

CHAPTER ONE

What Is Creativity?

“Creativity is the defeat of habit by originality.”

(Arthur Koestler)

Learning Objectives

- Recognizing the parallels between creative outputs across different contexts
- Pinpointing the defining components of creativity
- Grasping the challenges of defining creativity comprehensively
- Understanding the difficulties faced when evaluating creativity
- Identifying different types of creativity
- Distinguishing creativity from related concepts

1.1 Recognizing Creativity

This is a book about our incredible creative minds and their extraordinary workings. It is one that will serve as a reliable and enthusiastic guide in helping you explore what we know about our creative minds, and how we can study it – from inside out and outside in – through the confluence of behavioral and brain-based perspectives. To begin the journey of discovering the mechanisms and maneuverings of the creative mind, we must begin with a clear and unanimous picture of the phenomenon we are attempting to understand. We will be best placed before setting off if we are steered by some fundamental questions at the starting line. How do we know when something is creative? What are the indicators that enable us to recognize an instance of creativity? Let us begin with a few examples of creative achievements across different fields of human enterprise to help us envisage this better.

1.1.1 Scientific Domains

An event that showcased iconic displays of inventiveness in the engineering domain was the *Apollo 13* mission to the moon in April 1970.

A three-person crew together with a team of flight controllers and support personnel at NASA's mission control in Houston successfully solved a series of problems that transpired over three days under conditions of extreme pressure. The most famous instantiation of creative problem solving during this event was the making of an improvised device called the "mailbox" (see Figure 1.1) using the limited material available on the spaceship. The excess carbon dioxide in the air could be drawn out using this device, enabling the crew to stay alive long enough to get back to Earth. Throughout the entire event the team generated novel and workable solutions to problems they had neither encountered nor imagined before (King, 1997).

The creative mind does not only come into play under conditions of time pressure when quick and spontaneous engagement is necessary. It is just as vital in the case of deliberate innovation. *Design that Matters* is a non-profit company that engineers products with the potential to have a positive social impact by feasibly improving the standard of healthcare for the poor in developing countries. One great example of such a product is its design for an incubator made entirely of car spare parts, the NeoNurture (see Figure 1.1). The promise of this product lay in the fact that the team, led by Timothy Presterio, Founder and CEO, identified that one of the reasons that pre-term infants in Africa have an extremely poor prognosis is not so much the paucity of aid but the lack of sustainability in maintaining the technology that has been made available through aid. Incubators break down over time and the general lack of spare parts as well as repair services meant that, when an incubator broke, it remained in a state of disrepair and could not be used any further. The novelty of the NeoNurture therefore lay in how this logistical problem was circumvented by designing a product using car parts that were readily available in that regional context – owing to the abundance of motorized vehicles – which would allow for quick and cost-effective repairs locally.

The previous examples demonstrate the brilliance of creative minds during problem solving in applied domains of science and technology. The end products to evaluate are concrete and exist in physical space. But often, the end products of creative minds are not concrete things that we can all consciously perceive using our senses of touch, sight, sound, taste, or smell. I am referring here to ideas that are more conceptual in nature, but no less powerful than physical objects.

Within the scientific domain there are countless examples of ground-breaking ideas, theories, and discoveries, which come about through observation, experimentation, and introspection. Marie Curie, the only

