The Stages of the Creative Process

Over the last century, philosophers have developed two competing theories about the creative process. Idealist theorists argue that once you have the creative idea, your creative process is done. It doesn’t matter whether or not you ever execute your idea, or whether anyone else ever sees it; your creative work is done once your idea is fully formed in your head. This idea is often called the “Croce-Collingwood” theory, after two philosophers who promoted it in the 20th century (see Sawyer, 2000).

Action theorists, in contrast, argue that the execution of the creative work is essential to the creative process. Action theorists point out that in real life, creative ideas often happen while you’re working with your materials. Once you start executing an idea, you often realize that it isn’t working out like you expected, and you have to change what you had in mind. Sometimes the final product that results is nothing like your beginning idea. Perhaps the purest example of action creativity is jazz improvisation. Because it’s improvised, musicians don’t know what they’ll play in advance; the notes emerge in the moment, from the complex give-and-take among the members of the ensemble. In improvisation, performers start playing without knowing what will emerge.

Scientific studies of creativity have shown that the idealist theory is false. Only an action theory can explain creativity. Creativity takes place over time, and most of the creativity occurs while doing the work. The medium of the artwork is an essential part of the creative process, and creators often get ideas while working with their materials.

In chapter 2 we learned that our creativity myths are more like the idealist theory than the action theory. We tend to think that ideas emerge spontaneously, fully formed, from the unconscious mind of the creator. If the idealists were right, it would be almost impossible to study creativity scientifically—because all of the action is in the head, the scientist can’t observe it. We’re lucky that the idealist theory is wrong, because action theories have a big advantage: they allow scientists to observe and explain the creative process.

Psychologists have been studying the creative process for decades. They have several different theories about how it works, but most of them agree that the creative process has four basic stages: preparation, incubation, insight, and verification (see figure 4.1).

- **Preparation** is the initial phase of preliminary work: collecting data and information, searching for related ideas, listening to suggestions.
- **Incubation** is the delay between preparation and the moment of insight; during this time, the prepared material is internally elaborated and organized.
- **Insight** is the subjective experience of having the idea—the “aha” or “eureka” moment.
- **Verification** includes two substages: the evaluation of the worth of the insight, and elaboration into its complete form.

**Stage 1: Preparation**

The holy grail of the first wave of creativity research was a personality test to measure general creativity ability, in the same way that IQ measured general intelligence. A person’s creativity score should tell us his or her creative potential in any field of endeavor, just like an IQ score is not limited to physics, math, or literature. But by the 1970s, psychologists realized there was no such thing as a general “creativity quotient.” Creative people aren’t creative in a general, universal way; they’re creative in a specific sphere of activity, a particular domain (Feldman, 1974, 1980; John-Steiner, 1985; Csikszentmihalyi, 1988b). We don’t expect a creative scientist to also be a gifted painter. A creative violinist may not be a creative conductor, and a creative conductor may not be very good at composing new works. Psychologists now know that creativity is domain specific.

Most domains of creative activity have been around for many lifetimes—the centuries of European fine art painting, or the decades of empirical research in particle physics. Without first learning what’s already been done, a person doesn’t have the raw material to create with. That’s why an important part of the creative process is first becoming very familiar with prior works, and internalizing the symbols and conventions of the domain. Creativity results when the individual somehow combines these existing elements and generates some new combination.

**Figure 4.1.** Stages of creative process (by author).
Some domain knowledge is internalized in a passive and direct way; the student of physics has to learn Maxwell's equations and Einstein's theories exactly. But some domain knowledge is creatively transformed even while it's being learned. When an artist walks through a gallery, she views paintings very selectively, looking for ideas or inspirations that can solve creative problems that she's currently working with. This can lead her to see something in a painting that its creator may not have intended. When a scientist reads a historical work by a long-dead theorist, he reads into the work whatever perspectives or issues he's currently working with.

