

R. KEITH SAWYER

the
SCIENCE
of
HUMAN INNOVATION

Explaining Creativity

SECOND EDITION

OXFORD



EXPLAINING CREATIVITY

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*The Science of
Human Innovation*

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R. Keith Sawyer

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PREFACE TO THE SECOND EDITION

A lot has happened since I finished writing the first edition of *Explaining Creativity* in 2003. There's been an explosion of new and exciting research on creativity and innovation—in neuroscience, cognitive science, assessment, education, and group creativity. This second edition has new chapters on all of these topics (seven new chapters in all), and every other chapter has been rewritten to incorporate new scientific studies.

Soon after the first edition was published in January 2006, three other overviews of creativity research were also published: Robert Weisberg's *Creativity* (April 2006), Mark Runco's *Creativity* (2007), and James Kaufman's *Creativity 101* (2009). Each of these books took an *individualist* approach, one that focuses on psychological studies of the creative person; in my first edition, I chose instead to focus on a *sociocultural* approach that emphasized social and cultural contexts (as noted by reviewers: Kaufman, 2007; Simonton, 2007). In addition to these textbooks, there are now four handbooks of creativity (Kaufman & Sternberg, 2006, 2010; Runco, 1997; Sternberg, 1999) and a two-volume encyclopedia (Runco & Pritzker, 1999).

As I studied these recent books, I became convinced that I should have included a more complete treatment of individualist approaches. The keyword for my first edition was *sociocultural*; the keyword for this edition is *interdisciplinary* because I bring together individualist approaches and sociocultural approaches. The new material on individualist approaches is found primarily in Chapters 3, 5, 6, 7, 9, and 10, which are completely new; I'm particularly excited about Chapter 10, where I describe the latest research in cognitive neuroscience—research that takes images of the brain while it's engaged in cognitive tasks related to creativity.

My goal is to present the most comprehensive overview of what scientists have learned about creativity. It's always a challenge to be comprehensive; as the old saying goes, the risk is that you focus on the trees and lose sight of the forest—if you pay too much attention to small details, you no longer see the big picture. Dean Keith Simonton (2007) grouped creativity overviews into two broad categories: those that focus on the “forest” and present a unified narrative approach (he mentions my first edition and Weisberg, 2006) and those that focus on the “trees” and describe every study that's ever been published (he mentions Piirto, 1992, 1998, 2004, and Runco, 2007). This second edition is much more detailed and comprehensive than my first; but still, I retain a narrative thread, and I make sure to bring all the research together to provide the field's consensus as a take-home message.

I've chosen to dedicate more attention to areas where the field has experienced controversy—for example, whether or not creativity is related to mental illness, or to what extent creativity tests are effective, or whether creativity is domain-general or domain-specific (or a bit of both). I've tried to be fair to all positions that have some basis in scientific studies. But at the end of each argument, I tell you what the consensus of the field is. After many years of research into these controversies, we have a pretty good idea of what the reality is.

Another reason I decided to unite individualist and sociocultural approaches in this second edition was my experience writing my 2007 book *Group Genius*. That book had three parts, and in the second part I reviewed research showing how often individual mental processes are influenced by collaborative conversations. Paul Silvia called this book an “integration of the sociocultural approach and the cognitive approach” and suggested that the book “could spark attempts to unify the sociocultural and cognitive traditions” (Silvia, 2007, p. 255). I liked that idea and realized no book had done that yet; here's my attempt.

In my first edition, I provided a broad historical and cultural context for creativity research. For these perspectives I went outside of the field of psychology; you can find excellent book-length treatments by Robert Paul Weiner (*Creativity & Beyond*, 2000) and Rob Pope (*Creativity: Theory, History, Practice*, 2005). In this second edition, I've further elaborated these reflective perspectives in an attempt to capture the collective creation that is “creativity research.” I've combed through historical documents to assemble eight appendices that include key dates, publications, journals, conferences, and scholars that have advanced our understanding of creativity. This material is not gathered together in any other book, and I hope it will serve as a reference for everyone interested in the scientific study of creativity.