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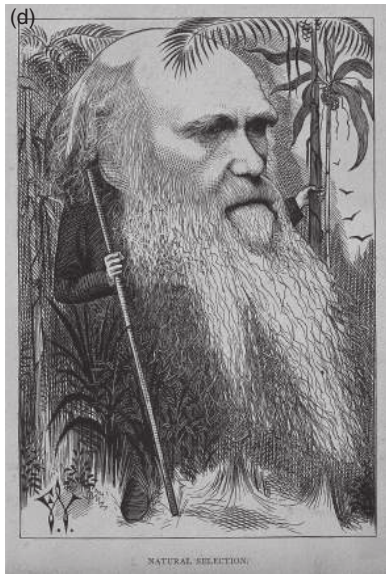
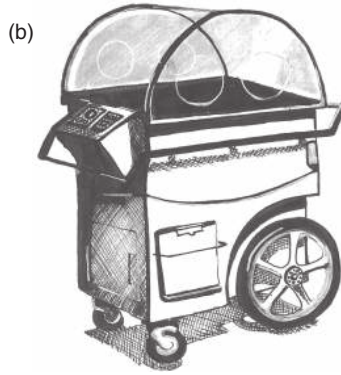
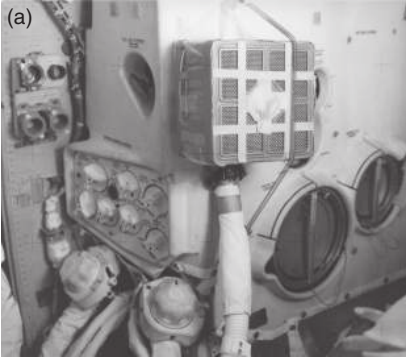


Figure 1.1 Exemplars of scientific creativity

(a) Interior view of the *Apollo 13* lunar module and the “mailbox.”

Courtesy: NASA/JPL-Caltech. **(b)** Sketch of the NeoNurture device.

© Greig Abraham. **(c)** Portrait of Marie Curie [1867–1934], Polish chemist, wife of Pierre Curie. Credit: Wellcome Collection. CC BY.

(d) Charles Robert Darwin. Wood engraving by [FW]. Credit: Wellcome Collection.

person to date to have won the Nobel Prize twice, in different sciences, was recognized for her pivotal contributions in radioactivity research with the 1903 Nobel Prize in Physics as well as with the 1911 Nobel Prize in Chemistry on account of her discovery of the elements, radium and polonium. Although the work of Charles Darwin was not of the kind that would have enabled him to receive this most prestigious of all scientific awards, in formulating his seminal theory of evolution he has had a colossal impact, not only on the field of biology but far beyond (Ridley, 2015), making him among the most influential figures in the history of mankind.

1.1.2 Artistic Domains

The artistic domains of human enterprise, which indeed are most dominantly associated with the concept of creativity (see Box 1.1), also boast an abundance of examples of the creative spirit in action across a range of different fields (Figure 1.2). Let's take four examples from the fields of painting, music, fashion, and literature.

Box 1.1 Types of Creativity

Within psychological research, the most common division in terms of types of creativity is that of scientific versus artistic creativity, particularly in personality-based studies on creativity (Barron & Harrington, 1981; Feist, 1998). Across the domains of science and art, highly creative people show greater openness to novel experiences, are attracted to complexity, and display heightened aesthetic sensibilities. Some recent work has shown, though, that "openness to experience" is predictive of creative achievement in the arts whereas "intellect" is predictive of the same in the sciences (Kaufman et al., 2016).

This simplistic division does not, however, adequately represent the breadth and complexity of creativity in human enterprise (Gardner, 2011). For instance, domains like architecture and creative design represent a combination of artistic and scientific creativity. In fact, Donald MacKinnon studied architects for this very reason because they "as a group reveal that which is most characteristic of the creative person" given that "if an architect's designs are to give delight, the architect must be an artist; if they are to be technologically sound and efficiently planned he must also be something of a scientist" (1965, 274). Other theorists have distinguished between art, science and humor (Koestler, 1969), spontaneous and deliberate creativity (Dietrich, 2004b), as well as problem solving and expression (Abraham, 2013). And some have taken the opposite approach by seeking to identify what is common to both, such as

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the drive to get closer to “truth” and “beauty” given that “for what the artist creates must be ‘true to itself,’ just as the broad scientific theory must be ‘true to itself’” (Bohm, 2004, 40). So the jury is still out with regard to the types of creativity and how best to conceive of their commonalities and distinctions within a single viable framework. From the neuroscientific perspective, theoretical frameworks that posit brain-based differences in artistic versus scientific creativity are rare (Andreasen, 2012).