No one can be creative without first internalizing the domain, and this is why scientists now believe that formal schooling is essential to creativity. After all, the function of schools is to pass on domain knowledge to the next generation. In modern science, for example, you can't even begin to work in a domain without first getting a PhD. However, the role played by schooling in creativity is complex; creativity isn't highly correlated with high grades in school and in college. Even in science, where schooling is perhaps more critical than in art, high grades are not strongly correlated with adult achievement (see Simonton, 1988b, pp. 118-126). And many eminent scientists begin to publish important articles before they receive their doctorate (Roe, 1972).

Some studies have found that creativity is an inverted U function of educational level; after a certain point, additional formal education begins to interfere with creativity. Figure 4.2 presents a curve derived from 192 creators from the Cox (1926) sample. In 1926, the education level corresponding to peak creativity was somewhere between the junior and senior years of college. Of course, these data are from an earlier era, and as the sciences have become progressively more complicated, this peak has shifted to the middle of graduate study (Simonton, 1984, pp. 70-73).

Up to college, formal schooling doesn't interfere with creativity; in fact, just the opposite. To participate successfully in a field, the young individual must internalize the domain. But the inverted-U pattern shows that there's some truth to the idea that schooling can get in the way. After getting just enough education to internalize the domain, further training can oversocialize a person, resulting in a rigid, conventionalized way of thinking.

Stage 2: Incubation

Instead of thoughts of concrete things patiently following one another . . . we have the most abrupt cross-cuts and transitions from one idea to another . . . the most unheard-of combinations of elements, the subtlest associations of analogy;

in a word, we seem suddenly introduced into a seething cauldron of ideas, where everything is fizzling and bobbing about in a state of bewildering activity.

—William James (1880, p. 456)

William James was one of the first famous American psychologists. At a time when almost all important science was being done in Europe, when aspiring American scientists had to learn German and French to gain access to the domain, James was one of the first American psychologists to be widely read in Europe. His writings on religious experience are still widely read today. In this passage, James describes "the highest order of minds," the elevated level of performance that results in true creativity. Like James's "seething cauldron," many creators use cooking metaphors to describe unconscious incubation: they talk about "keeping things on the back burner," or "providing fuel for the fire," and they say that creativity takes time to "stew" or "bubble up." James is describing the incubation stage, when ideas and thoughts combine rapidly in an almost undirected way.

The incubation stage is often below the surface of consciousness. It's the least understood stage in the creative process. In incubation, mental elements com-

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bine, and insight occurs when certain combinations emerge into consciousness. Einstein wrote in a letter to Hadamard that "the psychical entities which seem to serve as elements in thought are certain signs and more or less clear images which can be combined ... This combinatory play seems to be the essential feature in productive thought" (in Hadamard, 1945, p. 142).

Many creative people say they get their best insights during a period of idle time, when they take time off from their hard, focused work to engage in an unrelated activity—gardening, walking—or to work on another problem for a while. Former CEO of Citicorp John Reed, widely acknowledged to be one of the most innovative bankers, reports, "I do my best work when I have some alone time. It often happens when I'm sitting around a hotel room, I'm on a trip and nothing's going on, I sit and think, or I'm sitting on a beach ... and I find myself writing myself notes." Physicist Freeman Dyson said that whenever he feels like he's not getting much done, he must be going through a creative period; his daily insights come while he's shaving or taking a walk. Economist Kenneth Boulding takes a 40-minute bath every morning, and reports that ideas often come to him while taking a bath (all quoted in Csikszentmihalyi & Sawyer, 1995).

In the last chapter, we learned that creative people multitask in networks of enterprise; they make sure that they're working on more than one project at the same time. While they're consciously attending to one project, the others are on the back burners. They know that good ideas require some incubation time, so they schedule their workday to accommodate this process. The unconscious mind seems to be able to incubate on many projects at once "in parallel," unlike the conscious mind, which can only focus on one thing at a time (also see Csikszentmihalyi & Sawyer, 1995).

