

CREATIVITY

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■ **Abstract** Creativity has clear benefits for individuals and society as a whole. Not surprisingly, a great deal of research has focused on creativity, especially in the past 20 years. This chapter reviews the creativity research, first looking to the relevant traits, capacities, influences, and products, and then within disciplinary perspectives on creativity (e.g., biological, cognitive, developmental, organizational). Great headway is being made in creativity research, but more dialogue between perspectives is suggested. New and important areas of research are highlighted, and the various costs and benefits of creativity are discussed.

CONTENTS

INTRODUCTION	658
BACKGROUND AND CONTEXT	659
PERSON, PRODUCT, PRESS, AND PROCESS	661
DISCIPLINARY EMPHASES	663
The Behavioral Perspective	664
The Biology of Creativity	664
Einstein's Brain	665
Clinical Research	666
Cognitive Research	667
Attention Deployment	667
Developmental Research	668
Economic Factors and Theories	669
Educational Research	670
Historical and Historiometric Research	671
Organizational Perspectives	671
Psychometric Research	672
Social Research	672
CURRENT TRENDS IN THE FIELD	673
Implicit and Explicit Theories of Creativity	673
Trend Analyses	674
TOPICS OF CONTINUED OR DISCONTINUED INTEREST	675
Problem Finding	675

Evolutionary Theories of Creativity	675
Creativity in the Moral Domain	676
Case Studies	676
CONCLUSIONS	677

INTRODUCTION

The world is becoming more and more complex. Modern conveniences abound, and technology seems to have touched everything from cooking to mass production, from communication to driving. In some ways life today is easier than ever before. In other ways, it is more difficult. Although we may now use a cellular phone to keep track of family members and to synchronize our appointments, we must also master cell phone operation—and update the requisite skills each time we buy a new cell phone. We must also develop new skills to operate our televisions, ovens, automobiles, and computers. Perhaps it would be most accurate to say that we have more opportunities than ever before, but more demands are placed upon us as well.

This complexity is increasing and will continue to do so. The information boom is not slowing down, and technological advances are occurring more often. Such changes reflect cultural evolution, which is unlike biological evolution in its rapidity. Although there is some debate about this (Gould 2002), biological evolution seems to take a great deal of time; changes are not maintained until they have been selected for generations and generations. Cultural evolution, on the other hand, can be seen in changes that occur from one generation to the next. This is Lamarckian, in contrast to Darwinian, evolution (Wilson 1978). It is fast and part of the reason life today is so complicated and complex.

All of this implies that creativity is more important now than ever before. This is because creativity is a useful and effective response to evolutionary changes. In addition to what may be its most obvious function, namely as part of the problem-solving process (Mumford et al. 1991, Runco 1994, Torrance 1971, Wallas 1926), creative ideation allows the individual to remain flexible (Flach 1990; Runco 1986, 1994). Creativity is usually tied to original behavior, and indeed, originality is necessary for creativity, but it is not sufficient. Creativity is a syndrome or complex (Albert & Runco 1989, MacKinnon 1983/1960, Mumford & Gustafson 1988), and flexibility is an important part of it. The flexibility of creative persons is what gives them the capacity to cope with the advances, opportunities, technologies, and changes that are a part of our current day-to-day lives.

This view of creativity implies that it is reactive; and surely, it often is a reaction to problems or challenges. Yet creativity is also one of the engines of cultural evolution. As Paulus & Nijstad (2003) described it, innovation is a vital process today, and that innovation requires change. In their words, “the basis for such change comes down to the stimulating effects of new ideas. . . . Creativity is therefore often defined as the development of original ideas that are useful or influential.” In this perspective, creativity is not only a reaction to but also a contribution to change and evolution. Creativity thus underlies problem solving and problem

finding; it plays a role in reactions (e.g., adaptations and solutions) but it is also often proactive.

Bruner (1962) claimed that we must encourage the creativity of our children and students as preparation for the future, given that the future is more difficult than ever before to define. Given the “greying of America,” it will come as no surprise that more and more research is exploring life span creativity. The research reviewed in this chapter suggests that creativity facilitates late-life adaptations and growth (Cohen 1989; Cohen-Shalev 1986, 1989; Dudek & Hall 1991; Gott 1992, 1993; Helson 1990; Hogg 1993; Lindauer 1992, 1993; Runco & Charles 1997; Zausner 1999). This is especially true of the flexibility allowed by creativity, because older adults tend to rely on routines and, unless intentionally creative, become inflexible (Rubenson & Runco 1995). Creativity contributes to both physical and psychological health (Eisenman 1991, Mraz & Runco 1994, Pennebaker et al. 1997, Runco & Richards 1997) and to optimal human functioning (Bloom 2001).

Creativity is not, however, just a concern and target for individuals. Its benefits are just as clear for society and culture (Simonton 1991). As noted above, creativity plays an important role in technological advance, in the social and behavioral sciences, and in the humanities and arts (Dudek 2003). Because of its role in innovation and entrepreneurship, creativity has become one of the key concerns of organizations and businesses. The organizational perspective and research is reviewed below. Before turning to specific perspectives on creativity, it will be useful to put this chapter into context with the field of creative studies.

BACKGROUND AND CONTEXT

Although a number of excellent studies of creative talents and creative persons were published before 1950 [see Albert & Runco (1986) or Runco (1999a) for histories of the field], a great deal of credit is given to J.P. Guilford (1950). His presidential address to the American Psychological Association was titled “Creativity,” and his argument at that time, and his subsequent empirical efforts, went a long way toward convincing individuals of the possibility of being scientific about creativity. Guilford also argued convincingly that creativity was a vital “natural resource.” This may be a good example of *zeitgeist* (“the spirit of the times”), for Guilford’s arguments were entirely compatible with the assumptions and needs of the 1950s. Many other examples of *zeitgeist* have been reported in the creativity literature (Shlain 1999, Simonton 1984).

The present chapter is in part an update to the review of Barron & Harrington (1981). Many significant advances have occurred since they published their chapter in the *Annual Review of Psychology*, and a number of new directions of study have opened. These new directions (and resulting new issues) are covered below. They imply that this chapter is not simply an extension of the fine work of Barron & Harrington (1981). Consider in this regard the fact that Barron & Harrington (1981) devoted most of their review to (*a*) creativity in relation to intelligence, and

(*b*) creativity and personality (the title of their chapter was “Creativity, Intelligence, and Personality”). These emphases—intelligence and personality—are given much less attention in the current literature, and thus in this chapter. The relationship between creativity and intelligence has been researched since 1981. Runco & Albert (1987), for instance, reported that the threshold theory (wherein a minimum level of intelligence is a prerequisite for creative performance) is only found with certain measures of creativity. And there is research on creativity and personality, which is reviewed later in this chapter. Yet, neither of these emphases is as central to the field as they were in 1981. At that point, there was still a concern that creativity was simply an expression of general intelligence and not a distinctive capacity (Getzels & Jackson 1962, Wallach & Kogan 1965, Wallach & Wing 1969). That view is no longer prevalent. The topic is still being investigated, but these investigations are no longer motivated by the need for discriminant validity (the distinctiveness mentioned just above). Personality is also being studied, but many other influences on creative work have been identified. Some of these are tied to the individual’s potentials, dispositions, abilities, and capacities, and some are tied to the environment and social context. The creative personality, indeed the creative person, is only one focus for contemporary research.