My ambition for this second edition is the same as it was for the first edition: to deliver on the ambitious title *Explaining Creativity: The Science of Human Innovation* by presenting everything that scientists have learned about creativity. I hope that this book will serve as a shared reference representing the state of the art and the consensus of the field. *Explaining Creativity* is for everyone who wants to learn what scholars today know about the science of human innovation.

ACKNOWLEDGMENTS

I have been studying and teaching creativity for over 20 years and have published several academic books on the topic. But when you write a book like this one, summarizing an entire field for the interested general reader, it's like learning the material all over again. It's been a wonderful experience! I begin by thanking Mike Csikszentmihalyi for introducing me to the field of creativity research. I thank all of my colleagues who work in the field of creativity research for sharing ideas and research in countless conversations. I owe a debt to my students, who have helped me discover how best to explain creativity. I'd like to thank all of the musicians, actors, and artists whom I've observed and interviewed through the years for sharing with me their perspectives on creativity. I am grateful to Abby Gross and Joanna Ng of Oxford University Press. And I'd like to thank my wife, Barb, who made this book possible.

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P A R T 1

CONCEPTIONS

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INTRODUCTION

Genius. Invention. Talent. And, of course, creativity. These words describe the highest levels of human performance. When we're engaged in the act of being creative, we feel we are performing at the peak of our abilities. Creative works give us insight and enrich our lives.

Creativity is part of what makes us human. Our nearest relatives, chimpanzees and other primates, are often quite intelligent but never reach these high levels of performance. And although advanced "artificially intelligent" computer programs hold the world title in chess, and can crunch through mounds of data and identify patterns invisible to the human eye, they still cannot master everyday creative skills.

Politicians, educators, and business leaders in the United States have realized that creativity and innovation are central to economic success (Business Roundtable, 2005; Council on Competitiveness, 2005; Sawyer, 2006e). Creativity is also needed to solve pressing social problems. The European Union dubbed 2009 "The European Year of Creativity and Innovation," pronouncing in its manifesto that "Europe's future depends on the imagination and creativity of its people" (2009, p. 1). Asian countries such as Singapore and China have announced major initiatives in creativity (Lau, Hui, & Ng, 2004; Singapore Ministry of Education, 2002). All of these countries have transformed from industrial economies to creative knowledge economies, where economic activity is focused on producing ideas rather than producing things.

Creativity will continue to increase in importance, due to several broad societal and economic trends:

1. Increasingly globalized markets result in greater competitiveness, even for industries that historically had been protected from significant challenge.
2. Increasingly sophisticated information and communication technologies result in shorter product development cycles.
3. Jobs that don't require creativity are increasingly being automated, or are moving to extremely low-wage countries.
4. Increasing wealth and leisure time in advanced countries (and beyond) have increased the demand for the products of the creative industries. As of 2007, the creative industries represented over 11% of U.S. GDP (Gantchev, 2007).

Despite its increasing importance, creativity hasn't received much attention from scientists. Until very recently, only a few researchers had studied creativity. Most psychologists instead

study what they believe are more fundamental mental properties—such as memory, logical reasoning, and attention. But in recent years psychologists—along with increasing numbers of sociologists, anthropologists, biologists, and computer scientists—have increasingly turned their attention to creativity. Because creativity isn't a central topic in any of these fields, these scholars work without big research grants, and without a lot of attention from the leaders of their fields. Even so, their research findings have gradually accumulated, and our knowledge about creativity has now attained a critical mass. Perhaps for the first time, we hold in our grasp the potential to explain creativity.

Modern creativity research began in the 1950s and 1960s. This **first wave** of creativity research was focused on studying the *personalities* of exceptional creators (Chapters 3 and 4). In the 1970s and 1980s, researchers shifted their attention to the *cognitive approach*, a **second wave** based in cognitive psychology and focused on the internal mental processes that occur while people are engaged in creative behavior (Chapters 5, 6, and 7). In the 1980s and 1990s, the cognitive approach was complemented by the emergence of a **third wave**, the *sociocultural approach*, an interdisciplinary approach that focused on creative social systems: groups of people in social and cultural contexts (Chapters 11 through 15). This third wave includes research by sociologists, anthropologists, historians, and others.