**Associations**

Incubation can't start until the creative person has prepared by internalizing the products and conventions of the domain. But once the domain is inside the mind, incubation gets to work. During incubation, existing ideas bounce into each other, almost like atoms in a chemical soup. Some of the ideas will fit together into stable mental structures, whereas others won't fit at all. Some of these stable mental structures will somehow be striking enough to be noticed by the conscious mind.

The theory that new ideas are associations between existing ideas is one of the oldest theories in psychology; it's called **associationism**. Well over 100 years ago, psychologist Alexander Bain (1855/1977) first argued that in incubation, "the new combinations grow out of elements already in the possession of the mind" (p. 572). One of the first modern versions of the associationist theory of creativity was developed by psychologist Sarnoff Mednick (1962). Mednick identified several mental variables that contribute to the likelihood of having a novel association:

- the organization of an individual's associative hierarchy, the strength and structure of associations invoked by a given concept;
- the number of associations the individual has to the relevant elements of the problem;
- the individual's cognitive style;
- the ways that individuals select the creative combination.

And of course because the 1960s were the heyday of psychometric testing, Mednick developed a test to measure all of these things, the **Remote Associates Test** of creative potential (Mednick & Mednick, 1967). Mednick's associationist theory proposed that a more creative person has a flat associative hierarchy, allowing her to make large numbers of remote associations between seemingly distinct ideas. In contrast, average people have a steep associative hierarchy; they tend to have fewer overall associations, those associations are stronger, and they're between ideas that are more similar (see figure 4.3). In a flat hierarchy, more ideas are connected and their associations are not as strong; this results in a more interconnected mind that is better at generating groundbreaking inter-disciplinary combinations (see also Simonton, 1999b).

Scientists have developed several different explanations for what happens during incubation. How do elements combine, and which combinations make it into conscious awareness? One hypothesis is that the combinations are random;
the creative person “just happened to be standing where lightning struck” (Campbell, 1960, p. 390). Simonton called these associations “chance permutations” (1988b, pp. 6–8, 1997a). Some researchers have suggested that nothing is going on in the subconscious mind; idle time results in insights because the person switches to a new environment and then has totally different experiences that can spark an insight (Seifert et al., 1995). But most psychologists believe that combinations are guided in some way beneath the surface of consciousness. For example, psychoanalytic theorists argue that the combinations are “active, directed forms of cognition in which the creator intentionally and in distinct ways brings particular types of elements together” (Rothenberg, 1979, p. 11); the elements are “integrated” rather than being “merely added or combined” (p. 12).

Cross-Fertilization

All decisive advances in the history of scientific thought can be described in terms of mental cross-fertilization between different disciplines.

—Arthur Koestler (1964, p. 230)

With their networks of enterprise, creative people work on multiple projects at the same time. While they’re hard at work on one project, the other projects are incubating beneath the surface. In many cases, incubation brings together ideas from more than one project, and an insight results from the combination of two projects that the creator had originally thought were not related.

A lot of important scientific insights happen when scientists switch fields, introducing techniques or modes of thought that are already standard in another domain (Koestler, 1964; Simonton, 1988b, p. 127). Landsteiner’s previous background in chemistry facilitated his isolation of blood groups; Kekulé’s early desire to become an architect may have influenced the way he thought about the structural basis of organic chemistry; and Helmholtz acknowledged that his invention of the ophthalmoscope resulted from his interest in optics that predated his training as a physician.

Some researchers hypothesize that field-switchers have more novel insights because of their marginality. Because they’re at the margins of the discipline, the thinking goes, they’ll be more likely to have innovative ideas because they are less constrained by the domain (Black, 2000). But other studies have found no evidence that marginality contributes to creative output. Other researchers explain these multidisciplinary insights by appeal to analogical thinking, the idea that analogies between distinct domains allow the individual to perceive patterns in a way that would not be apparent to members of only one domain. The best explanation seems to be that if you have multiple projects and multiple domains internalized, you’ll have a larger pool of basic ideas. As a result, your chance of having an interesting new combination during incubation goes up significantly (Simonton, 1988b, p. 128).