The literature on creativity is quite diverse. It can be organized in several ways. In this review I first use a scheme proposed by Rhodes (1961/1987) that distinguished between the creative person, process, product, and press. (Press research may be the least intuitively obvious label in this list. It refers to pressures on creativity. Examples are given below.) This framework takes us quite a distance into the creativity research, but leaves a number of gaps. For that reason, I then review research reflecting different disciplinary assumptions. I review the behavioral perspective on creativity, research on the biology of creativity, then clinical, cognitive, developmental, economic, educational, historiometric, organizational, psychometric, and social research. These approaches overlap a great deal, and an interdisciplinary perspective is best, but the disciplinary scheme does help round out this review. Because several important topics do not fit neatly into either the alliterative or the disciplinary categorization schemes, I end this chapter by covering explicit theories of creativity and key issues in the field. It is interesting to compare the issues that are receiving the most attention today with those of 20–25 years ago.

This chapter will be a success to the degree that it convinces readers that creativity is more important now than ever before. Consider the breadth of the research reviewed here. This breadth demonstrates the numerous and diverse applications of creativity and is suggestive of its importance. Creativity is useful; it can be applied each day to many aspects of our lives. In fact, as noted above, it can help us keep up with the challenges of modern life. This is part of the take-home message of this chapter: Creativity does not just play a role in the arts, invention, and innovation; it also is a part of our everyday lives (Runco & Richards 1997). The benefits of creativity are numerous, especially if its duality, suggested earlier, is acknowledged. Creativity is not just a kind of problem solving and a reaction,

but can also be proactive. This duality is apparent in the review of the different perspectives on creativity below.

PERSON, PRODUCT, PRESS, AND PROCESS

Probably the most often-used structure for creative studies is that suggested by Rhodes (1961/1987). It is an alliterative scheme that divides creative studies (and findings) into the following categories: person, process, press, and product. The person category includes research on personal characteristics. These may reflect personality, for example, and there has been copious research on the traits that characterize creative persons. Barron & Harrington (1981) summarized the research to that point as indicating that creative individuals have a “high valuation of aesthetic qualities in experience, broad interests, attraction to complexity, high energy, independence of judgment, autonomy, intuition, self-confidence, ability to resolve antinomies or to accommodate apparently opposite or conflicting traits in one’s self concept, and finally, a firm sense of self as ‘creative’” (p. 453). The concept of “domains” (e.g., art versus science) is very relevant here, however, for there may be differences in the traits that allow creative performances in different fields.

Personality research frequently includes intrinsic motivation as a core characteristic of creative persons. In actuality, motivation may be tied to states and drives as much as to personality, but it does make sense that creative persons tend to follow intrinsic interests, and that tasks that are intrinsically motivated tend to be free from the evaluations and constraints that can inhibit creativity (Amabile 2003, Stohs 1992). Certainly, creative efforts are sometimes extrinsically motivated (Rubenson & Runco 1992, 1995). Amabile (2003) demonstrated experimentally how certain kinds of extrinsic factors (e.g., evaluation) could inhibit creative thinking.

Process research may be less personal and more behavioral. Csikszentmihalyi (2003), for example, presented a systems theory in which creative ideas originate with an individual, may then influence a particular field (e.g., experts and curators and others devoted to one interest or area), and may eventually even have an impact on the more general domain. This description is in some ways parallel to descriptions of historical processes, such as dialectical materialism, wherein changes occur only after periods representing one perspective (or “thesis”), a movement to the opposite extreme (an “antithesis”), and finally a synthesis. This is, however, just a parallel, and dialectical materialism is usually used to describe something over a longer period (and perhaps more general than “an idea”). Experimental demonstrations of important processes have also been reported. Associative processes, for example, seem to be involved in divergent thinking and problem solving, at least when the problem at hand is open-ended (e.g., Martindale & Hasenbus 1978, Runco 1991a). More is said about these processes in the Cognitive Research section below.

The concept of “press” was proposed by Harry Murray (1938) and is used in the creativity literature to describe pressures on the creative process or on creative

persons. Rhodes (1961/1987, p. 220) stated that “press refers to the relationship of human beings and their environment.” Press influences may be general, and perhaps operate through implicit valuation and tradition (as would be the case for cultural, organizational, or familial presses), or more specific (as would be the case in interpersonal exchanges or environmental settings). Much of the research on press focuses on social dynamics. Press is not, however, entirely social nor even a part of objective experience. Murray (1938) distinguished between alpha and beta pressures. The former pressures reflect the more objective aspects of press, and the latter the individual’s interpretation of some contextual pressure. These are significantly different, but the differences are not always acknowledged (cf. Mraz & Runco 1994).

Amabile & Gryskiewicz (1989) and later Witt & Beorkrem (1989) identified the following “situational influences on creativity”: freedom, autonomy, good role models and resources (including time), encouragement specifically for originality, freedom from criticism, and “norms in which innovation is prized and failure not fatal” (Witt & Beorkrem, pp. 31–32). Some influences can also inhibit creativity. These include a lack of respect (specifically for originality), red tape, constraint, lack of autonomy and resources, inappropriate norms, project management, feedback, time pressure, competition, and unrealistic expectations. These do not necessarily inhibit creativity; they are potential inhibitors. Recall the alpha and beta presses identified by Murray (1938), one being objective and one being subjective. Competition is a good example of how these may differ, for competition may both stimulate and inhibit creative work (Watson 1968); its impact depends on the individual’s interpretation. The same may hold true for resources, at least in the sense that creative insights may sometimes absolutely require resources, but sometimes result from paucity (“Necessity is the mother of invention”).

Time is indeed an important resource. Mednick (1962), for example, suggested that original ideas are remote and well removed from the original problem or initial idea. This remoteness requires time; it takes time to move from idea to idea to idea, and to find (eventually) the “remote associate.” A number of empirical studies have confirmed Mednick’s (1962) predictions. Time is also important for incubation, though here it is time away from a task rather than devoted to it. Many notable creative achievements (e.g., Darwin’s theory of evolution) seem to have required sustained efforts (Gruber 1988). A creative insight is not a quick “aha!” but instead is protracted (Gruber 1981a, Wallace 1991). This conclusion can be easily applied to many aspects of everyday life; people should take their time if they want a creative idea or solution. Similarly, students and employees should be given sufficient time if they are expected to do creative work.

The role of press in the creative process also can be seen in the research on family background. Most work in this area seems to focus on family structure, in contrast to family process. The relevant structural variables include birth order, family size and number of siblings, and age gap (or interval). Much of this research parallels studies of giftedness (Albert 1980), and those focused on IQ and academic aptitude (e.g., Zajonc & Markus 1975). Sulloway (1996), for instance, presented data showing

that middle children are the most rebellious, and are therefore potentially creative (also see Gaynor & Runco 1992, Runco & Bahleda 1987). Albert & Runco (1989) reported that the autonomy within a family, not just the number of siblings or family structure, could dramatically influence creativity. Very likely, family structure has an impact on development and creativity because it determines family processes. Larger families have more-authoritarian parents, just to name one example of how structure can determine process.