After decades of research, we're closer than ever to an explanation of creativity. The problem is that each of the three waves has largely proceeded in "parochial isolation," in the words of leading creativity researchers Lucille Wehner, Mihaly Csikszentmihalyi, and István Magyari-Beck (1991, p. 270). Two other famous creativity researchers, Robert Sternberg and Todd Lubart (1999), also claimed that this lack of multidisciplinary had blocked our understanding of creativity (p. 9).

My goal in this book is to address this problem by bringing together the three waves of creativity research—the personality approach, the cognitive approach, and the sociocultural approach—in what I call the *interdisciplinary approach*. In addition to the scientists who study the creative individual—psychologists, neuroscientists, and biologists—I also present research by scientists who study the contexts of creativity: sociologists of science and art, and anthropologists who study art, ritual performance, and verbal creativity in different cultures. For additional perspective, I occasionally draw on the work of scholars who study specific creative domains: musicologists, historians of art, scholars of theatrical performance, philosophers of science, legal scholars who study intellectual property—particularly in Part IV. By combining everything that scientists have learned about how people generate new things, the interdisciplinary approach provides us with a powerful explanation of creativity.

WHY EXPLAIN CREATIVITY?

The scientific study of creativity makes some people nervous. For example, practicing artists may worry, "Isn't the whole project just a mistaken attempt to impose the analytic worldview of science onto the arts? Isn't creativity a mysterious force that will forever resist scientific explanation?" Some artists worry that if they become too analytic, it could interfere with their muse. Other people are skeptical about corporations harnessing individual creativity for greater profit (Osborn, 2003). I believe that these worries are unfounded. Explaining creativity is important for many reasons.

Explaining creativity can help us identify and realize every person's unique creative talents. Without explaining creativity, it's easy to fail to recognize and nurture individuals with important creative abilities. If we hope to solve all of the pressing problems facing our society and our world, we must take advantage of the creative talents of everyone.

Explaining creativity can help our leaders to respond better to the challenges facing modern society. Researchers have discovered that creativity is an essential skill for effective leadership (Bennis & Biederman, 1997; Simonton, 1994). Creative leaders have much more impact because they can motivate their teams more effectively. Creative leaders are especially effective at handling novel challenges that force them to go outside the typical routines. At the beginning of this chapter, I pointed out changes in the modern economy that make creativity more important than ever (also see Florida, 2002). Before the 1980s, creativity was thought to be only occasionally important to a corporation; today, most business leaders believe that creativity is critical to the survival of their organization.

Explaining creativity can help us all to be better problem solvers. We each face problems in our everyday lives that require creative responses. Our society faces challenges like pollution, poverty, and terrorism. Some of these problems can be solved simply by a single individual having a good idea, but most of them will require groups of people working together.

Explaining creativity helps us realize the importance of positive, peak experiences to mental health. During peak experiences known as *flow*, people are at their most creative. Researchers studying *positive psychology* have discovered that flow and creativity contribute to a happy, fulfilling life (Csikszentmihalyi, 1990b). A better explanation of creativity can help people to achieve these positive, healthy experiences.

Explaining creativity can help educators teach more effectively. Educational psychologists are increasingly discovering the role that creativity plays in development and learning (Sawyer et al., 2003). In recent decades, psychologists have identified the step-by-step creative processes that underpin learning (Bransford, Brown, & Cocking, 2000; Sawyer, 2006b). Creativity is important not only to classroom learning but also to the critical informal learning that occurs in the preschool years—how to speak a first language, how to behave at the dinner table, how to make friends and engage in group play (Sawyer, 1997b).

Explaining creativity provides more than intellectual satisfaction; it will lead to a more creative society, and will enhance the creative potential of our families, our workplaces, and our institutions.