Figure 1.2 Exemplars of artistic creativity

(a) *Seated Peasant* by Paul Cézanne (ca. 1892–1896). Courtesy: Metropolitan Museum of Art; Walter H. and Leonore Annenberg Collection. **(b)** Sketch of Miles Davis playing the trumpet. © Greig Abraham. **(c)** Coco Chanel, 1931. © Bettman via Getty. **(d)** Commemorative stamp celebrating 125 years since the birth of Franz Kafka (1883–1924). Courtesy: Deutsche Post AG; designed by Jens Müller and Karen Weiland.

Paul Cézanne is credited as being the father of modern art, both visually and conceptually, on account of the fact that his extraordinary work represented the nexus between Impressionism and the later art forms, such as Cubism and Fauvism. Pablo Picasso is said to have remarked, “Cézanne! He was like the father of us all.” Henri Matisse went even further in his praise: “Cézanne, you see, is a sort of God of painting.” His approach has been described as “groping for a conciliation of the methods of Impressionism and the need for order” with the need “to convey the feeling of solidity and depth” (Gombrich, 2011, 544). Cézanne once stated, “I want to make them [Nature and Art] the same. Art is a personal apprehension, which I embody in sensations and which I ask the understanding to organize into a painting.” To Merleau-Ponty (1993, 65, 70), this meant that Cézanne aimed “to make *visible* how the world *touches us*” as “distinctions between touch and sight are unknown in primordial perception.”

While Cézanne’s work is a testament to the mastery that derives from a profound and focused *raison d’être*, other eminent artists are known for the evolution in their visionary output over time. Described as “probably one of the finest conceptualists of music in American history,” the jazz trumpeter Miles Davis is considered “a great innovator” as his creative contributions were central to several different stylistic developments in jazz; so much so as to be considered as one who had “several distinct creative periods like Picasso” (Early, 2001, 3, 15). He was a prolific musician and composer and found great success throughout his career. In fact, his album “Kind of Blue” is still the top-selling jazz album of all time, and set the benchmark for the then-emerging modal jazz style. He was renowned for his unconventional approaches, such as minimalism in composition, focus in listening, and the quite astonishing ability to have “always played the most unexpected note, and the one that is the perfect note,” in the words of the producer, Quincy Jones (Tingen, 2001).

Still others make their mark by achieving critical success and acclaim across several domains. Coco Chanel exemplified such creative innovation in the world of fashion by setting wildly popular trends across a range of products such as clothing, perfume, and accessories. She is credited with fundamentally changing how women dressed in Western Europe through the influence of her designs of elegant yet comfortable clothes and by upturning centuries of clothing etiquette by establishing the outfit that could be worn on any occasion – *la petite robe noire* or the little black dress. Her innovative use of jersey fabric in the 1920s, for instance, has been attributed to the success of her designs as other more expensive materials were scarce at the time of war and the sheer practicality of the fabric meant that women could move with ease and were no longer dependent on others to dress them (Wallach, 1998).

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However, recognition within one's lifetime, acclaim in the form of accolades, or exceptional financial success are not prerequisites for creative eminence. The case of Franz Kafka, who died at the age of 40, illustrates this point well as he was relatively unknown within his lifetime having published only a few collections of short stories. His reputation slowly grew and was fortified following the publication of his three incomplete novels after his death. In his singular style of writing, he juxtaposed surreal and ambiguous contexts that provoke feelings of discomfort with the very real existential experience of anxieties that emerge within contexts of powerlessness in the face of unrelenting authority that emanate from power structures at home, at work, and in society. So groundbreaking was the perspective accorded by his prose that it necessitated the addition of a new word "Kafkaesque" to the English language to accommodate this conceptual leap. Kafka was both widely admired by and hugely influential for several eminent writers and philosophers (Sandbank, 1989). Nabokov went so far as to dub Kafka "the greatest German writer of our time" and continued, "[s]uch poets as Rilke or such novelists as Thomas Mann are dwarfs or plastic saints in comparison with him" (Nabokov & Bowers, 1980, 255).

1.2 Defining Creativity

Now that we have a few exemplars of exceptional creative achievement across different domains in science and art, let us broach the important issue of the definition of creativity. Our preliminary aim in this context will be to make cross-domain generalizations. If we try to identify what aspects of the solutions or ideas expressed in the examples above are common to all of them, at least two factors should readily stand out. Can you identify these?