Some recent research suggests that certain environmental designs for schools are conducive to creativity (Hasirci & Demirkan 2003). Although it would be best to design an environment on an individual-by-individual basis (and take an individual's idiosyncrasies and interpretations into account), all other things being equal, environments should allow independent work, be stimulating but not distracting, and allow easy access to resources. These findings align well with those in the organizational setting (Amabile 2003, Witt & Beorkrem 1989).

The product approach to creativity focuses on outcomes and those things that result from the creative process. The assumption here is that studies of products (e.g., publications, paintings, poems, designs) are highly objective, and therefore amenable to the scientific method. Products can be counted, for example, and sometimes it is just the quantity of one's efforts that is measured. The value of this approach is supported by the amazing productivity of Piaget, Picasso, and other luminaries (Simonton 1984). The problem with this approach is that it often informs us only about productivity and not about creativity. Also, it can be quite misleading because what it takes to be productive may differ from what it takes to be creative. An individual can be productive without being original; and originality is the most widely acknowledged requisite for creativity. In methodological terms, productivity and creativity are correlated but not synonymous.

Rarely is the product approach used with noneminent individuals (cf. O'Quin & Bessemer 1989). Usually it directs an investigation to eminent persons. After all, eminent individuals tend to be the most productive. They are also unambiguously creative. There is no doubt about their talent. The problem is that inferences are necessary to identify the influences on their productivity. Further, generalizations to noneminent populations may not be warranted. Gardner (1993) reported that the eminent creators he studied (e.g., Picasso, Freud, and T.S. Elliot) were in some ways childlike and tended to promote themselves, but these tendencies may not apply to everyday creativity or to the creative efforts of children and other noneminent persons.

DISCIPLINARY EMPHASES

Quite a bit of research does not fit easily into the categories above (person, product, process, and press). For that reason it is necessary to employ a more detailed framework. A disciplinary framework—organized by behavioral, biological, clinical, cognitive, developmental, historiometric, organizational, psychometric, and

social perspectives—works well and is summarized below. There is overlap with the person, product, process, and press categories, but without the disciplinary survey, some research would be overlooked. The more notable examples of overlap are highlighted in the concluding section below.

The Behavioral Perspective

It is not easy to apply the behavioral perspective to creativity. This is because creativity does not lend itself easily to overt behaviors (Epstein 2003). Yet, there are behavioral correlates of creativity, such as insight and novelty (Epstein 2003, Runco 1994, Stokes 1999). Epstein, for example, reported a number of studies that suggest that insight results from “the spontaneous integration of previously learned responses.” He used reinforcement to teach a series of discrete behaviors and then placed the research participants in a setting where they could solve a problem by integrating the discrete behaviors into one series or solution. This research does not really inform us about where the integration occurs, nor if insights in the natural environment are also a reflection of this kind of spontaneous integration, but it does demonstrate that the probability of insights can be increased through experience. It is impressive that subhuman species, including porpoises (Pryor et al. 1969) and pigeons (Epstein 2003), can be taught to demonstrate insightful behaviors.

The Biology of Creativity

The complex nature of creativity seems to have inhibited certain areas of research, including that subsumed under the biological label. In fact, some of the research in this area does not pinpoint creativity but instead involves related behaviors and aptitudes. Sperry’s (1964) well-known research on the hemispheres of the brain exemplifies this. His work is often applied to art and creativity (e.g., Edwards 1989), but in fact the original studies of individuals who received commissurotomies (the corpus callosum, connecting the two hemispheres, was surgically bisected to inhibit seizures) referred to skills more aligned with simultaneous and sequential processing than with originality and the other components of creativity. Perhaps the most significant flaw in the various theories of right-brain creativity is that creativity actually requires the capacities from both hemispheres. Creativity is not always or entirely intuitive, for example, nor even radically original. Creativity instead reflects originality and appropriateness, intuition and logic. It requires both hemispheres. As Katz (1997) put it, “Creative activity cannot be localized as a special function unique to one of the cerebral hemispheres. Rather, productive thought involves the integration and coordination of processes subserved by both hemispheres.”

Hoppe & Kyle (1991) and TenHouten (1994) studied Sperry’s patients and described how they lacked this kind of integrated thought. Hoppe & Kyle suggested that the problem was alexithemia, a lack of emotionality and affect. They found clear evidence of this in the language of the patients, and in the lack of affect-laden interpretations of experience. The patients described things rather than their reactions to things. They also “showed a relatively impoverished fantasy life.”

Shlain (1999) tied hemispheric communication—a “shuttle back and forth, intertwining the warp and woof of right and left, space and time, art and physics” (p. 742)—to self-reflection and *zeitgeist*. Both of these in turn are involved in creativity. It can’t be emphasized too strongly that creativity is best viewed as a whole-brain (rather than right-brain) process.

Various investigations have focused on EEGs. Hoppe & Kyle (1991), for instance, employing the commissurotomy patients, found that there was little activity in the right temporal area (T4) when individuals were listening to music or viewing a movie that was highly emotional. The left hemisphere was also relatively inactive. This included Broca’s and Wernicke’s areas (F3, T3). One interpretation of this is that “inner speech” is lacking (Hoppe & Kyle 1991). Meanwhile, there was a high level of activity in P3, the left parietal area. Consistent with the proposal outlined above, concerning emotionality, Hoppe & Kyle reported high coherence between the right frontal (F4) and the P3 areas. This was taken to be indicative of “a possible interhemispheric aspect of inhibition of expression.” Control subjects had coherence between the F4 and T3 areas, which implied “a possible mechanism facilitating the transformation of the effective understanding in the right hemisphere into verbal expression of the lower left hemisphere.”

Martindale & Hasenpus (1978) suggested that EEG activity would vary in different stages of the creative process. They relied on the stages outlined by Wallas (1926), which have shown their usefulness through years and in some very recent work. (For a review of stage theories, see Runco 1994.) Martindale & Hasenpus measured EEGs at the right posterior temporal area and found more alphas during the inspiration stage than in the elaboration stage, at least in notably creative individuals. Martindale & Hasenpus (1978) also proposed that low cortical arousal would allow defocused attention, which would in turn facilitate the associations that provide original insights.

Einstein’s Brain

Diamond et al. (1985) apparently held the perspective that we can learn about creativity by studying unambiguous cases, in particular eminent individuals. This approach makes a number of assumptions, including the assumption about generalizing from one or few cases to other persons, but it is a commonly used approach (see also Davis et al. 2003, Gruber 1988, Rothenberg 1990, Runco 1998a, Wallace 1991). Diamond et al. examined the brain of Albert Einstein. They reported that, in area 39 of the left hemisphere, there was a significantly smaller mean ratio of neuron to glial cells than in control scientists. No differences were found in three other areas of the brain or in the right hemisphere. Diamond et al. felt this implied that Einstein’s cortex may have had an unusual “metabolic need,” and they discussed the role of the cortex in associative thinking and “conceptual power.” Mednick (1962) and many others (e.g., Mendelsohn 1976) have described how associative processes can contribute to creative thinking and problem solving.