BEYOND HIGH ART

Almost all scientific books about creativity have been limited to those expressions of creativity that are highly valued in Western cultures.¹ By limiting their studies to “high” forms—to fine art painting rather than decorative painting, graphic arts, or animation; to basic science rather than

1. We find this bias in many books about creativity. Winner's 1982 book *Invented Worlds: The Psychology of the Arts* focuses on painting, music, and literature, and explicitly excludes what she calls “popular forms of art” such as television, jazz, and comic strips (p. 11). Wilson's 1985 book *The Psychology of the Performing Arts* focuses on “classical drama, music and opera” (p. i). Csikszentmihalyi's 1996 book *Creativity* is based

applied science, engineering, or technology; to symphonic compositions rather than the creativity of the violinist, the ensemble interaction of a chamber quartet, or the improvisation of a jazz group—these researchers have implicitly accepted a set of values that is culturally and historically specific. These biases must be discarded if we want to explain creativity in all societies, in all cultures, and in all historical time periods.

To explain creativity, we have to consider a broad range of creative behaviors, not only the high arts of Western, European cultures. In addition to fine art painting, symphonic performance of the European classical repertoire, and dramatic performance of scripted plays, a complete explanation of creativity must also explain comic strips, animated cartoons, movies, music videos, mathematical theory, experimental laboratory science, the improvised performances of jazz and rock music, and the broad range of performance genres found in the world's cultures. In this book, I examine creativity in non-Western cultures, and the creativity associated with the most influential contemporary developments in media and art—movies, television, computer software, music videos, multimedia, videogames, performance, and installation art.

The bias in creativity research toward the fine arts is a little out of keeping with the times; postwar America has been characterized by its valorization of spontaneity and improvisation, not only in performance but even in writing and painting: Black Mountain and beat poets, bebop musicians, abstract Expressionists, modern dance, and installation art (Belgrad, 1998; Sawyer, 2000). The visual arts have been heavily influenced by the creative potential of performance art, resulting in installation-specific pieces and multimedia works that integrate video images or taped sounds. That's why in Chapter 16, on visual creativity, I discuss not only fine art painting but also movies and installation art. And in Chapter 18, on musical creativity, I examine not only European symphonic composition but also the improvisational performances of jazz and of a broad range of non-Western cultures.

It's strange that psychologists in recent decades have been so focused on the fine arts; after all, within the arts themselves, such categories have increasingly been challenged and broken down since the 1960s (see Fry, 1970). In the 1960s, pop artists like Andy Warhol and Roy Lichtenstein broke the boundaries between high and low art, incorporating elements of advertising graphics and comic strips into their paintings. The Fluxus group began experimenting with performance and installation art, and in the following decades, installation art has become increasingly prominent within the mainstream art world. In the 1960s through the present, American popular music has experienced a flourishing of creativity that some believe is the historical equivalent to prior bursts of creativity in European symphonic music. In the 1970s, the New Hollywood era in film was a major creative break in movie production. In the 1980s, the advent of MTV and its music videos enabled a new burst of creativity among dance choreographers and film artists. And in the early years of this new century, the Internet has enabled participatory creativity; today, anyone can edit and post a video, a story, or a new song and share

on interviews with approximately 100 highly creative individuals; all of these individuals create in areas highly valued in dominant cultural groups in Western, European cultures: the sciences, the fine arts. Mumford (2003), in a review of two massive handbooks that surveyed the field of creativity research (Runco, 1997; Sternberg, 1999a), pointed out that they "talk about artists, scientists, and musicians at length, [but] I could find no mention of engineers, computer programmers, designers, marketing and advertising executives, consultants, or managers . . . there appears to be a tendency in the field toward a platonic, class-stereotypic view of the creative act" (p. 110).

it with the world. Although audiences have been declining for the so-called high arts, the audiences for these new creative forms are huge and continually expanding. Any serious study of creativity in the 21st century must explain the full range of human innovation.

TWO DEFINITIONS OF CREATIVITY

To explain creativity, we first need to agree on what it is, and this turns out to be surprisingly difficult. All of the social sciences face the task of defining concepts that seem everyday and familiar. Psychologists argue over the definitions of intelligence, emotion, and memory; sociologists argue over the definitions of group, social movement, and institution. But defining creativity may be one of the most difficult tasks facing the social sciences.