Cognitive Structures

Our understanding of creativity cannot be complete without a detailed and rigorous treatment of the cognitive processes from which novel ideas emerge.


Of all of the mental processes studied by cognitive psychologists, the ones thought to be most relevant to creativity are conceptual combination, metaphor, and analogy (Ward, Smith, & Vaid, 1997a, 1997b). It’s creative to combine two concepts to make a single new one; for example, a “boomerang flu” is a flu that goes away and then returns. Many of us use novel metaphors in everyday speech, for example, saying that “children are sponges” to comment on how quickly they absorb new information. In analogies, some properties from one mental model are transferred to another; famously, de Mestral had the idea for Velcro when he began to ponder how burrs clung to his clothing (Hill, 1978).

The creative cognition approach explains creativity by examining how the mind combines concepts (Finke, Ward, & Smith, 1992). Creative cognition theorists hypothesize that a cluster of basic cognitive processes are used in creativity: generative processes that produce ideas, filtering processes that select among these ideas, and exploratory processes that expand on the potential of each idea. Generative processes include information retrieval, association, and combination. The mind then uses various properties of these ideas—novelty, surprisingness, aesthetic appeal—to evaluate which of them should be retained and explored. Exploratory processes then modify and elaborate the idea, consider its implications, assess its limitations, and even transform the idea.

For example, Wisniewski (1997) examined an everyday type of creativity as a way of better understanding conceptual combination: he examined cases when speakers combined nouns to make novel concepts, such as “car boat” to refer to a new kind of boat that is also a car, or “boomerang flu” to refer to a flu that goes away and then comes back. In such cases, the two component concepts themselves change when they are combined (the “car” that is a “car boat” is not exactly like any other kind of car); and this conceptual change is itself a form of creativity, as each concept guides the creative modification of the other. Thus
conceptual combination is not simply additive, but is a case of emergence—
concepts are combined in a complex system of higher-level concepts, and each
of the component concepts is itself changed by its participation in the higher-
level concept. Because the parts change when they're combined together, the
new concept can't be understood by breaking it apart into its component con-
cepts and studying them in isolation.

Before we can explain how the mind combines concepts, we need to start
with a good theory of what a mental concept looks like. Since the 1970s, cog-
nitive psychologists have proposed schema or frame models that represent a con-
cept as a data structure with variables or “slots” that can be set to different values.
For example, the schema for “vehicle” would include slots for:

* number of wheels (two for a motorcycle, four or more for a truck, but with
  a default value of four for a car)
* number of seats (again, a default value of four). Slots can themselves be filled
  with representationally complex concepts; the “seat” in the vehicle schema
  can be a motorcycle seat or a car seat, which have very little in common.

If we accept that concepts are schemas, then we can explain conceptual
combination as a process of slot filling, with values of the slots of one schema
filling in values of the other, as the two schemas merge to form a single new
one.

However, it’s a long way from “car boat” to the development of creative
products that transform a domain (as noted by Simonont, 1997b; Ward, Smith,
& Vaid, 1997a, p. 4), and one might reasonably wonder whether exceptional
creativity really occurs in the same way. For the most part, cognitive psychol-
gists haven’t examined creativity directly; instead, they focus on everyday cog-
nitive processes (Ward, Smith, & Vaid, 1997a, p. 1)—what many creativity
researchers refer to as “small-c” creativity, in contrast with the “big-C” cre-
vativity of major historical breakthroughs.