Before leaving the biological and neuropsychological research, it is worth noting that more and more theorists are calling for investigations of the prefrontal lobes and their role in creativity. Arieti (1976) mentioned the prefrontal lobes in his theory of creativity; he was one of the first researchers to argue that a “magic synthesis” occurs when the entire brain (rather than one hemisphere) is involved. Elliott (1986) also pointed to the prefrontal lobes, as did Norlander (2000). The latter cited evidence from cerebral regional blood flow, but studies of the hypofrontality of schizophrenic patients show them to lack the integrations necessary for meaningful thinking. Perhaps hypotheses about prefrontal lobes will soon be accurately tested with newer methodologies. Already inferences about creativity and the brain may be drawn from magnetic imaging of musicians (Albert et al. 1995). These methodologies will allow us to move beyond the research that relied on weaker inferences, such as those resulting from studies of head trauma.

Clinical Research

In the introduction to this chapter, I suggested that creativity studies have changed since Barron & Harrington (1981) reviewed the field in an earlier *Annual Review of Psychology* chapter. I suggested that less attention is being given to the relationships between creativity and intelligence and personality than in 1981. On the other hand, several issues were included in that 1981 review that are receiving more attention than ever before. Some of these are clinical issues, including what was once called “the mad genius controversy” (Becker 1978).

Most of the research on this topic involves the affective disorders, and in particular the bipolar disorders (Andreasen 1997, Hershman & Lieb 1998, Jamison 1997, Richards 1990). Yet a number of investigations have recently looked specifically at schizophrenia and creativity (Sass & Schuldberg 2001), and Eysenck (1999) suggested that creativity was related to psychosis. This relationship was, however, apparent only in the components of the creative process, and not in the creative person. In other words, creative people were not necessarily psychotic, but they have the same cognitive tendency as psychotic persons. Eysenck felt this cognitive tendency involved overinclusive thinking.

Other disorders with ties to creativity include alcoholism (Noble et al. 1993, Rothenberg 1990, Runco et al. 1990b), suicide (Lester 1999, Mraz & Runco 1994), and stress (Carson & Runco 1999, Mraz & Runco 1994). Rothenberg (1990), for example, interviewed Nobel prize-winning author John Cheever, a self-reported alcoholic.

Looking in the direction of health (rather than disorder), creativity has been associated with self-actualization (Maslow 1971, Rogers 1970, Runco et al. 1990a), and longevity (Kaun 1991; Lindauer 1992, 1993; Runco & Charles 1997). Aging and creativity are discussed below (in the Developmental Research section); for now, only the domain differences in longevity are noted. Writing and poetry, for example, seem to be the domains in which creative persons have the shortest life expectancy.

One clear strength of research in this general area is the emphasis on the difference between objective and subjective experience. Recall here that in some areas of research objective experience is taken to apply uniformly to everyone; interpretations are ignored. The same mistake was made in the early research on stress (Holmes & Rahe 1967), when stressors were identified and stress was tied to objective experiences and assessed with event scales. Stress is now viewed as a matter of interpretation, and assessments now focus on perceived stress rather than entirely on objective events. Indeed, a general premise of the clinical research is to acknowledge the discrepancy between the objective world and subjective experience (see Smith 1999, Smith et al. 1989). This potential discrepancy is important for all of psychology, but especially important for research on creativity, for it can often be understood only by taking into account subjective processes.

Cognitive Research

The cognitive research on creativity is quite diverse. Basic cognitive processes that have been studied include memory (Pollert et al. 1969), attention (Martindale & Greenough 1973), and knowledge (Mumford et al. 1991, Rubenson & Runco 1995). Cognitive research has also focused on tactics, strategies, metacognition (Adams 1980, Root-Bernstein 1988, Runco 1999c), and intellectual skills (e.g., divergent thinking). The former tend to be nomothetic studies and the latter idiographic.

Attention Deployment

Attention deployment seems to be particularly important for creative thinking. Wallach (1970), for example, suggested that wide attention deployment facilitates the discovery of remote and original ideas. He felt that someone who is capable of broad attention deployment will have “a broader range of stimulus information . . . a broader range of memory traces . . . a greater sensitivity to the utilizing of incidental cues,” with “more diffuse or extensive deployment of attention in the reception of information, in its retrieval, or both” (pp. 1248–1249). Along similar lines, Martindale & Greenough (1973) looked to defocused attention, which they felt occurred during periods of low cortical arousal and led to a large number of associations.

Very different evidence is also available wherein attention is focused and creative insights suffer. Smith et al. (1990), for example, suggested that evaluation and pressure often lead directly to anxiety and divided attention, and that this undermines creative thinking because attention is directed to a stressor rather than to the task or problem at hand. Smith et al. acknowledged that there is probably a threshold, below which creative thinking is unaltered (see also Toplyn & McGuire 1990).

Knowledge plays a role in creative cognition—two roles, in fact. Declarative and factual knowledge may supply the individual with options when he or she is solving problems, but at the same time can inhibit creative thinking if the individual

looks only to established knowledge. Indeed, experts are often inflexible, and thus overlook original options, precisely because they rely so heavily on established knowledge (Hayes 1978, Simon & Chase 1973). The second role of knowledge involves tactics, for these rely on procedural knowledge. Without a doubt, tactics are often used to solve important problems (Root-Bernstein 1988, Runco 1999a). Tactics are among the most teachable aspects of creative thinking.

The flexibility mentioned above is often studied via divergent thinking tests. These are open-ended assessments (unlike traditional tests, which have one correct or conventional answer) and are scored for fluency (the number of ideas or solutions given), originality (the unusualness or uniqueness of the ideas given), and flexibility (the variety or diversity of the ideas). These tests were widely criticized, but they do seem to have psychometric qualities that parallel IQ tests and other accepted measures and are often used. They should be viewed as providing an estimate of the potential for creative thinking, however, for they are only predictors.

Torrance (1974) suggested that an elaboration score be used, at least with certain divergent thinking tests, and several new scoring techniques have been proposed since the original *Annual Review of Psychology* chapter on creativity was published in 1981. Runco & Charles (1993), for instance, suggested that the appropriateness of ideas could be taken into account. This is important because creativity is usually defined as a combination of originality and appropriateness (or fit). Runco & Mraz (1992) suggested that more accurate scores could be calculated from ideational pools. The idea here is that a set, or pool, of ideas provides more information than does an examination of single ideas. Qualitative scores have been used by Khandwalla (1994) and Dudek & Verreault (1989).

Other key cognitive aspects of creativity have been reviewed, including conceptualization (Mumford et al. 1989), imagination (Singer 1999), incubation (Smith & Dodds 1999), insight (Sternberg & Davidson 1999), intuition (Policastro 1999), Janusian processes (i.e., the ability to consider two very different perspectives simultaneously) (Rothenberg 1999), logic (Johnson-Laird 1999), metaphors (Gibbs 1999), mindfulness (Moldoveanu & Langer 1999), misjudgment (Runco 1999d), perceptgenesis (i.e., the role of perception in cognition) (Smith 1999), perspective (Runco 1999e), and synaesthesia (Domino 1989). Quantum theory, chaos theory, and nonlinear dynamics have also recently been used to explain creative thinking (Goswami 1999, Richards 1990, Zausner 1998).