Creativity researchers can be grouped into two major traditions of research: an individualist approach and a sociocultural approach. Each of them has its own distinctive analytic focus, and each of them defines creativity slightly differently.

INDIVIDUALIST DEFINITION

The individualist approach studies a single person while that person is engaged in creative thought or behavior. This is the approach associated with first-wave personality psychology—which studies the traits of creative people—and second-wave experimental cognitive psychology—the branch of psychology that studies how people think, perceive, learn, and remember. Because individualists focus on single individuals, the individualist definition of creativity refers only to structures and processes that are associated with a single person.

Individualist definition: *Creativity is a new mental combination that is expressed in the world.*

- Creativity is *new*. The most basic requirement of a creative thought or action is that it must be novel or original. Repeating a previously mastered sequence of behaviors isn't creative; repeating a sentence verbatim isn't creative; speaking from memory isn't creative. Our minds spend large parts of every day engaged in non-creative activities—driving or walking the same route to work or school; preparing coffee and breakfast every morning; dialing a phone number; typing at a keyboard. These activities are non-creative because they repeat already mastered behavioral patterns.
- Creativity is a *combination*. All thoughts and concepts are combinations of existing thoughts and concepts. The mind is an immense web of symbolic material; most of it has been previously mastered, and simply recalling from memory isn't creative. Creativity involves a combination of two or more thoughts or concepts that have never been combined before by that individual.
- Creativity is *expressed in the world*. Creativity researchers can't study what they can't see. This is why the scientific definition of creativity has to exclude ideas that stay in a person's head and are never expressed, and ideas that no one else can see or understand. Under this definition, your nightly dreams aren't creative; ideas that you have but never write down or communicate to anyone else aren't creative.

The individualist definition is based on one of the oldest theories in psychology: *associationism*. Well over 100 years ago, psychologist Alexander Bain (1818–1903) first argued that “new combinations grow out of elements already in the possession of the mind” (1855/1977, p. 572). Most of these combinations won’t be completely new to the world, but as long as they’re new in that person’s mind, they satisfy the individualist definition. Creativity researchers refer to this as “little c” creativity. Little c creativity includes activities that people engage in every day: modifying a recipe when you don’t have all of the ingredients called for; avoiding a traffic jam by finding a new way through side streets; figuring out how to apologize to a friend for an unintended insult; a child building a block tower (or even a baby stuffing peas into his nose for the first time). Thousands, or even millions, of people may have already solved those same problems, but as long as it’s your first time, it meets the individualist definition.

How can we know if a combination is new for a particular person? Creativity researchers have developed a wide variety of clever experiments to do exactly this. For example, we can display three abstract geometric shapes and ask people to combine them to make an invention (see Chapter 6); we can present three randomly chosen words and ask people to write a story using them (see Chapter 3); or we can ask children to combine magazine photos to make a collage (see Chapter 3). Many other individualist measures of creativity are described in Chapter 3 on assessment.

SOCIOCULTURAL DEFINITION

The third-wave *sociocultural approach* studies creative people working together in social and cultural systems. Socioculturalists study how groups collectively generate innovation, and the structures and processes of social, cultural, and organizational systems that are creative. A jazz ensemble or a theater group is a fundamentally ensemble art form. A hit videogame or a computer-animated movie typically has 200 different creative people participating in its creation. A scientific paper that reports a new discovery often has 50 or 100 authors.

Even works that are generated mostly in solitude, like paintings, poems, or novels, are difficult to understand without incorporating the sociocultural level of analysis in addition to the individual level. That’s because the only works that survive and that are disseminated to a broad public are those that successfully navigate a complex social and organizational system of gatekeepers, curators, and experts (see Chapter 11 on the sociology of creativity).

Sociocultural definition: *Creativity is the generation of a product that is judged to be novel and also to be appropriate, useful, or valuable by a suitably knowledgeable social group.*

The sociocultural definition of creativity requires that some socially valuable product be generated before the act or the person is called “creative.” Only solutions to extremely difficult problems, or significant works of genius, are recognized as creative. This is sometimes called “big C” Creativity. All creations that satisfy this definition will by default also satisfy the individual or “little c” definition—because any product that is novel to a social group must also be novel to each individual within that social group.