The problem with studying underlying cognitive mechanisms like concep-
tual combination is that higher-level mental processes like creativity are built
out of many mental mechanisms. After all, most big-C creative innovations are
complex networks of many concepts, not a single concept; ramping up from
conceptual combination to creative innovation is likely to be quite difficult. For
example, Dunbar (1997) found that creative ideas in science emerge over the
course of a collaborative meeting, from a series of small changes, each produced
by a different cognitive mechanism—one by analogy, another by induction, yet
another by causal reasoning (see chapter 14). Even though cognitive psychology
helps us to understand each of these component mechanisms, it may not help us much with understanding the complex system that ultimately re-
sults in the emergence of creativity, because the creative insight might contain
hundreds of concepts in complex combinatorial relations (cf. Ward, Smith, &
Vaid, 1997a, p. 18). Again, it comes down to a question about emergence: al-
though creative insights emerge from complex underlying cognitive processes,
the emergence may be so complex that the creative insight could not have been
predicted in advance (Finke, Ward, & Smith, 1992, p. 8). For these reasons, many
prominent creativity researchers believe that cognitive psychology is fundamen-
tally limited and can’t provide the full explanation of exceptional creativity
(Csikszentmihalyi, 1988a; Simonton, 1997b).

Stage 3: Insight

The mind being prepared beforehand with the principles most
likely for the purpose . . . incubates in patient thought over
the problem, trying and rejecting, until at last the proper
elements come together in the view, and fall into their places
in a fitting combination.


In incubation, existing ideas blend and combine to form complex mental struc-
tures. Some of these mental structures—no one knows exactly which ones or
why—surface into consciousness, and the creator experiences an “aha” or “eure-
ka” moment. The existing ideas that form the mental structure are not new;
they are familiar ideas and conventions that are already in the domain. A cre-
ative insight is never 100% original. What makes an insight novel is the way that
these existing ideas are put together.

Creativity science doesn’t yet know very much about the psychological struc-
ture of creative insights. We don’t know exactly how existing pieces of the do-
main mix together in the creator’s mind. To explain creativity, we’ll need to have
a pretty good theory of how the parts of the domain are stored in the creator’s
mind, because without knowing what they look like, we won’t be able to ex-
plain how they combine to form novel insights. One example is the schema
theory that I just discussed. Other theories of these mental structures include
Sternberg and Lubart’s (1991) model of “selective encoding” and “selective com-
parison,” and Wisniewski’s (1997) theory of conceptual change.

There’s one important alternative to the dominant associationist explaina-
tion of insight: Wertheimer’s gestalt theory of productive thinking (1945). He
started by observing that many creative people seem to experience a sudden burst
of insight, when the entire way they think about the problem suddenly changes.
Wertheimer didn’t think you could explain this by talking about associating
small, simple ideas to build a complex structure; instead, it seemed that the mind jumped all at once from a complete structure to a new one. So Wertheimer explained creativity by examining the structural properties of the problem. Every mental structure is incomplete; there are tensions, sometimes contradictions, built into the structure. The creator’s mind has an ability to transform the structure into a more stable, better structure, and insights happen when a complex mental structure suddenly transforms into a more stable structure. But this holist gestaltist theory has several weaknesses. For example, by focusing on the structural characteristics of the problem, it almost seems that all problems would quickly solve themselves. And it’s hard to explain why one person can do the transformation but another can’t.

Boden’s (1999) theory of transformational creativity is a modern variant of Wertheimer’s gestaltist theory. Boden argued that although some forms of creativity are combinations of existing elements, the most important creativity involves a transformation of conceptual space. Using a linguistic analogy, Boden observed that generating a new sentence from the rules of grammar—a sentence that no one had ever said before—would be creative but it wouldn’t be surprising, because everyone would realize how that sentence could have been said by anyone before even though it wasn’t. But transforming a conceptual space is like someone who develops a modification to the rules of grammar themselves, so that completely new kinds of sentences can now be uttered, sentences that would not have been possible, or would have sounded nonsensical before. This kind of creativity couldn’t be the result of associations between existing elements, because it would change the way associations themselves could be made.

