase after it has opened itself to extensive alien influences, whether through immigration, travel abroad, or studying under foreign teachers (Simonton, 1997b). By enriching the cultural environment, the ground may be laid for new creative syntheses. This finding is consistent with a host of other empirical results, such as the creativity-augmenting effects of ethnic marginality, bilingualism, and even exposure to ideological or behavioral dissent (e.g., Campbell, 1960; Lambert, Tucker, & d'Anglejan, 1973; Nemeth & Kwan, 1987; Simonton, 1994).

These and other sociocultural forces are potent enough that they can completely extinguish creativity in a given nation, sometimes producing a dark age that may last for

generations (Simonton, 1984). However, it requires emphasis that zeitgeist factors serve to raise or lower the general level of creative activity at a given time and place, but cannot easily account for individual differences in the development and manifestation of creativity. For example, the general milieu may largely explain why the Renaissance began in Italy but not why Michelangelo towered over his Italian contemporaries.

## Conclusion

Although psychologists have made tremendous progress in the understanding of creativity, much work remains to be done. Certainly, many substantive questions demand considerably more empirical scrutiny. Consider, for example, the following three desiderata:

1. Psychologists still have a long way to go before they come anywhere close to understanding creativity in women and minorities (see, e.g., Helson, 1990). So far, creativity in such groups seems to display a complex pattern of divergence and convergence relative to what has been observed in majority-culture male study participants (e.g., Simonton, 1992a, 1998). The details of these differences and similarities must be empirically documented before psychologists can be said to understand how this form of optimal functioning operates in the entire human race.

2. Psychologists must carry out more ambitious longitudinal studies that examine how creativity develops during the course of childhood, adolescence, and adulthood. Terman's (1925) classic investigation followed a cohort of intellectually gifted children throughout their life courses, but most current work has been obliged to scrutinize a narrower slice of the life span (e.g., Csikszentmihalyi, Rathunde, & Whalen, 1993; Getzels & Csikszentmihalyi, 1976; Subotnik & Arnold, 1994). Although such investigations have told psychologists much about creative development, only more extensive studies can complete the picture of the origins of creative potential.

3. Psychologists also need to carry out more research on the attributes of the creative product. Ironically, although psychologists have made considerable advances in their understanding of what contributes to the success of an aesthetic composition (e.g., Martindale, 1990; Simonton, 1980), they still know very little about what determines the creativity of a scientific contribution (e.g., Shadish, 1989; Sternberg & Gordeeva, 1996).

Beyond expanding the scope of empirical inquiries, more attention must be devoted to the development of more comprehensive and precise theories of creativity. At present, two theoretical movements look the most promising: (a) economic models that examine the individual's willingness to invest in "human capital" and to engage in risk-taking behaviors (see, e.g., Rubenson & Runco, 1992; Sternberg & Lubart, 1995); and (b) evolutionary models that have elaborated Campbell's (1960) variation-selection model of creativity into more complete explanations of the creative process, person, and product (see, e.g., Eysenck, 1995; Simonton, 1999b). Both the economic and evolutionary theories have supported the emergence of mathematical

models that make predictions susceptible to empirical tests (e.g., Simonton, 1997a).

Finally, and perhaps most important, the scientific understanding of creativity should be extended to lead to ever more useful applications. To the world at large, creativity is not just an interesting psychological phenomenon but a socially and personally valued behavior besides. It is partly for this reason that there are so many workshops and self-help books that purport to enhance personal creativity; yet the gap between scientific knowledge and practical interventions is often so wide that doubts are cast on both science and practice. However, if creativity research continues to expand and diversify, a time will come when scientific theories prove their utility by successfully stimulating creativity in the everyday world. Ultimately, ever more human beings may be able to display optimal functioning through creativity.

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