Developmental Research

Various developmental stages have been identified in the empirical research. These never apply universally, but some do seem to apply to large numbers of children and adolescents. Torrance (1968), for example, found a fourth-grade slump in creative thinking, and Raina (1997) found evidence of the same outside of the United States. This slump is widely cited, but importantly, seems to describe approximately 50% of the population—by no means is it universal. Smith (1990) suggested that another slump occurs somewhat later, in preadolescence. Harrington et al.

(1987), Johnson (1985), and Jaquish & Ripple (1981) also investigated creativity during adolescence. A great deal of attention has been devoted to creativity during adulthood (Gott 1992, 1993; Helson 1990; Hogg 1993; Jaquish & Ripple 1981, 1984–85; Kaun 1991; Lindauer 1992, 1993; McCrae et al. 1987; Mumford et al. 1989; Simonton 1984). This probably reflects the more general trend in all of the social and behavioral sciences and the demographic trend (i.e., the “greying of America”). A number of early studies on creativity during adulthood are still important (e.g., Lehman 1962, 1966).

Research suggests that creative potential may be tied to family background. Birth order, family size and number of siblings, age gap, and family tendencies and values may each play some role (Albert & Runco 1989, Gaynor & Runco 1992, Sulloway 1996). Perhaps most impressive in predictive power are the findings of birth order, and of the frequency with which middle-born children develop into adults who maintain the potential for rebelliousness and nonconformity (Sulloway 1996). Apparently, the dynamics of growing up with an older sibling, especially one of the same sex, drives the middle-born child to find his or her own niche, and this is often in some unconventional direction. Rebellion and nonconformity do not guarantee creative work, but many creative individuals have rebelled and resisted convention.

Sex differences can be explained in terms of family background (and the transmission of social roles), though biology is a strong influence as well. Sex differences are not always found in assessments of creativity, though historical analyses do uncover differences that may reflect bias and favoritism. There does seem to be a benefit in being raised in a psychologically androgynous fashion (Harrington et al. 1983) rather than as a stereotypical male or female. The androgynous individual may have more options available when solving problems, rather than just options that are stereotypically masculine or feminine, and he or she may be more flexible than the stereotyped male or female.

Early family experiences may help explain differences between boys and girls (Baer 2003, Tegano & Moran 1989), but it is also now clear that sex differences also reflect life span discrepancies between men and women (Helson 1990, Reis 1999, Walberg & Stariha 1992). Reis described how the developmental and career paths of women are more diverse than those of men. She also concluded that relationships play a larger role in women’s creative efforts than in men’s creative efforts. In her view, women face unique barriers and need to make more of a conscious effort to devote themselves to creativity than do men. Helson’s (1990) findings complement this view, and her data are the result of a well-designed longitudinal study of women from Mills College.

Economic Factors and Theories

The economic basis of creativity has been investigated. Dudek et al. (1993), for example, felt that socioeconomic status (SES) contributed to creative thinking during an individual’s developmental years, with higher SES being beneficial to

creativity. Though “necessity is the mother of invention,” the alternative—that some necessities are common in lower SES levels and stimulate creative thinking—has not been supported empirically, at least not directly. Indirect support comes from findings of high divergent thinking in families with a large number of children (Runco & Bahleda 1987), given that family size and SES are inversely related.

Most of the economic work on creativity does not look to SES but instead draws on economic theory. Walberg & Stariha (1992), for example, argued that creativity, learning, and achievements are forms of human capital. Rubenson & Runco (1992) developed the “psychoeconomic theory” that led to descriptions of optimal groups for creative work and descriptions of the costs (psychic and objective) of creative efforts. The value and limitations of this model were described in the articles following the 1992 paper and in several articles in the 1991 *Creativity Research Journal* (Rubenson 1991; Runco 1991b,c; Sternberg & Lubart 1991). Most of the economic predictions have yet to be tested empirically.

Educational Research

This may be one of the most important areas for research because there are serious concerns about the impact of education on creativity. It is possible, for example, that the expectations placed on young children to conform in the classroom (sitting quietly in rows of desks, thinking about topics chosen by the teacher) lead to the fourth-grade slump (Runco 1999a, Torrance 1968). Biological changes may explain this, given that children’s nervous systems seem to become sensitive to conventions (Gardner 1982), but some of that drop in originality may also reflect the pressures to conform that characterize many educational settings. Clearly, most tests given in the schools require primarily convergent thinking (there is only one correct or conventional answer) and relegate divergent thinking (where an individual can think about original options).

One problem is that individuals and organizations are more likely to invest in traditional educational skills (e.g., literacy) than in creative skills. Rubenson & Runco (1992) outlined the reasons for this; the basic idea is that creativity is a riskier investment, with less-certain payoffs, than literacy and other skills tied to traditional education. This same idea might apply to organization decisions as well: An employer may be more likely to hire an applicant who has a degree from an accredited educational institution than an applicant who has invested as much time in a creativity enhancement program. One reason for this is that the former has clearer benefits to offer the organization. The ideal arrangement would be for the educational system to integrate creative skills into the curriculum. Headway is being made in this regard (Runco 1992).

Quite a bit of research is relevant to education and creativity, even if it was not conducted in a classroom. For example, researchers have examined the impact of test directions (and instructions) on divergent thinking and creative problem solving (Harrington 1975, Reiter-Palmon et al. 1997, Runco 1986, Chand & Runco 1992), and frequently these instructions could easily be adapted to the educational setting.

Dudek et al. examined the divergent thinking of 1445 elementary school students. They reported significant differences among schools and suggested that

these were tied to differences in SES. This is consistent with other investigations of SES (Dhillon & Mehra 1987, Lichtenwalner & Maxwell 1969, Srivastava 1982). Dudek et al. also found significant differences between classrooms within schools and suggested that the immediate classroom environment has an impact on divergent thinking. The finding replicates what Wallach & Kogan (1965) reported in their classic study of creative thinking. They too emphasized the immediate classroom environment and felt that creativity is inhibited by several common classroom conditions and instructions (e.g., testlike activities) and released when activities are presented in permissive and gamelike fashion. The teachers themselves are potential models for children (Graham et al. 1989, Runco 1992) and their expectations may be very influential (Runco 1984, 1989). Interestingly, creativity may contribute to the effectiveness of a teacher. In this case, it is not teachers as influence but creativity as influence on teaching.

Historical and Historiometric Research

Creativity has been defined in various ways throughout history (Boorstin 1992, Dudek 2003). This is readily apparent in the biographical analyses cited throughout this chapter (see also Davis et al. 2003). Albert & Runco (1999) presented a history of creativity research. Boorstin (1992) took a wider view, and a more traditionally historical perspective, in his lengthy volume on “the creators.” He was more interested in creative persons than creativity, and thus did not deal in depth with historical changes in the concept of creativity. Dudek (2003) examined conceptual changes in depth, but she looked mostly to art.

Historiometric research is very relevant to the present psychological perspective of creativity. Simonton (1984) defined the historiometry as “a scientific discipline in which nomothetic hypotheses about human behavior are tested by applying quantitative analyses to data concerning historical individuals.” Although the data are archival and nonexperimental, the analytic methods are extremely powerful and often able to control or test the influence of the most likely biases in this kind of data. Simonton’s (1984, 1988) methods are innovative and powerful, and have generated a large number of convincing findings. Simonton has, for example, presented data on the impact of zeitgeist, war, and role models (also see Simonton 2003).

