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Making an Art of Creativity: The Cognitive Science of Duchamp and Dada

Phillip Andrew Prager
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Dada is the infant terrible of art history, an anarchic movement that is typically referred to as nihilistic, pathological, and firmly enshrined within the modernist paradigm and the context of WWI. Through the lens of classical, romantic, and psychoanalytic notions, it certainly appears almost antithetical to creativity. Yet from a cognitive point-of-view, Dada marks a watershed in the understanding of creativity, and articulates principles of creative cognition with surprising insight and precision many decades ahead of science.

Dada pioneered a range of radical new techniques and media, ranging from collages, montages, and assemblages to poster poems and bruitist concerts, and its exuberant cast of characters shocked the art world by using found and castaway objects and employing chance operations to compose their work. Their subversion of traditional aesthetics, authorship, and craft is widely interpreted as a political attack on bourgeois culture or a pathological enactment of the trauma of WWI. Dada's self-professed meaninglessness and pursuit of anti-art have henceforth been interpreted as "a kind of guerrilla warfare against the Establishment. An absurdist attack on materialism" (Flam, 1988, xii) and "intellectually oriented nihilism" (Rubin, 1968, p. 185) that was "useful as a means of communicating ideas, but not worthy of delectation in themselves" (p. 11). More generous interpretations suggest that "its iconoclastic diatribes are better read as a critique of both modernism and more traditional art rather than as a wholesale jettisoning" (Dickermann & Witkovsky, 2005, p. 3).

Dada's significance remains obscured by outdated, classical, romantic, and psychoanalytic theories of creativity that persist within art historical methodologies even in the 21st century. Rothenberg (1990), for example, debunked the myth of the troubled genius by conducting a psychiatric analysis of high-creative individuals from the past and present; he demonstrated that creative

thinking does not occur in altered or psychotic states of mind, and that mental illness poisons, rather than inspires, creative work. Such scientific research on creativity has reverberated little across art history. Yet without an interdisciplinary approach, Dada, which marks a turning-point in the Western understanding of creativity, remains encrusted under a patina of mystery, muse, and mental entropy, and captive to the ruminative, dysphoric, and analytic Western traditions that it so passionately tried to subvert.

Although creativity is no mystical phenomenon, it certainly differs from conventional, logical thought. From a cognitive point-of-view, creativity is often described as a "combinatorial" process in which seemingly incompatible concepts are blended into surprising new meanings, "a cut and paste process" in which "two concepts or complex mental structures are somehow combined to produce a new structure, with its own new unity, but showing the influence of both" (Boden, 1990/2004, p. 130), or "conceptual combination," in which "properties often emerge in a combination that were not evident in any of its constituents" (Ward, Smith, & Finke, 1999, p. 202). The German chemist August Kekulé (1829–1896), for example, was once pondering the chemical structure of benzene. As he gazed into his fireplace, the flames began to merge into coiling snakes biting each other's tails. He merged the mental image of a string of atoms with the fantasy reptiles and revolutionized chemistry by positing the existence of the circular structure of benzene—a revolutionary idea at a time in which molecules were presumed to be linear (Boden, 1990/2004).

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The combinatorial techniques that Dada pioneered—collage, montage, and assemblage—very literally externalize the combinatorial nature of creativity. Max Ernst (1891–1976), one of the founders and leading figures of Dada, wrote:

Collage technique is the systematic exploitation of the chance or artificially provoked confrontation of two or more mutually alien realities on an obviously inappropriate level—the poetic spark which jumps across when these realities approach each other. (quoted in Elger, 2004, p. 74)

In defining collage technique, Ernst captured core principles of creativity as understood by cognitive scientists. Dada would, however, celebrate its 50th anniversary before creativity began to be understood in such combinatorial terms, most notably in Arthur Koestler's work on *The Act of Creation* (1964/1989, which he defined as the “bisociation of matrices . . . the pattern of perceiving of a situation or idea . . . in two self-consistent but habitually incompatible frames of reference” (p. 35).

Such combinatorial creativity thrives on an appetite for make-believe and an inclination toward play; had Kekulé not managed to verify the existence of circular molecules, his fantasy would have remained a mere play of the imagination, a whimsical and comical paradox. As Koestler pointed out:

The history of science abounds with examples of discoveries greeted with howls of laughter because they seemed to be a marriage of incompatibles—until the marriage bore fruit and the alleged incompatibility of the partners turned out to be derived from prejudice. (p. 95)

The Dada spirit was similarly exuberant and anarchic, exalting in a celebration of the paradoxical and the absurd. “A Dadaist is someone who loves life in all its unencompassable forms,” wrote Johannes Baader (1875–1955; cited in Richter 1978, p. 215), who, together with Raoul Hausmann (1886–1971), led Dada's Berlin branch. In a similarly passionate spirit, the Romanian-born French Dadaist Tristan Tzara (1896–1963) proclaimed, “Dada Dada Dada, a roaring of tense colors, and interlacing of opposites and of all contradictions, grotesques, inconsistencies: LIFE” (1951/1988, p. 82).