Stage 4: Verification: Evaluation and Elaboration

Many creators say that the best way to have a good idea is to have a lot of ideas, and then just get rid of the bad ones. I call this the productivity theory. Poet W. H. Auden said that “the chances are that, in the course of his lifetime, the major poet will write more bad poems than the minor” because they “write a lot” (quoted in Bennett, 1980, p. 15). It’s a creativity myth that geniuses are always right; geniuses are wrong in a similar proportion to everyone else, and may generate more wrong ideas simply by virtue of generating more ideas overall (Weisberg, 1986; see chapter 2). Galileo insisted that planets traveled in a circular orbit, even with the increasing evidence for comets’ elliptical paths; Darwin undermined his evolutionary theory with the doctrine of pangenesis, now known to be false; and Einstein persisted in arguing for a unified theory, and rejected quantum mechanics.

In addition to such anecdotal evidence, quantitative research supports the productivity theory. Simonton (1988a, 1988b) measured the raw productivity of historical creators, and also identified the creations that had stood the test of time as truly significant works. He found a strong relationship between productivity and significant creations: when comparing individuals, the creators that had the highest overall lifetime output were the people most likely to have generated a significant work. Even when he measured year-to-year productivity within a single person’s lifetime, he found that the most productive periods were the times when a creator was most likely to have generated a really significant work (pp. 88–91). A 1998 study of patented inventions (Huber, 1998) found that in a group of 408 full-time inventors, those with the most patents were those whose patents were judged the most significant.

At first glance, the productivity theory seems to defy common sense. It seems that the person who’s really productive must be a little sloppy, cutting corners and generating second-rate work. It seems like the most important works would require a lot of time and energy to generate; the person who generates a really important work should be the one who dedicates all of his or her energies to that one project. We can all conjure up an image of a solitary creator, working alone for years in isolation, growing increasingly eccentric, until he finally comes out of the lab or studio to reveal the masterpiece that will change the world. But this image is a creativity myth; it doesn’t happen very often. In fact, the productivity theory proves several of our creativity myths to be false or misleading—that geniuses are special people who are always right, or that creative works spring to mind fully formed (as the idealist theory would have it).

After evaluation comes elaboration, the conscious hard work where the creator takes the raw insight and molds it into a complete product. Most creative insights are not fully formed; the creator has to use his or her immense domain knowledge—in particular, how to work using the materials and techniques of the domain—to convert the idea into a finished work. Monet had the idea to
paint a haystack in a field at different times of the day and the year; but his idea wouldn’t have gone anywhere unless he also had the painting skills to mix the right colors, to hold and to move the brush to make the right strokes, and to compose the overall image to get the desired effect. A person might have a new idea about how to design a computer word processor, but that idea would be lost to history if the person didn’t know how to write computer programs.

Elaboration always goes together with evaluation, because it’s often hard to tell if an insight is a good one without elaborating it at least part way. You’ll probably have to work with an idea at least a little bit before you can tell if it’s a good one. And you always end up modifying the initial insight during elaboration. Raw insights are just sparks, nothing but rough outlines; the creator usually experiences a continued cycle of mini-insights and revisions while elaborating the insight into a finished product.

Problems With Stage Theories

You have these ideas, and then you work on them. As you work on them, you get new ideas... one makes the other one come out.


Many influential studies have demonstrated the complexity of creativity by focusing on the ontogenesis of the creative product—biographical studies of the day-to-day development of creative products over months and years. The first influential study like this was Gruber’s close reading of Darwin’s journals (Gruber, 1974). Creativity researchers are still fleshing out theories about these long-term processes: how long creative periods are sustained, and how one multyear period is succeeded by a shift to another research question, or another style of visual representation (cf. Gruber, 1988; Nakamura & Csikszentmihalyi, 2003).

The four-stage model I’ve just described is a little too linear; the creative process is more cyclical. These ontogenetic studies have found that creators work on many problems at the same time, and that in most creative careers, an insight often generates even more questions than it answers. A creative insight that generates good questions is more valuable than one that conclusively answers every known question but doesn’t suggest any further research. The task of solving a good question leads to the reformulation of difficult problems and the generation of completely new questions.