Organizational Perspectives

Earlier in this chapter, I reviewed the *Creative Work Environment Inventory* and the research of Amabile (2003) and Witt & Beorkrem (1989). I used these works as an example of research on the creative press, but that research was specifically intended to forward knowledge about creativity in organizations. In that sense, it fits into the present section of this chapter as well. Recall here that resources and autonomy seem to be relevant to organizational creativity. Note also the parallel with educational and even home settings. Those same factors are relevant to any social context, at least if creativity is a concern (see Albert & Runco 1989, Houtz 2003).

Runco (1995) examined an organization that was itself designed to produce creativity. The employees—and participants in his research—were artists. He

administered the adjective check list (ACL; Gough & Heilbrun 1980) and found large discrepancies between the self-descriptions of the artists and their descriptions of an “ideal artist.” Even more telling was the correlation between job satisfaction and creativity scores from the ACL: The most creative artists were the least satisfied by their jobs. It appeared that “time and resources” (one scale from the measure of organizational climate) were the biggest concern of the artists.

Extensive reviews of the literature on organizational innovativeness have been prepared by Service (2003) and Rickards & deCock (2003).

Psychometric Research

The psychometric approach assumes that creative potential can be captured in paper-and-pencil tests. It further assumes that creative potential is widely distributed. This follows from the fact that students and other noneminent persons typically participate in psychometric studies. No psychometric investigations were found with eminent participants taking the tests. The focus of psychometric studies is validation and the establishment of reliability. Validation takes many forms, including discriminant validation (e.g., the empirical separation of creativity from IQ and traditional expressions of intelligence) and predictive validation (e.g., finding how strongly the creativity test is associated with some measure of real-world performance). Reliability often involves comparisons of judges' ratings (Runco 1989) but sometimes is based on the internal consistency of the items within the test (Nunnally 1978).

The revised semantic scale (O'Quin & Bessemer 1989) and the work environment inventory (Witt & Beorkrem 1989) demonstrate psychometric research in this area. Much more commonly used are the divergent thinking tests (Guilford 1968, Torrance 1974). A number of new scoring techniques and divergent thinking tasks have been developed in the past 20 years (Runco 1999a). These too are the subjects of numerous psychometric investigations. Attitude measures (Basadur, 1994), consensual assessment (Amabile 2003), and socially valid measures (Sing 2003) are also receiving increased amounts of attention. One claim is that attitudes are the most sensitive to enhancement of all aspects of the creativity complex. Lifetime achievement can now be assessed (Richards et al. 1988) as well. The creative personality scale (CPS; Gough & Heilbrun 1980) has been available for more than 20 years, but new scales from the ACL have been developed fairly recently (Domino 2003).

Social Research

A number of works have explicitly tied social processes to creativity (Albert 1983, Amabile 2003, Paulus & Nijstad 2003, Simonton 2003, Montuori & Purser 1999). The typical rationale is that too much attention was given to individual characteristics (e.g., personality, ability) in the early research on creativity, and that social processes are very influential. These may occur within the family (Albert 1980, Albert & Runco 1989), the educational setting (Dudek et al. 1994), or the

organizational setting (Basadur 1994, Rickards & deCock 2003, Runco 1995, Runco & Basadur 1993).

Brainstorming research exemplifies the social research on creativity. This is a group technique for solving problems (Parnes & Meadow 1959, Osborn 1953), the key features of which are to (a) postpone judgment; (b) focus on quantity, not quality (i.e., the number of ideas, not the probability of their success); and (c) hitchhike or piggyback (extend the line of thought suggested by someone else in the group). Rickards & deCock (2003) reviewed the extensive research on brainstorming and concluded that it is somewhat ineffective, at least in terms of creative problem solving. Often, individuals who work alone generate more and better ideas than groups. This is often explained in terms of social loafing. Granted, there may be benefits to brainstorming (e.g., team building) that justify its use, even if it is not the best way to find high-quality solutions to problems.

Other examples of social research on creativity are given in the discussions of culture, organization, and research on families. The organizational research reviewed above suggests that certain kinds of evaluations (e.g., criticism from a supervisor) can inhibit creative thinking, and that resources (including other people) are often necessary for creative work.

CURRENT TRENDS IN THE FIELD

The categories of research (i.e., person, product, process, and press, and the disciplinary categories) reviewed above suggest that in many ways creativity research has broadened its scope in the past 20 years. It is now more of an interdisciplinary effort than ever before, and new techniques, topics, and applications are apparent in the research. The journals mentioned by Barron & Harrington in their 1981 *Annual Review of Psychology* article included *Intelligence*, the *Journal of Creative Behavior*, and the *Gifted Child Quarterly*; at the time this chapter was written, the *Creativity Research Journal* was 15 years old. In 1999 the *Encyclopedia of Creativity* was published, and Sternberg (1999) and Runco (1998b, 2003a, 2003b) later published handbooks on creativity. The field is also more focused, and more selective. It is not easy to pinpoint exactly how it is selective, however. It is not, for example, simply more rigorous and scientific. If that were the case, there would be fewer qualitative, nonexperimental, and quasi-experimental efforts; instead, there are more (Dudek & Verreault 1989, Khandwalla 1994, Murdock & Moore 2003). The selection that has occurred within the field may be best viewed as topical, and perhaps due to the current zeitgeist. Certain topics clearly are not receiving the attention they did 20 years ago. Several empirical efforts have identified the topics that are receiving attention in the current creativity research. One such empirical effort involves implicit and explicit theories.

Implicit and Explicit Theories of Creativity

Runco et al. (1997) surveyed 143 individuals who were actively involved in the field of creative studies (e.g., doing research). They were given a survey that asked

them to judge and rank the importance of various topics and issues for future research. They were also asked to judge the importance of various developmental influences and traits for creative achievement. Results indicated that the topics rated as most important for future research were “actual creative behaviors,” motivation and drive, imagery, imagination, and creative products. Some generality of these findings is suggested by the lack of group differences: Respondents who had taught creativity courses did not differ from those who had not, nor did individuals who had published a book or article differ significant from those who had not published. (Most respondents had in fact published something on creativity, but some had merely submitted work or inquired about submitting a manuscript. This latitude insured that the sample was moderately heterogeneous.) Also notable was that “behaviors reflecting motivation” were viewed as the most critical for creative achievement. This was followed in the ratings by problem finding (skill) and behaviors reflecting “adaptive cognition” (p. 43). The last of these reflects the kind of creativity mentioned in the introduction to this chapter; it includes flexibility and is creativity of the reactive problem-solving sort.

Here is the entire list of topics included in the survey, presented with the highly rated (and thus viewed as important for future research) topics listed first, and the topics viewed as unimportant listed at the end: Creative Behavior, Motivation or Drive, Imagery, Imagination, Creative Products, Metacognitive Processes, Divergent Thinking, Social Influences, Problem Solving, Cognitive Processes, Intuition, Developmental Processes, Emotion and Affect, Education, Incubation, Mental Health, Personality, Environmental Influences, Giftedness, Potential, Art/Artists, Cross-Cultural Differences, Humor, Science, Enhancement, Leadership, Intelligence, Free Will, Testing and Measurement, Brainstorming, Gender Differences, Neurobiology, Business/Management, Mental Illness, Therapy, and Psychic or Futuristic Phenomena.