Art historians, however, rarely regard artists to engage in play behavior; and even more seldomly is a distinction made between art and creativity. Understanding creativity as a combinatorial practice, fuelled by an effervescent love of paradox, humour, and play, casts a new light on Dada's distinction between art and its self-professed anti-art. Marcel Duchamp (1887–1968) argued that “man invented art . . . art has no biological source. It's addressed to a taste” (Cabanne, 1971, p. 100), but his writings

certainly abound with many normative claims about creativity, as in *The Creative Act* (1957/1975b), or *Specifications for 'Readymades'* (1975c). Through the lens of modern creativity research, Dada can reveal itself in its own terms, while highlighting the formidable role this generation of artists played in identifying and articulating principles of creative cognition decades ahead of science.

CONCEPTUAL BLENDING IN CONCEPTUAL ART

Conceptual blending theory (Fauconnier & Turner, 2002) provides a useful tool in this reassessment of Dada, because it presents the principles underlying combinatorial creativity in greater detail. Conceptual blending describes the formation of figurative meanings as the integration of two or more input domains through cross-domain mappings (shared traits, attributes, roles, functions, analogical and metaphorical connections). The mappings create a blend space in which certain input from each domain is projected into a new, emergent meaning, resulting in anything from the absurd to the poetic, humorous, or scientifically revolutionary. Kekulé's snakes and atom string share a cross-domain

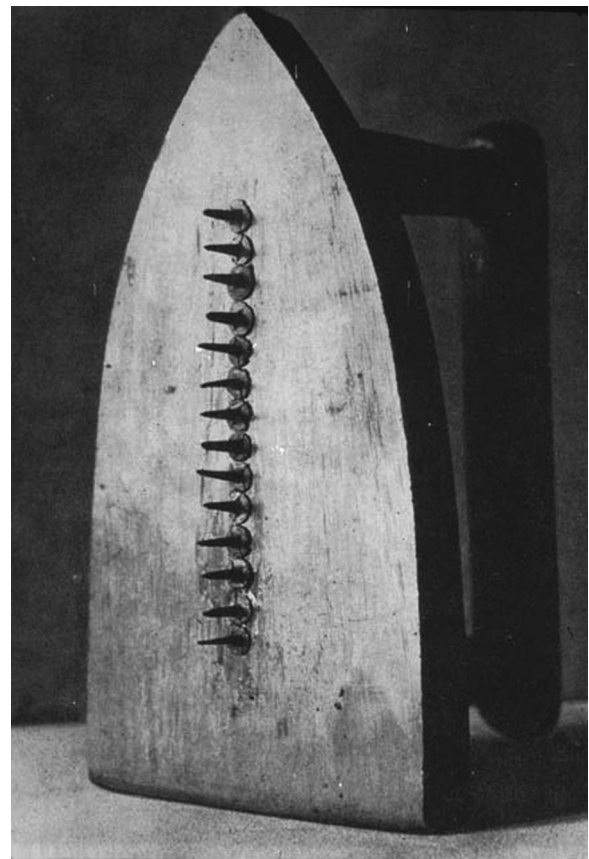
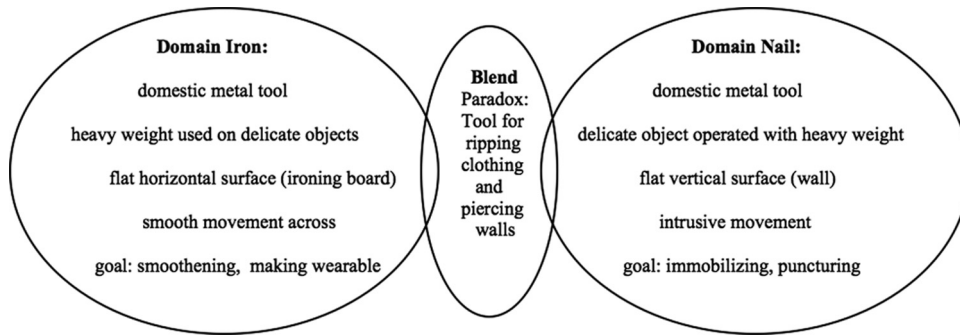


FIGURE 1 Man Ray, *Gift* (1921).

FIGURE 2 Conceptual blending in Man Ray's *Gift* (1921).

mapping in that they can both be conceptualized as lines. They differ in the sense that the snakes can change their shape and coil, but Kekulé had never entertained the idea that atoms could be arranged in anything but a line. The snakes' property was subsequently projected into the blend, which inspired the new, emergent meaning of a coiling string of atoms.

Koestler (1964/1989) observed that humour and surprise are "mental jolts, caused by the collision of incompatible matrices" (p. 92), but emphasized that this is merely a necessary rather than sufficient condition: "To any given situation or subject he must conjure up an appropriate—or appropriately inappropriate—intruder which will provide the jolt" (p. 92). Similarly, Dada masterpieces are never random compilations, but based on careful choreographies of appropriate inappropriateness, as, for example, in Man Ray's *Gift* (1921), which consists of an iron to which a series of nails has been attached (see Figures 1 & 2)

The two input domains—iron and nails—constitute a marriage of perfectly compatible incompatibles. The iron, a heavy item used to operate on delicate objects (clothing), corresponds to the nail as a delicate item that needs a heavy metal force with a smooth edge to enact it. The smooth, horizontal movement contrasts with the pounding of a vertical surface that is characteristic of a hammer and nail. Moreover, the function of the iron—to smoothen and animate clothing into a wearable, dynamic state—contrasts sharply with the goal of the nail, to pierce the wall and immobilize an object. The resulting blend creates a humorous paradox in which the contrasting attributes of each input domain are merged into a tool for ripping clothes and piercing walls.