Rather than coming in a single moment of insight, creativity involves a lot of hard work over an extended period of time. While doing the work, the creator experiences frequent but small mini-insights. Unlike the mysterious insight of our creativity myth, these mini-insights are usually easy to explain in terms of the hard conscious work that immediately preceded them.

Psychoanalytic theorists were some of the first to explore the cyclical nature of mini-insights. Arieti (1976) noted that “complex works that can be divided into parts” involve a series of insights, with incubation occurring throughout the creative process, and he concluded that the four stages aren’t separated through time (p. 18). Rothenberg (1979) argued that creation is not found in a single moment of insight but is “a long series of circumstances... often interrupted, reconstructed, and repeated” (p. 131). He criticized stage theories, arguing that “the temporal distinction made between inspiration and elaboration in the creative process is an incorrect one; these phases or functions alternate—sometimes extremely rapidly—from start to finish” (p. 346). And Vinacke (1952) argued that in many creative fields, especially fine art, the final work results from a series of insights beginning with the first draft or sketch and continuing until the work is completed. Incubation does not occur in a particular stage but operates to varying degrees throughout the creative process. For example, poems and plays do not emerge suddenly or completely, but are gradually developed through a process of many incubations and insights (see chapter 11).

Every so often a creator will have a subjective experience of a moment of insight. But even though it may seem sudden to the creator at that moment, in retrospect it can always be traced to the prior work that the creator was engaged in. By analyzing the sketches and notebooks leading up to the insight, we see that each innovation resulted from a connected, directed, rational process (Weisberg, 1986, 1993). For example, Jackson Pollock’s paintings are now known to have emerged from a long process of careful deliberation, and not from a sudden insight in the middle of the night followed by a binge of paint pouring. Darwin’s groundbreaking innovation—the theory of natural selection—is now known to have emerged from a multitude of smaller, incremental insights (Gruber, 1974). This history is lost unless there are detailed notebooks (like those left by Charles Darwin) or video recordings (made by creativity researchers who happen to be present during the process). But in every case where researchers have access to this kind of detailed record, they can trace the final product from a complex series of small mini-insights that are closely tied to the work of the moment. In the chapters of part 4, I present the best of this process-analytic research, and show how it supports the action theory of creativity.

These new studies show that insight is overrated. Studies of the work processes of creative individuals have revealed that the typical creator experiences many small mini-insights every day, and that these mini-insights can be traced...
back to the material they were consciously working on. We only think we see leaps of insight because we didn’t observe the many small, incremental steps that preceded the “insight.” Creative activities require problem solving and decision making throughout the process, and each one of these decision points involves a small amount of creative inspiration; yet, when these mini-insights are viewed in the context of the ongoing creative work, they no longer seem so mysterious. Creativity researchers today agree “that creativity takes time . . . the creative process is not generally considered to be something that occurs in an instant with a single flash of insight, even though insights may occur” (Tardif & Sternberg, 1988, p. 430).

The mythical view of a moment of insight overly simplifies the complexity and hard work of most creativity. Instead of a single glorious moment, creators experience small insights throughout a day’s work, with each small insight followed by a period of conscious elaboration; these mini-insights only gradually accumulate to result in a finished work, as a result of a process of hard work and intellectual labor of the creator. The continued fascination with a moment of insight is another example of the persistence of our culture’s creativity myths—the Romantic era belief that the creator should be inspired while in a spiritual, mystical state.

Finding Problems

We say that a question well put is half resolved. True invention thus consists in posing questions. There is something mechanical, as it were, in the art of finding solutions. The truly original mind is that which finds problems.

—Paul Souriau (1881, p. 17, translation in Wakefield, 1991, p. 185)

The formulation of a problem is often more essential than its solution. . . . To raise new questions, new possibilities, to regard old questions from a new angle, requires creative imagination and marks real advance in science.