Runco & Bahleda (1987) used a similar methodology to study artists’ implicit theories of creativity. They found significant differences between judgments of artistic and scientific creativity. Artists said they felt that scientific creativity was “thorough” and “patient,” and that artistic creativity involved emotions, imagination, and expressiveness. Artists’ views are very interesting, but it is important to recognize that generalizability is low. Different groups seem to have quite different implicit theories of creativity. Teachers (Runco 1984, Runco et al. 1992), parents (Johnson et al. 2003, Runco 1989), children (Miller & Sawyers 1989), and the general population (Sternberg 1981) have each been investigated. Differences include parents’ emphasis on motivational and intellectual characteristics, and teachers’ emphasis on interpersonal behaviors.

Trend Analyses

Another useful approach for identifying trends in the field involves analysis of the published literature. Feist & Runco (1993), for instance, examined research published in the *Journal of Creative Behavior* between 1969 and 1989. They found a decrease in the attention being given to personality, and an increase in social

research and educational studies of creativity. They also examined *Psychological Abstracts* for the 1980s and discovered that approximately 0.01% of the abstracts involved creativity. This reflected a substantial increase, for Guilford (1950) reported that only 0.002% of the publications from 1920 to 1950 were devoted to creativity. According to Feist & Runco (1993), approximately 9000 works on creativity were published between 1960 and 1991. Feist & Runco reported indications of an increase in educational and social research. They also found indications of a decrease in research on the creative personality. These observations are based on one outlet (i.e., the *Journal of Creative Behavior*), and on publications between 1969 and 1989. As the reviews of social, educational, and personality research reviewed earlier in this chapter show, exceptions to the reported increases and decreases are easy to find.

TOPICS OF CONTINUED OR DISCONTINUED INTEREST

Problem Finding

A more casual observation (not based on data of any sort) suggests that a few topics that were being studied 20 years ago (and more) have recently received an increased amount of attention. Barron & Harrington (1981), for instance, reviewed the research on problem finding, which was at that point in early stages. Csikszentmihalyi & Getzels (1971) published their classic study on the problem finding of artists before that 1981 review, but a great deal of research has been devoted to problem finding since then. Csikszentmihalyi (2003), for example, reported an 18-year follow-up of that first 1976 study. This follow-up demonstrated that the problem-finding skills of artists were effective in predicting the quality of their work, even 18 years later. The problem finding of children has been investigated (Okuda et al. 1991, Wakefield 1985), as has the problem finding of college students (Chand & Runco 1992) and artists (Kay 1991). Jay & Perkins (1997) reviewed the research to that point, and Runco (1994) edited *Problem Finding, Problem Solving, and Creativity*, which contains contributions from a number of investigators and gives a good overview of the progress in this area. Very importantly, it appears that we can and should distinguish between problem identification (just noticing that there is a problem at hand) and problem definition and redefinition (making a problem operational and workable). It may no longer be sufficient to refer to “problem finding” in a general sense.

Evolutionary Theories of Creativity

Evolutionary theories of creativity are much more common today than 20 years ago. These use evolutionary principles to describe the creative process, and sometimes describe the role of creativity in evolution. Campbell's (1960) paper is the seminal work in the former, but in the past 20 years Albert (2003), Lumsden & Findlay (1988), and Simonton (1998) have extended it. Here creativity may contribute

to the variation that is one of two critical aspects of evolution (at least in the Darwinian sense, with selection being the other critical aspect). Creative ideas are often deviant and new, and as such broaden the range of options and the variation.

The variations supplied by creative efforts do not always benefit fitness and adaptiveness. Indeed, the “dark side of creativity” has given us weapons of mass destruction and other evil inventions and techniques (McLaren 1993). Admittedly, some of these unfortunate inventions and techniques are unplanned and the result of other, possibly beneficial, innovations. All too often, an advance is offered, but some of the implications are detrimental (McLaren 1993).

Creativity in the Moral Domain

The antithesis of the dark side, creative morality, is receiving even more attention (Gruber 1993). This area may have been overlooked previously because of the potential oxymoron: Morality often implies agreement among persons or groups, and even a kind of conformity (to mores, rules, and traditions), while creativity is tied to individualism and originality. Yet, as Gruber pointed out, moral leaders are often highly creative. In addition, creativity in the moral domain is greatly needed: Many problems (e.g., energy, ecology, and equality) are serious and need to be approached from a creative perspective (Stein 1993). Some of the best work on creativity in the moral domain has involved case study research. I turn now to that approach to creative studies.

Case Studies

A large number of case studies have been reported in the past 20 years. These often utilize new methodologies (see Davis et al. 2003). The following have been examined in the creativity literature: Piaget (Gruber 1999); John Cheever (Rothenberg 1990), Paul Klee, Pablo Picasso, and Lautrec (Pariser 1991); Dorothy Richardson (Wallace 1991); Rabindranath Tagore (Raina 1997); Shakespeare (Simonton 1999); Anne Sexton (Sanguinetti & Kavalier-Adler 1999); George Bernard Shaw (Tahir 1999); Beethoven (Hershman & Lieb 1998); William James (Osowski 1989); Einstein (Miller & Sawyers 1989); Piaget (Gruber 1999); Sylvia Plath (Lester 1999, Runco 1998b); the Wright brothers (Jakab 1999); the Brontë sisters (VanTassel-Baska 1999); Lewis Carroll (Morrison 1999); Paul Cezanne (Machotka 1999); Charles Darwin (Gruber 1981b, Keegan 1999); Georgia O’Keefe (Zausner 1999); Virginia Woolf (Ippolito 1999); and William Wordsworth (Jeffrey 1999). Gardner (1993) threw a wider net and in one volume explored the lives of Freud, Einstein, Picasso, Stravinsky, T.S. Eliot, Martha Graham, and Gandhi. Davis et al. (2003) provided an overview of many other case studies and discussed the pros and cons of the relevant methodologies.

Sometimes investigations focus on unambiguously creative persons but look to large samples (rather than single cases). Ludwig (1995), for example, published a careful and detailed analysis of more than 1100 eminent persons, and Sulloway

(1996) similarly investigated nearly the same number of creative revolutionaries. Their book titles are both quite apt: Ludwig gave a number of examples of *The Price of Greatness*, and Sulloway found that middle-born children often develop into nonconformists and as such are *Born to Rebel*. This work is fascinating but is archival and therefore has the limitations of nonexperimental ex post facto research.

CONCLUSIONS

Most of the research reviewed above implies that creativity is beneficial. Creativity facilitates and enhances problem solving, adaptability, self-expression, and health. The potential costs for creativity should also be acknowledged. Its association with the various disorders implies this (Eysenck 1999, Richards 1990, Schuldberg 1997), by the profile of “ideal students,” which emphasizes conventional rather than creative behavior (Torrance 1968), and by the madness and eccentricity that have long been attributed to creative geniuses (Becker 1978, Ludwig 1995). In fact, because it is so strongly tied to originality, and original behavior is always contrary to norms, all creativity is a kind of deviance. No wonder there is frequent stigma attached to creativity (Eisenman 1991, Plucker & Runco 1999, Rubenson & Runco 1992, Runco 1999d).