Humorous blends are based on irreconcilable matrices; they are stated paradoxes. In poetic blends, by contrast, the marriage of incompatibles is very carefully choreographed so as to never to resolve itself in a straightforward manner, instead enmeshing the input domains in an evocative network of ambiguous relationships. In *The Chinese Nightingale* (1920), for example, Max Ernst used collage technique to assemble an anthropomorphic

creature by attaching paper clippings of a fan, white scarf and human features to a bomb, the handle of which functions as a beak (see Figure 3); the title alludes to Hans Christian Andersen's fairytale, *The Nightingale* (1843), in which the beauty, wisdom, and healing powers of a nightingale compete with a mechanical bird, which functions as a symbol of vanity and a harbinger of death for the Chinese Emperor.¹

The Chinese Nightingale is a more complex conceptual blend than *Gift* in that it consists of a multitude of input domains, and thus represents an example of what Fauconnier and Turner define as *multiple-scope networks*. It comprises the domains *bomb*, *grass*, *fan*, *arms*, and Andersen's *The Nightingale* (1843). Each domain can be mapped to one another in a variety of analogous, metaphoric, or abstract ways. The human arms could be interpreted as an expression of helplessness, and consequently mapped to the bomb, although viewed as a delicate, performative gesture, might also relate to the fan; and both arms and fan can be linked to the ritualized aesthetics of Chinese court culture. On the other hand, the arms resemble the artificial limbs of a doll and establish a mapping to the mechanical nightingale, which the Chinese Emperor commissions in Andersen's fairy-tale, and the form and function of the fan evoke the extension of wings and sensation of flight. The bomb could be mapped to grass, because WWI was notoriously characterized by trench warfare in the countryside, far removed from urban settings, although the tactile quality of the grass contrasts sharply with the bomb's metallic smoothness. WWI was, in a sense, concealed from public view, so the bomb could also be related to the fan and the Chinese court, although as a nocturnal and airborne object, it can be mapped to the nightingale. As a manmade killing device and embodiment of political hubris, it also relates to Andersen's mechanical creature and the Emperor's vanity. Moreover, the very collageness of the work feeds back into the domain of the mechanical nightingale, for it

¹For a visual analysis, see also Elger (2004).



FIGURE 3 Max Ernst, *The Chinese Nightingale* (1920). (Figure is provided in color online.)

similarly consists of an entity that has been artificially assembled.

The way in which *The Chinese Nightingale* evokes a complex array of sophisticated, emergent meanings by blending innocuous paper cut-outs is exemplary of the power of combinatorial creativity, and its jarring sense of surprise speaks of the creative, mental shifts required both by artist and audience. Creativity may simply be based on the recombination of preexisting concepts, but it certainly requires an immense source of knowledge, an effusive imagination, and great flexibility of mind.

Dada, for Duchamp, concerned the rejection of the 'retinal' aspect of visual language in favor of the "conceptual" (Cabanne, 1971, p. 39): "I wanted to put painting once again at the service of the mind . . . I was endeavouring to establish myself as far as possible from 'pleasing' and 'attractive' physical paintings" (Sweeney, 1971/2007, p. 141). Duchamp noticed with some disapproval that this endeavour was "at once regarded as 'intellectual' 'literary' painting" (Sweeney, 1971/2007, p. 141). He felt justifiably misunderstood, for the conceptual that Duchamp strove for has far more in common with conceptual blending and the simultaneous mode of creative cognition. To grasp *The Chinese Nightingale* requires the audience to abandon the sequential, linear, and causal modes of Western thought and perform multiple shifts

of reference in which the visual sense is reduced to equal status with all other sensory modalities. Dada's embrace of the conceptual was not literary, but preverbal.

THE MYTH OF THE READYMADE

Dada's redefinition of art in terms of creativity is perhaps most poignant in Duchamp's readymades—found objects that he allegedly transformed into works of art merely by signing and placing them within an art context—the most famous of which is the urinal he exhibited at the Society of Independent Artists in New York in 1917. Peter Bürger (1980/1984) wrote that an "arbitrarily chosen" item such as Duchamp's *Fountain* (see Figure 4) "radically questions the very principle of art in bourgeois society" and thereby subverts "all claims to individual creativity" (p. 51); Amelia Jones (2005) regarded *Fountain* as symbolic of capitalist market values and the "fetishistic logic of the art market" (p. 157). Such interpretations do, indeed, take an intellectual and literary attitude to Duchamp's art, but do not do justice to *Fountain's* inherent creativity; it is not a symbolic gesture, but a creative act in the most literal sense, a highly imaginative multiscope network with a rich variety of humorous meanings.