—Albert Einstein & Leopold Infeld (1938, p. 92)

At the beginning of a painting class in 1992, instructor Michell Cassou began by asking his students, “How many of you came here with your first painting already done in your head?” Half of the students raised their hands. Cassou continued, “If you paint that painting, you’ll just be copying what you’ve already done.” These students came to the class holding our idealist-theory myth, that creativity is when you have the idea. Instead, Cassou told his stu-

dents to “open themselves to the moment,” without predetermined plans (Cushman, 1992, pp. 54–55). Creativity researchers call this the problem-finding creative style.

Many cognitive psychologists compare the stages of creativity to the stages of problem solving (Flavell & draguns, 1957, p. 201; Guilford, 1967; Kaufmann, 1988; Klahr, 2000; Klahr & Simon, 1999). But creativity researchers have discovered that some creative people work in areas where problems are not specified in advance, where a big part of success is being able to formulate a good question (Beittel & Burkhardt, 1963; Csikszentmihalyi, 1965; Getzels, 1964; Mackworth, 1965). As a result, many creativity researchers now believe that creativity involves both problem solving and problem finding.¹

Of course, in the real world—whether in the arts, science, or business—problems are rarely neatly presented. The only place where you’re likely to be asked to solve problems is on a test—either an intelligence test, or a measure of creative ability. Problem solving, like IQ testing, is a convergent activity, and problem finding is a divergent activity. All real-world creativity involves some degree of problem finding; in fact, this is one of the common critiques of standardized testing—that it only measures problem-solving, but not problem-finding ability (Sternberg, 1985).²

American society in the 20th century valorized spontaneity, but this emphasis on problem-finding creativity is relatively recent (Belgrad, 1998; see chapter 2). Prior to the 19th-century Impressionists, who were influenced by the naturalism and spiritualism of the earlier Romantic writers, painters were definitely not supposed to paint without prior planning. The great academies of Europe, such as the École des Beaux-Arts in France, taught the importance of choosing an appropriate subject (ideally, a historical or mythological theme), of carefully composing its placement on the canvas, of experimenting with color mixes for each portion of the painting, and of sketching and painting preliminary drafts or “studies” before beginning the actual work. This was how painting had been done in Europe for centuries. Problem finding is a bigger part of our conception of creativity today than it’s ever been.

Summary

Psychologists were the first scientists to seriously study creativity. The psychological study of creativity has gone on for so long that I’ve grouped it into two distinct periods: a first wave of personality psychology in chapter 3, and a second wave of cognitive psychology in chapter 4. After all of this research, we have some pretty solid knowledge about creativity.
INDIVIDUALIST APPROACHES

• Creativity is not a special mental process, but involves everyday cognitive processes.
• Creativity is not a distinct personality trait; rather, it results from a complex combination of more basic mental capabilities.
• Creativity does not occur in a magical moment of insight; rather, creative products result from long periods of hard work that involve many small mini-insights, and these mini-insights are organized and combined by the conscious mind of the creator.
• Creativity is always specific to a domain. No one can be creative until they internalize the symbols, conventions, and languages of a creative domain.

Although these are all important scientific findings, we haven’t yet explained creativity. Psychology only provides one piece of the complex explanation of creativity that modern science has developed. In the next two chapters, we’ll explore two exciting new individualist approaches to the study of creativity: the biological and the computational. And after that, in part 3, we’ll broaden our scope to examine contextualist approaches to creativity.

Thought Experiment

• Think of a time when you made something that you think was particularly creative—a school project, a written report, a mechanical device, a block tower, a painting, or musical performance.
• What mental process led to its creation?
• Did you have the idea all at once, fully formed, and then all you had to do was make it? If so, what preceded the insight—what preparation did you do, and was there an incubation period?
• Or did you begin with only the germ of an idea, having mini-insights throughout the process, so that the final product was not exactly what you started out to make?
• Would you call this a problem-finding or a problem-solving type of creativity?

Suggested Readings