The creativity research is best understood by considering various perspectives (e.g., person, process, product, or press). The research on creativity is itself helpful in this regard, for it demonstrates that insights are often inhibited by “functional fixity” or “fixedness” (Ward & Smith 2003), and this kind of fixity can be avoided through flexibility (Adams 1980, Wicker 1985). Individuals who study and apply creativity should maintain a flexible approach and avoid relying too heavily on one perspective. Consider how misleading it would be to rely on the press perspective of creativity. This perspective might help with the objective and contextual factors involved in some settings, but if personality or process work is ignored because it belongs in another theoretical category (i.e., the person or process categories), a realistic view will never be achieved. To be realistic, both press and person factors need to be recognized. To be realistic, the situation must be studied, as well as the individual and his or her interpretation of that context. An interdisciplinary perspective on creativity should keep investigators out of theoretical ruts (Isaksen et al. 1994). This chapter suggests that this kind of interdisciplinarity might draw from a very wide range of perspectives, including the biological, cognitive, developmental, and the others summarized above.

Another important example of interplay between approaches involves the clinical and cognitive perspectives. Recall here that creativity is often associated with mood disorders (Richards 1990) and psychosis (Eysenck 1999). These mood disorders may be associated with creativity because of mood per se, or indirectly, via cognitive tendencies that result from particular moods or mood swings. Eysenck (1999), for example, suggested that psychotic individuals have a tendency to rely

on overinclusive thinking. They do not use the conventional conceptual boundaries. This leads them to ideas that are not at all realistic, which in turn leads to psychotic behavior (and behavior that implies they are out of touch with reality). Yet according to Eysenck, overinclusive thought also allows creative persons to find original insights. Schuldberg (1997) similarly described cognitive tendencies that characterize clinical populations but are associated with creative insights.

Creativity is expressed in different ways in different domains. Evidence for domain differences in the creative personality, the creative product, the creative process, and the creative press is available (Solomon et al. 1999, Milgram & Milgram 1976, Plucker 2000, Runco 1986). Mathematical creativity differs from artistic creativity, then, and each of these differs from the creativity that characterizes interpersonal, organizational, athletic, or political creativity. Many different domains have been proposed and explored (Plucker 2000, Runco & Pritzker 1999), but the concept of domains must be acknowledged because most of what has been uncovered about creativity is domain specific. Clarifying these differences is one of the most important impetuses in the literature.

Early research on creativity examined artists (e.g., Patrick 1935, 1937) and architects (Barron 1972), but at this point the concept of domains was implicit: Those studying creativity focused on particular domains, but not much was said about the number and significance of domain differences. Gardner (1983) was explicit about the need to recognize domains and itemized seven of them: musical, mathematical, verbal-symbolic, bodily kinesthetic, spatial, interpersonal, and intrapersonal. He later added "the naturalist" (see Solomon et al. 1999). In very brief terms, the naturalist is sensitive to flora and fauna. Recall here that moral creativity has received recent attention (Gruber 1993). Recall also that creativity is now viewed as something that can be found and used in an "everyday" domain (Runco & Richards 1997). This has become a popular domain for research, in part because it acknowledges the creativity that is an aspect of coping and day-to-day problem solving, and because it allows us to consider the potentials of children. Everyday creativity does not require high-level achievement or expertise, so children can (and do) demonstrate it. Everyday creativity may also be a part of mundane problem solving (Cohen & Ambrose 1999). The more recent research has also explored what might be called subdomains. Poets seem to differ from novelists, for example, and both may differ from playwrights and writers of situation comedies (Pritzker 1999). Designers (Sawyers & Canestaro 1989), performing artists (Nemiro 1997), and fine artists seem to differ in their thought patterns and cognitive styles (Domino 1989).

The recognition of different domains, such as the naturalist, makes it relatively easy to understand culture differences in creativity. In Western culture, many creative achievements (and educational programs) focus on verbal and mathematical domains, but in other cultures, traditions may value the naturalist, or perhaps performances in spatial or other nonverbal domains. Differences apparently reflect the degree of dogma (or latitude) and locus of control within a culture (Aviram & Milgram 1977), as well as attitudes and values (Johnson et al. 2003) and

expectations (Dudek et al. 1993). Cultural similarities have been reported as well. Raina (1984), for example, found that children in India, like their counterparts in the United States, frequently experience a fourth-grade slump in original thinking. This apparently characterizes approximately 45% to 60% of the fourth-grade population of students (Torrance 1968). Importantly, 11% and 38% of the students involved in the original longitudinal study showed improvements during the same period. Not all fourth-grade children slump—far from it—and some actually improve their creative thinking.

The take-home message I promised in the beginning of this chapter concerned the increasingly diverse applications of creativity. At this point, the role of creativity in both basic research and applied research should be apparent, as should the potential role of creativity outside of research—as applied to the natural environment. The various domains listed above confirm that creativity is applied widely, as does the duality of creativity mentioned in the first section of this chapter and exemplified throughout the literature. Creativity drives innovation and evolution, providing original ideas and options, but it is also a reaction to the challenges of life. It sometimes helps when solving problems, but also sometimes allows problems to be avoided. It is both reactive and proactive (Heinzen 1994).

When Barron & Harrington (1981) wrote the previous chapter on this topic for the *Annual Review of Psychology*, many investigators seemed to be unconvinced about the separation of creativity from traditional intelligence. Since that time the separation seems to have been widely accepted. Now the research is mostly directed at the correlates, benefits, and conditions of creativity. The research has become extremely diversified, which is why there are numerous different perspectives and a large number of applications of experimental findings. Sadly, investigations of correlates of creativity do not necessarily take us any closer to understanding the actual mechanisms that underlie creative capacities (Jay & Perkins 1997; Runco 1995, 1996). Another concern is that some experimental findings may apply to a correlate of creativity and not to creativity per se. Recall here that Sperry's (1964) research was on hemispheric specialization, not on creativity; the behavioral research examined novelty and insight, not creativity; the product approach to creativity focuses on productivity, not creativity. It is almost as if we have gone too far. When Barron & Harrington (1981) published the first *Annual Review of Psychology* review of creativity, the primary question was: Is creativity distinct from traditional intelligence? Apparently, the distinctiveness of creativity is rarely questioned. Research is connecting creativity with these other things (productivity, novelty, adaptability, and so on), but perhaps we should again ask about its distinctive nature instead. Granted, to be objective markers of covert processes are necessary, but it is possible that the field has spread the conceptual umbrella too far.

We do know much more about what creativity is and is not. We know, for example, that originality is necessary but not sufficient for creativity, and that creativity is associated with certain forms of psychopathology, but does not guarantee it. Creativity is not a kind of psychopathology! Creative persons are sometimes quite

healthy, physically and mentally (Runco & Richards 1997), and may even be self-actualized. Some clinicians take this to be the epitome of mental health (Maslow 1971, Rogers 1970). Creativity can facilitate problem solving, yet here again there are signs of separation. Not all creativity involves problem solving, and not all problem solving requires creativity. We know much more about creativity than we did in 1981, but this includes the knowledge that plenty of research has yet to be conducted.

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