The meaning of *Fountain* emerges from the blending of four input domains—art (gallery setting), *Fountain* (the title), *R. Mutt* (signatory) and *urinal* (object). The



FIGURE 4 Marcel Duchamp, *Fountain* (1917).

domain *Fountain* establishes cross-domain mappings to *urinal* through attributes *elegant proportions* and *water feature*, but retaining *ornamental versus utilitarian*, *waste water versus clean water*, and *public exterior versus private interior* in the humorous blend. There are cross-domain mappings between *art* and the other three input domains, since they correspond to the domain *art* as a signed, titled, and exhibited object, yet there is a fundamental clash between *art* and *urinal* because the latter is a manufactured, utilitarian object rather than a stimulating and unique product of human ingenuity. At the same time, though, a *urinal* immobilizes its user in a moment of reflection, just as a work of art does.

The fourth input domain, *R. Mutt*, is similarly interwoven in a complex web of emergent meanings, as Duchamp himself explained:

Mutt comes from Mott Works, the name of a large sanitary equipment manufacturer. But Mott was too close so I altered it to Mutt, after the daily cartoon strip *Mutt and Jeff* which appeared at the time, and with which everyone was familiar. Thus, from the start, there was an interplay of Mutt: a fat little funny man, and Jeff: a tall thin man . . . I wanted any old name, And I added Richard [French slang for moneybags]. That's not a bad name for a pissotière. Get it? The opposite of poverty. But not even that much, just R. MUTT. (Schwarz, 1969/1997, p. 649)

R. Mutt thus maps the urinal to a toilet factory and blends its simple curvaceous shape with a fat cartoon character. At the same time, the signature maps the urinal to input domain *art*, because it bestows the aura of artistic authorship, thereby contributing yet another pair of conflicting conceptual integrations. The result is a richly evocative blend of paradox and humour (see Figure 5).

Peter Bürger (1980/1984) argued that “it is obvious that this kind of provocation cannot be repeated indefinitely” (p. 52). Certainly this particular paradoxical blend—utilitarian, industrial object, and high art—cannot be repeated without disintegrating into a cliché, but combinatorial creativity inherently consists of re-arranged readymades. It is merely this particular blend that comments on the nature of art, not readymade-ness itself. The real provocation lied in Duchamp's astute recognition of the prosaic nature of creative thought and in his imaginative foregrounding of such banality in the cartoonish character of Mr. Mutt:

Whether Mr. Mutt with his own hands made the fountain or not has no importance. He CHOSE it. He took an ordinary article of life, placed it so that its useful significance disappeared under the new title and point of view—created a new thought for that object. (Duchamp, 1917/2007, p. 143)

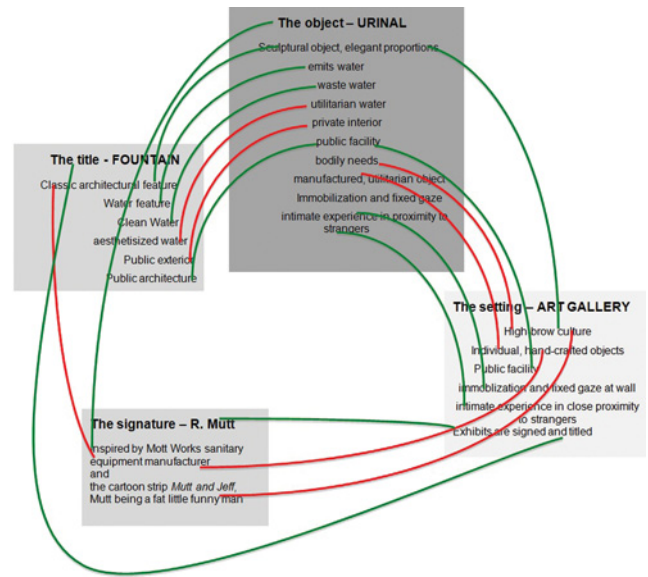


FIGURE 5 Conceptual blending in Marcel Duchamp's *Fountain* (1917). Green lines indicate similarities between input domains (cross-domain mappings); red lines describe contrasting relationships. (Figure is provided in color online.)

POSTMORTEM EEG: DUCHAMP'S BETA FREQUENCY

Not only was Duchamp's practice highly creative, but, as the reference to Mr. Mutt indicates, he had great insight into the cognitive principles of creativity. Indeed, much of his philosophy of art was written in a normative manner and can be interpreted as a coherent and scientifically sound theory of creativity. He made one of his most defining statements in an interview with Cabanne (1971): “You have to approach something with an indifference, as if you had no aesthetic emotion. The choice of readymades is always based on visual indifference and, at the same time, on the total absence of good or bad taste” (p. 48). This “aesthetic of indifference,” as Roth (1977, p. 46) coined it, has inspired tremendous speculation ever since and contributed to the Duchampian mythology. Buskirk and Nixon (1996) interpreted indifference quite literally as the embodiment of Dada absurdity, it “produces canned chance on its own and subverts authorship” (p. 105) and is equivalent to “*Buridan's ass*, that donkey which the nominalist philosopher Buridan pictured between two buckets of oats, as tempted by the one as by the other, dying of starvation for not having known how to exercise its *freedom of indifference*” (p. 104; original emphasis). Roth (1977) related the aesthetic of indifference to Duchamp's political apathy and societal disengagement and, in reference to his female alter ego Rrose Selavy, drew a comparison to the *femme fatale* and Greta Garbo. They share “psychological traits of distancing, mystery and moral indifference . . . They

both project an image of utter aloofness” (Roth, 1998, p. 19–20).