The sociocultural definition is quite similar to definitions of *innovation* in organizations; Amabile (1988) defined innovation as “the successful implementation of creative ideas within an organization” (p. 126). Most business scholars distinguish between “creativity” as the ideas or products generated by individuals, and “innovation” as the successful execution of a new product or service by an entire organization (Sawyer & Bunderson, in press). The study of

organizations is a central element of the sociocultural approach; we'll focus on organizations most directly in Chapter 12 on group creativity and Chapter 13 on organizations.

To satisfy the sociocultural definition, novelty to the creator isn't enough. Creators themselves can't know if their work is truly the first one in the history of the world; the identical creation might already exist, and the creator just doesn't know about it. Sociocultural novelty can be judged only by a social group, who can collectively determine whether an individual creation really is new. In addition, to satisfy the sociocultural definition, novelty isn't sufficient; the creation must also be *appropriate*, recognized as socially valuable in some way to some community. Appropriateness, like novelty, can be judged only by a social group.

The sociocultural definition of creativity has been widely adopted in creativity research—even by personality and cognitive psychologists.² That's because it's extremely difficult to scientifically define what is a “new combination” for an individual, under the individual definition. But there's a problem with including appropriateness as a criterion for creativity: because a work's appropriateness can be defined only by a society at a given historical moment, it becomes hard to distinguish creativity from worldly success and power. The influential creativity researcher Dean Keith Simonton accepted the appropriateness criterion and then argued that only eminent people can be said to be creative (1999b). You might prefer a conception of creativity that allows for unrecognized genius, people who are ahead of their time, or works that are simply so innovative that they are rejected as bizarre by the society, and thus aren't judged to be appropriate.

Although appropriateness may seem incompatible with creativity at first glance, it's not as bad as it may first seem. After all, creativity can't exist, even in principle, without appropriateness. For example, almost all musical compositions use the 12-tone Western scale—the notation system that all musicians learn in training—and are composed for instruments that are widely manufactured, distributed, and taught. Just because a work conforms to these conventions doesn't mean that we would say it's not creative. To be creative, you don't have to compose a work for a 42-tone scale, using instruments that don't exist and that no one knows how to play. If you did that, you'd be rejecting appropriateness but you'd certainly satisfy the “originality” criterion.

Composer Harry Partch (1949) became famous for doing exactly this. He spent his career writing such music, inventing and constructing his own unique instruments to perform his compositions (see Chapter 18). Certainly no one would disagree that his work is novel, nor that his work failed to satisfy criteria of appropriateness. And because it doesn't meet the appropriateness criterion, it's almost impossible to perform; it could be performed only if Partch himself guided a process that typically took about a year. First, Partch had a group of students build his instruments. After several months of construction, they would spend a few months learning Partch's idiosyncratic notation system and learning to play the instruments. After seven or eight months of work, the ensemble was ready to perform a few hours of music. Contrast this lengthy process with the eight hours or less of rehearsal that it takes a trained symphony orchestra to

2. The first wave of personality psychologists also emphasized that true creativity required not only novelty but also appropriateness (MacKinnon, 1962): “Novelty or originality of thought or action, while a necessary aspect of creativity, is not sufficient . . . It must to some extent be adaptive to, or of, reality” (p. 485). Stein (1961/1963, 1967, 1974) emphasized both novelty and usefulness at a point in time. The earliest published use of the little c/Big C terminology that I've found is in Stein (1987).

perform a new composition that follows the usual conventions, and we see the problems that face creators whose work is not appropriate—it's hard to display, disseminate, or perform.

Certain genres of music have an even more closely specified set of constraints; a sonata must have a certain form, or else it can't be categorized as a sonata at all. And just because all sonatas share many characteristics doesn't mean that all of them are the same, or that a new sonata is somehow only a copy of all of the other sonatas. Defining how different a work has to be to be considered a novel work is a complex issue facing critics and experts in many creative domains. For example, folklorists typically expect there to be some variation in the performance of traditional songs like Appalachian mountain tunes or Southern gospel songs, and even with performance variation, most of the audience would consider all of the variations to be instances of the same song, even though they aren't exactly the same.