The first commonality that you were probably able to glean from those examples of creativity was that each of them involved generating an idea that was new in some way. This is, in fact, the primary defining attribute of creativity (Runco & Jaeger, 2012). For an idea to be considered creative it must be original or novel. Originality is what renders an idea to be unique or unusual compared to other ideas that are afloat at any given time. We experience an idea as being new, original, or novel when we have not encountered it in quite that distinctive manner before. In quantitative terms, an original idea is one that is statistically rare or infrequent.

While originality is the central factor in determining the degree of creativity associated with an idea, it is not the only necessary factor. A second component needs to be added to the mix to arrive at a reasonably close characterization of creativity, and the component in question is that of appropriateness, relevance, or fit. In the examples expounded earlier (Section 1.1), this is reflected in the fact that each of the generated

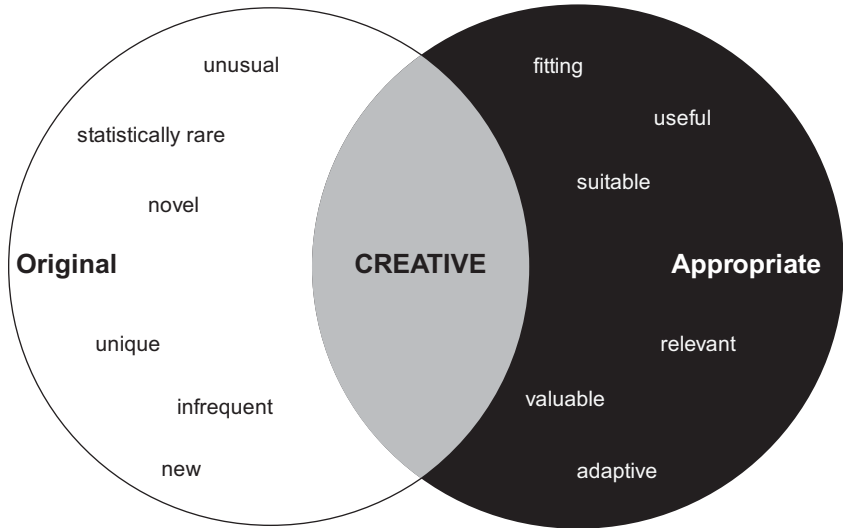


Figure 1.3 Definitional elements of creativity

solutions or expressions was useful, workable, effective, satisfying, or adaptive. So appropriateness refers to the value or fit of the response in terms of how meaningful or suitable it is in a given context.

With this, we have the two central defining elements of creativity (Figure 1.3), namely, that a creative idea is one that is deemed to be both *original* and *appropriate* within a particular context (Runco & Jaeger, 2012; Stein, 1953).

So how are these elements determined? Let us peruse selected quotations from some of the early pioneers in the field of creativity research who grappled with these issues. Originality or “the extent to which a work is novel depends on the extent to which it deviates from the traditional or the status quo” (Stein, 1953, 311). However, an idea that is only original cannot be considered creative because “uncommon responses which are merely random, or which proceed from ignorance or delusion” are not “adaptive to reality” (Barron, 1955, 479). So a product or idea is considered to be creative if it “is a novel work that is accepted as tenable or useful or satisfying by a group in some point in time” (Stein, 1953, 312). This means that, “it must serve to solve a problem, fit the needs of a given situation, accomplish some recognizable goal. And this is as true for the expressive arts as for scientific and technological enterprises; in painting, the artist’s problem is to find a more appropriate expression of his own experience; in dancing, to convey more adequately a particular mood or theme, etc.” (MacKinnon, 1978, 50).

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While several researchers have attempted to define creativity accurately and comprehensively across the decades (Dacey & Madaus, 1969), there is presently broad agreement regarding originality and appropriateness as being the two defining factors of creativity across domains of human enterprise. However, the buck does not stop there. There is less unanimity about whether these two components are sufficient to capture the full extent of creativity. In fact, influential theorists have argued for the importance of other factors, such as “surprise” and optimal “realization” (Boden, 2004; MacKinnon, 1978), which are discussed in the next section.