Perhaps there is a much more mundane explanation for Duchamp’s enthusiasm for indifference, which is so poignantly captured in a portrait by Man Ray (Figure 7). From a cognitive point-of-view, indifference simply describes the mindset most conducive to creative discoveries. An indifferent state of mind remains open and receptive to ideas that our mental heuristics and stereotypical patterns of thought would preclude. If, for example, one were asked to conceive of a fantasy bird, an indifferent regard for conventional associations such as flight, feathers, wings, nests, and beaks is likely to result in much more fanciful flights of the imagination. Furthermore, the combinatorial nature of creative thought requires mental nets to be cast widely and indifferently if concepts are to be brought into relationship that were previously thought incompatible.

Creative problem-solving is processed largely subconsciously in a state of incubation and typically enters into consciousness as a sudden flash of insight. Such *Aha!* moments are linked to particular right hemispheric processes, increased activity in the anterior superior temporal gyrus, which is associated with connecting distantly related information, and a burst of high-frequency (gamma-band) neural activity that begins 0.3 seconds before an insight enters into consciousness (Jung-Beeman et al., 2004). Duchamp was an insight-based problem-solver par excellence. He rarely painted after finishing *Large Glass* in 1923, but categorically rejected having given up this activity for a life of playing chess. He merely refused to repeat himself, as he saw most artists doing (Cabanne, 1971) and explained that he simply had no new insight. “If I had an idea pop into my head, like the ‘*Glass*,’ I’d do it for sure” (Cabanne, 1971, p. 106), he declared, but even the lure of a hundred thousand dollars could not motivate a burst of EEG activity (Cabanne, 1971, p. 106). There was simply no new insight to be had about painting after every conceivable innovation had already been conceived of and all limits explored; “after four or five hundred years of existence, [oil painting] has no reason to go on eternally” (Cabanne, 1971, p. 93). Asked whether he would indulge a friend’s request, he wrote:

I’d have to think for two or three months before deciding to do something which would have significance. It couldn’t be simply an impression, an amusement. It would have to have a direction, a sense. That’s the only thing that would guide me. I’d have to find it, this sense, before I started. So if I agreed to do something, it would be with reservations. (Cabanne, 1971, p. 106)

Duchamp may never have had another insight about painting, but, as discussed in the following, each of the very few artworks he did produce throughout the

remainder of his career represent creative insights of truly transformative quality.

Moreover, there is even neuroscientific evidence to support Duchamp’s theory of indifference. As early as 1975, Martindale and Mines discovered that highly creative individuals distinguish themselves by very low cortical arousal when performing creativity tests; in fact, their EEG alpha-wave activity was not only lower than that of less creative individuals, but lower than their own baseline recording. “The pattern is the one we would expect if creative activity requires the defocused attention produced by low levels of cortical activation,” Martindale (1999, p. 141) observed.

This link between an individual’s general resting-state brain activity and problem-solving strategy was further documented by Kounios et al. in 2008 (see Figure 6). Insight-based strategies, they hypothesized and validated, were employed more frequently by individuals with low resting-state brain activity, which not only results in defocused attention but a “more general activation of visual processing areas resulting in broader intake of visual information” (p. 283). The EEGs of low-insight individuals, by contrast, were found to exhibit significantly higher occipital beta and alpha band activity, which are responsible for focussing attention and inhibiting processing of peripheral visual information.

In Figure 6, blue areas depict regions in which beta activity is higher in the low-insight group, red areas show brain regions with more activity in the high-insight group (scores are calculated by subtracting beta frequency of the low-insight group from that of the high-insight group). Red dots are representative of electrodes used to measure beta frequency. The large blue area indicates very high beta scores for the low-insight group, which implies much higher focussed visual attention. The absence of any red areas, by contrast, suggests that

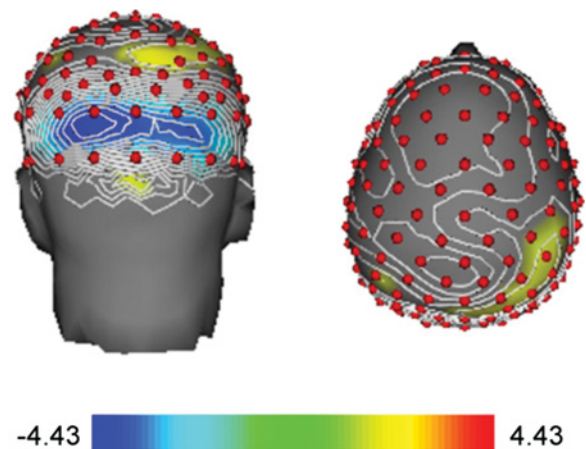


FIGURE 6 Topographic map depicting EEG scores for beta frequency (eyes open). From Kounios et al. (2008). (Figure is provided in color online.)