Individual style provides another set of constraints that don't seem to be antithetical to creativity. Many listeners who aren't connoisseurs in a certain musical genre have had the experience of thinking "it all sounds the same." In recent years, I've heard this said of several rock bands, including the Grateful Dead and R.E.M., of all bluegrass music, and of anything played on the accordion. I'm sure that many people feel the same way about the harpsichord compositions of Bach, bebop jazz, or hip-hop. Just because a painter generates a painting that is recognizably in a certain style or genre doesn't lead us to say that it's "the same" painting as every other one in that style. Many painters' careers are characterized by first discovering a new style and then continuing to explore that style, for years or even decades (see my discussion of Cézanne on pp. 281–283). Many popular bands continue to play in the same familiar style for their entire careers. In both painting and music, one can point to the exceptional rare individual who develops a new style every few years—for example, Picasso and Madonna. These individuals are rare because art markets and galleries pressure artists to continue working in the same recognizable style, so that they'll generate a known product and thus develop a reputation and a market for that work. Record companies are infamous for insisting that popular bands under contract for multiple albums continue to produce albums that sound like their first big hit, because they know that fans become loyal to a band in part because they can count on consistency and reliability in style.

The scientific studies of creativity that I review in this book focus on both individual creativity and sociocultural creativity, both little *c* and big *C* Creativity. These two bodies of research are complementary; understanding the cognitive processes behind a single idea is important to understanding those earth-shattering innovations that change the world. And understanding the social dimensions of creative fields can also help us understand the cognitive processes that result in new ideas.

RELATED DEFINITIONS

The two-level definition of creativity is widely accepted by creativity researchers, with the two levels typically referred to as "Big *C*" and "little *c*" creativity. Some researchers have proposed three or more types of creativity, rather than only two. Taylor (1959) identified five types of creativity:

- *Expressive*: Independent expression, where the quality and originality of the product are not important, such as the drawings of children

- *Productive*: Artistic or scientific products that restrict and control free play and develop techniques for producing finished products
- *Inventive*: Inventors, explorers, discoverers; ingenuity is displayed with materials, methods, and techniques
- *Innovative*: Improvement through modification involving conceptualizing skills
- *Emergentive*: An entirely new principle or assumption around which new schools flourish

Kaufman and Beghetto (2009) argued for two levels of creativity in addition to Big-C and little-c:

- *mini-c*: The creativity inherent in the learning process, when children discover something for the first time
- *Pro-c*: Professional expertise in a creative domain that does not attain the level of transforming the domain

Feldman (2003) proposed a three-part definition, using the metaphor of a piano keyboard. High C is equivalent to Big C creativity; low C is equivalent to little c creativity; and middle C is roughly equivalent to Pro-c as proposed by Kaufman and Beghetto (see Morelock & Feldman, 1999).

This book is organized around two definitions of creativity, because they are widely accepted by scholars in the field and also because they correspond to the two primary levels of analysis that are found in the social world—individuals at a lower level of analysis and social entities at a higher, complex system level of analysis (Sawyer, 2005b). A complete explanation of creativity requires an explanation of both types—combining the sciences of the individual with the sciences of groups.

THE FOUR P FRAMEWORK

Many creativity researchers have been influenced by a four-part division of creativity research proposed by Mel Rhodes back in 1961, the *four P* framework:

- *Product*: Research that focuses on the products judged to be novel and appropriate by the relevant social group. Product creativity is almost always defined and evaluated using a sociocultural definition.
- *Person*: Research that studies the personality traits or personality types associated with creativity. Creative people are those identified with an individualist definition, or they are identified indirectly, as those people who have generated creative products. (See Chapter 3.)
- *Process*: Research that studies the processes involved during creative work or creative thought. (See Chapters 5, 6, and 7.)
- *Press*: Research that focuses on the external forces or “pressures” acting on the creative person or process, such as the social and cultural context. (See Part III.)

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