1.2.1 Comprehensiveness in Defining Creativity

Surprise is certainly a key factor in determining creativity in specific contexts, such as in the case of the US patent office where an invention or process can only be patented if it evidences a nonobvious (i.e., surprising) step (Simonton, 2012b). That this quality of “the unexpected” is a defining attribute of creativity has been most strongly advocated by Margaret Boden (2004), who defined a creative idea as one that is novel, surprising, and valuable. She distinguished between two forms of originality or novelty in creativity – psychological (P-creativity) and historical (H-creativity). P-creativity occurs when an idea is experienced as being new and valuable to the person generating it regardless of how many others have generated that idea before. The scope of experience in the case of H-creativity fits at the other end of the continuum in that it reflects an idea that is so entirely novel that no one else, as far as is known, has generated it before.

These ideas parallel those of Mihaly Csikszentmihalyi’s (1997) little-c versus Big-C magnitudes of creativity (see Section 1.2.2) and MacKinnon’s (1978) concept of “frame of reference” or “range of experiences” in determining whether a given idea or product is original. Frames of reference can be at the level of (a) an individual, which is akin to P-creativity, (b) a group, or (c) mankind, which is akin to H-creativity. So the “creativity” of an idea when evaluated in terms of “statistical infrequency is always relative to a given population of products. Those that are most creative are the ones that are novel or original in the experience of an entire civilization or of all mankind” (ibid., 50).

Alongside the dual typology of P versus H novelty, Boden (2004) also advocated three instantiations of *surprise*. An idea may be “statistically surprising,” which is what comes to pass when two or more relatively unfamiliar concepts are brought together in unusual ways (e.g., use of metaphor in poetry, double entendre in advertisements). This idea-form comes about through combinatorial idea generation. The second

type is when an idea is experienced as unexpectedly surprising so as to evoke a “shock of recognition,” which occurs because it fits with a style of thought that is present in one’s repertoire (e.g., development of new forms of artistic style such as “performance poetry” – an evolving art form that stems from the crossroads of theater, literature, and music). Exploratory idea generation often results in this idea-form. The final type is that of “impossible surprise” and one experiences it that way because it is astonishing that such an idea even occurred to oneself or anyone else (e.g., Schoenberg’s twelve-tone technique, Freud’s theory of the unconscious mind, and Cajal’s discovery of the structural relationship between nerve cells). These revolutionary forms of idea creation are a result of transformational idea generation. Although these three qualitatively distinct instantiations of surprise map on to three principles by which new idea-forms are generated, these abstract principles of combination, exploration, and transformation are not mutually exclusive and can therefore be used in conjunction with one another.

The importance of “surprise” as a defining component of creativity is gaining traction, although it has not been systematically investigated or discussed within the empirical realms of psychology or neuroscience. What is rarely acknowledged, though, is that dissociating between novelty and surprise can be quite difficult. This is because, more often than not, something that is novel is also surprising. Indeed, as surprise is a conative or emotional state, its association with creativity potentially reflects the phenomenological experience that accompanies the eliciting or generation of an original and appropriate idea. An alternative concept is that of “freshness” of an idea, which can be said to be a combination of novelty and surprise. This is because something that is fresh “means more than just ‘new’ or ‘novel’ because ‘refreshing’ may involve making strange things familiar as well as familiar things strange” (Pope, 2005, xvi). Within this conceptualization, creativity is described as “the capacity to make, do or become something fresh and valuable with respect to others as well as to ourselves” (ibid.).

Mackinnon (1965), on the other hand, emphasized another alternative factor as being one of the “absolute criteria” in the definition of a creative product, namely, the optimal implementation or *realization of the idea*. He averred that, “true creativeness involves a sustaining of the original insight, an evaluation and elaboration of it, a developing of it to the full” (160). In the absence of the actual instantiation of the idea, the full worth of the idea cannot be fathomed, appreciated, or evaluated, and hence it cannot be considered to be significantly creative. For instance, only when an original and appropriate idea for a concept or plot of a screenplay is fleshed out in its entirety as a detailed story with dialogue, can we really gauge and consider the degree of creativity associated with that substantive piece of