FIGURE 7 Man Ray, *Marcel Duchamp* (1930): ‘The choice of readymades is always based on visual indifference and, at the same time, on the total absence of good or bad taste.’ From Pierre Cabanne (1971, p. 48).. (Figure is provided in color online.)

high-insight individuals process visual stimuli in a much more unfocused, or, to use Duchamp’s term, ‘indifferent’ manner.

Duchamp’s indifference may certainly be anti-art, as compared to traditional notions of art and authorship, but from the point-of-view of creativity it is enormously *procreative*. The much broader awareness of visual information facilitates a very deep phenomenological awareness and is quite contrary to the “utter aloofness” and disengagement that Roth identified in Duchamp’s “cult of self” (Roth, 1998, p. 20). In fact, as Ansborg and Hill (2003) pointed out, creative individuals’ different use of attentional resources facilitates a profound awareness of details, distractions, and peripheral environmental cues that analytic, goal-directed, focused thinkers will tend to ignore.

Duchamp’s description of indifference simply recognized a basic aspect of human cognition, which is neither historically contingent nor inherently subversive; it merely described the state of mind that is most conducive to generating creative ideas. It is ironic—and indicative of the romantic stereotypes that pervade the arts—that in trying to demystify the creative act, he only contributed to its continued mystification.

DISTILLING SUGAR FROM MOLASSES

Creative and analytical thinking can, to some extent, be conceptualized as different types of cognition, but they are neither polar opposites nor independent from each other (Cropley, 2006; Groborz & Necka, 2003). Although the disinterested state of mind explores the divergent reaches of lateral associations, reeling in remote ideas and experimenting with unusual combinations, there needs to be mechanism to identify the few truly fertile seeds and ensure value recognition and usefulness. “Creative and critical thinking are two sides of the same coin,” as Nickerson (1999, p. 399) observed; “idea generation and evaluation are going on more or less simultaneously and continuously in any instance of extended creative activity.”

Duchamp’s theory of creativity is keenly aware of the complex relationship between creative and critical thought. When he wrote that “you have to *approach* something with indifference,” he was only referring to idea generation; “the *choice* of readymades” (cited in Cabanne, 1971, p. 106; my emphasis) certainly implies an element of value recognition, an integration of both indifference and intentionality, a two-faced quality of creativity, which he succinctly articulated in his essay on *The Creative Act*:

In the creative act, the artist goes from intention to realization through a chain of totally subjective reactions. His struggle toward the realization is a series of efforts, pains, satisfactions, refusals, decisions, which also cannot and must not be fully self-conscious, at least on the aesthetic plane. (Duchamp, 1957/1975b, p. 139)

Duchamp defined the creative act as an incremental process that comprises both un(self)conscious explorations in conjunction with intentional refusals and decisions. As such, Duchamp reveals a close affinity to cognitive models that describe creativity as an oscillation between divergent and convergent thinking. The geneplore model (Finke, Ward, & Smith, 1992) describes a cyclical model of creativity in which generative and explorative, primary and secondary thought processes, complement each other. The creative process begins with a generative phase, in which

One constructs mental representations called pre-inventive structures, having various properties that promote creative discovery. These properties are then exploited during an exploratory phase in which one seeks to interpret the pre-inventive structures in meaningful ways. These pre-inventive structures can be thought of as internal precursors to the final, externalized creative products and would be generated, regenerated, and modified through the course of creative exploration. (p. 17)

For Duchamp, however, creativity did not only comprise an internal dialogue within an individual's mind; he viewed the artist to be involved in a genealogy cycle with society in general. Art is the "product of two poles—there's the pole of the one who makes the work, and the pole of the one who looks at it" (Cabanne, 1971, p. 70). The artist, he wrote, creates

art '*a l'état brut*,' that is, still in a raw state, which must be 'refined' as pure sugar from molasses, by the spectator. . . . All in all, the creative act is not performed by the artist alone; the spectator brings the work in contact with the external world by deciphering and interpreting its inner qualifications and thus adds his contribution to the creative act. (Duchamp, 1957, p. 140)

This statement reveals a very keen understanding of an ontological problem that creativity is faced with in the domain of aesthetics. Modern definitions of creativity, as advanced by Boden (1990/2004), include value as a central hallmark of creativity, but such a quality is very difficult to assess in regard to aesthetics. Circular benzene molecules became a revolutionary creative discovery because chemists could provide empirical evidence in support of such a seemingly outlandish claim. In the field of art, value is much more elusive. Boden (1990/2004) observed a

reluctance to accept new artistic ideas [which] springs from a temperamental and/or socially comfortable unadventurousness. But it is due also to the difficulty (at least for adult minds) of making truly fundamental conceptual shifts. . . . And artists, of course, cannot bludgeon their critics with independently verifiable facts. They can only seek to persuade them that the mental exploration is intelligible, and therefore—like the climbing of Everest—justified for its own sake. (pp. 74–75)

SWIMMING LESSONS FOR CONCEPTUAL SPACES: DUCHAMP'S TRANSFORMATIONAL CREATIVITY

Persuading society that a mental exploration is intelligible requires society to understand the proposed innovation as productively transforming established conventions and expanding the boundaries of accumulated and accepted knowledge. Borrowing a term from artificial intelligence, Boden (1990/2004) compared knowledge, whether on a personal or societal scale, to "conceptual spaces," which are "structured styles of thought," determined by culture, education, habit, and experience (p. 4). Such conceptual spaces function like road systems, with frequently travelled motorways following stereotypical patterns of thought and ambulatory

country lanes that lead to fringe ideas and divergent thoughts.

If new ideas cannot be discerned to link up to such a conceptual space, they cannot be identified as creative. As Boden (1990/2004) pointed out, atonal music would not have been considered creative in the 16th century, because Arnold Schoenberg's (1874–1951) compositional innovation, radical as it was, actually built upon centuries of musical traditions and transformed the boundaries of the conceptual space of Western music, rather than rejecting them. His compositions directly related to the 19th-century enthusiasm for chromatic and enharmonic modulation (changes in key), such as in the music of César Franck (1822–1890), and the innovative use of musical motifs in the work of Richard Wagner (1813–1883; Haimo, 2006).

Schoenberg's creative genius lay less in combining unusual concepts, than in pushing the boundaries of Western music's conceptual space and in loosening and experimenting with the rules that determined musical conventions. This *transformational* creativity can be distinguished from its combinatorial cousin (Boden, 1990/2004), though they often cooccur. Duchamp's *Fountain* may have been a brilliant act of combinatorial creativity, but it also pushed the boundaries of what is considered aesthetic. His disinterested approach allowed him to bypass all stereotypical notions and expectations and begin with a blank slate; *Fountain* reduced the Western concept of art into "a thought-provoking object of elegant proportions with an emergent meaning exhibited in a gallery with title and signature." Duchamp thereby not only generated an imaginative exemplar of the category *art*, but established a completely unprecedented new *type* of art, thereby unlocking the portal to a vast new conceptual space—that of conceptual art—which has dominated Western art ever since.

People are typically not aware of the way in which knowledge is embedded within their conceptual spaces, because it is largely subconscious and automatic. Duchamp distinguished himself by being highly conscious of the principles that determine and constrain the range of one's thoughts. When asked about the nature of taste, Duchamp responded: "A habit. The repetition of something already accepted. If you start something over several times, it becomes taste. Good or bad, it's the same thing, it's still taste" (Cabanne, 1971, p. 48). Indeed, Duchamp did not only consciously theorize about the conceptual space of art, but recognized that aesthetic innovation is, to a large extent, based on the systematic transformation of the heuristics that govern artistic convention:

First, the Impressionists simplified the landscape in terms of color, then the Fauves did it again by adding distortion. . . . Since photography gives us something very accurate from a drawing point of view, it follows that an artist

who wants to do something else would say, “It’s very simple, I’ll distort things as much as I can, and by doing that I’ll be as free of photographic representation as possible.” It’s very clear with all painters, whether they’re Fauves, Cubists, and even Dadaists and Surrealists. (Cabanne, 1971, p. 94)

Particularly noteworthy in Duchamp’s elaboration on the evolution of modern art is the sense of inevitability that accompanies the progression of aesthetic innovation. In so doing, he very aptly captured the way in which transformative creativity systematically manipulates rules and heuristics. Duchamp was similarly prosaic when describing his own work. He began his artistic career with “pseudo-Impressionist things” around 1902–1903 (Cabanne, 1971, p. 22), but soon embraced Fauvism, which he abandoned by 1911 to take up cubism. “I took it very seriously,” he commented (Cabanne, 1971, p. 26), but even so, “cubism interested me for only a few months” (Cabanne, 1971, p. 27), and he embarked upon his first sketches for *Nude Descending Staircase* (1912) in December 1911.

Despite its status as a milestone of Western art, there is no sense of romanticism in his account of the creative process involved in developing *Nude*. He portrayed it as a sober product of both combinatorial and transformative creativity. “[Chronophotography] gave me the idea for the execution of the ‘Nude Descending a Staircase,’” Duchamp recounted. “At the same time, I retained a lot of Cubism, at least in color harmony. . . . But I was trying to apply a slightly different formula” (Cabanne, 1971, p. 34), resulting in “a Cubist interpretation of a Futurist formula” (Cabanne, 1971, p. 35). At the same time, he transformed the established conceptual space of the nude—“One just doesn’t do a nude woman coming down the stairs, that’s ridiculous. . . . It seemed scandalous. A nude should be respected” (Cabanne, 1971, p. 44).

Duchamp referred to these formative years as “swimming lessons” (Cabanne, 1971, p. 27) a phrase that captures the way in which artists must first travel through the established conceptual space of art, grow accustomed to its conventions, rules, and traditions, before they can aspire to contribute anything of noteworthy originality. “From 1902 to 1910, I didn’t just float along!” as Duchamp himself emphatically pointed out (Cabanne, 1971, p. 27). Duchamp recognized that creative mastery requires a sustained immersion in a subject matter, rather than the kiss of a muse. Empirical research into the biographies of highly creative individuals illustrate that the character and duration of Duchamp’s swimming lessons were not peculiar to his own development, but represent a necessary preparatory phase for high-level performance in any artistic field. Hayes (1981, 1989) investigated the biographies of leading painters, poets, and

composers throughout the centuries and discovered that, on average, “10 years of silence” (Hayes, 1989, pp. 135–145) are required before the first masterwork is produced. Duchamp’s career development is perfectly average in this regard; *Landscape at Blainville* of 1902 is regarded as his first work; his first exhibition took place seven years later, at the Salon des Indépendants in 1909, and exactly 10 years after his first work, in 1912, he produced the first piece to enter into the canon of art history, *Nude Descending Staircase*.

Because Duchamp was so aware of the principles underlying transformative creativity, he consciously strove to ensure that each of his works had a transformative quality and introduced a new general idea about the nature of art. In 1920, his invention of a female alter ego, Rose Selavy, pushed the boundaries of authorship; his *Rotary Glass Plates* (1920) introduced the kinetic element to sculpture; *The Bride Stripped Bare by Her Bachelors, Even* (1915–23), known as *Large Glass* (see Figure 8), challenged fundamental tenets of a painting—it was wedged between glass panels and suspended mid-room as a vertical diptych; his *Box in a Valise* (1938–41),

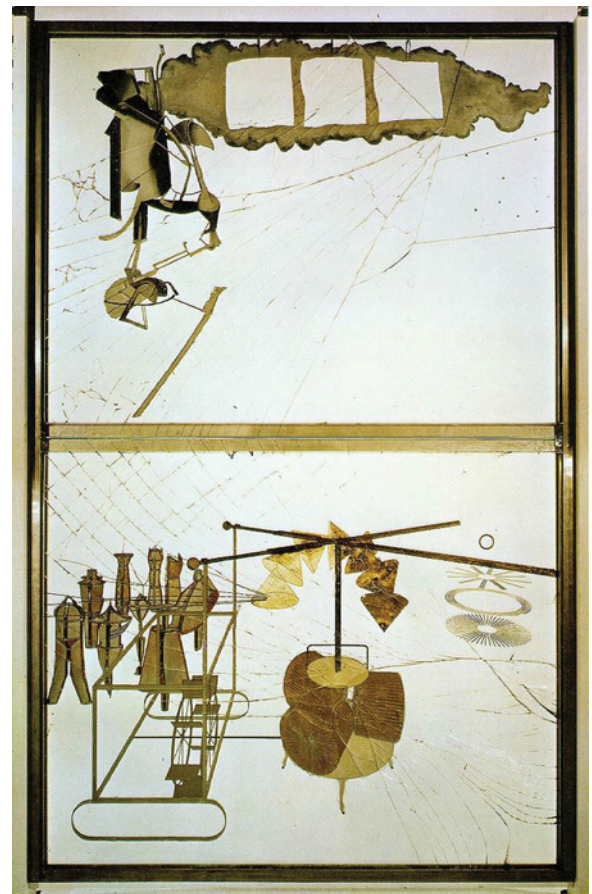


FIGURE 8 Marcel Duchamp, *The Bride Stripped Bare by Her Bachelors, Even* (*The Large Glass*), (1915–23). (Figure is provided in color online.)

presented the world with a portable museum of miniatures; and *Etant donnés* (1946–1966) surprised its viewers as a tableau visible only through peepholes.

Gardner (1993) observed that the 10-year-rule does not merely apply to the production of a first masterpiece, but that significant periods of time pass between the most original and surprising works of an artist; “independent of the number of discrete works issued by an individual, there may be a limit to the number of genuinely innovative works or ideas that an individual can produce in a finite period of time” (p. 372). Duchamp agreed: “I’ve noticed that most artists only repeat themselves. This is necessary, however, you can’t always be inventive” (Cabanne, 1971, p. 98). He, himself, wisely refused to follow this pattern: “I did as few things as possible, which isn’t like the current attitude of making as many as you can, in order to make as much money as possible” (Cabanne, 1971, p. 95).

CHANCE—THE REAL MUSE

Cultivating indifference may help to bypass stereotypical modes of thought, yet one can never fully escape the boundaries of one’s conceptual spaces. They inherently limit the range of computational possibilities minds can make, and determine what can be thought and what remains simply unthinkable. There is, however, one heuristic that can breach this barrier: chance, which, by definition, is indifferent and beyond taste, habit, and value. Harnessing chance as part of the creative process can, therefore, vastly enhance the probability for a bisociation of matrices that is truly original (Simonton, 2004, 2007; Weisberg & Hass, 2007). To allow chance to reveal itself, one must provide as many docking sites as possible. Having many simultaneously activated mental representations helps, for example, because it increases the probability of chance intersecting with a mental pathway in a meaningful way, as does the indifferent state of mind that Duchamp aspires to, for it diffuses and enlarges the grid of conceptual spaces. “Chance favours the prepared mind,” as Louis Pasteur wisely observed (Knowles & Partington, 1999, p. 849).

Duchamp’s open-mindedness allowed him to transform a chance encounter with a thick piece of glass into an alternative type of painting palette, which, in turn, led to his discovery that colours look very different when they are protected from oxidization (Cabanne, 1971, p. 41). This serendipitous event directly inspired the revolutionary *Large Glass*. Chance struck again, when *Large Glass* was carelessly moved in a truck and rattled about for 40 miles, causing cracks to appear; they created a delicate and fluid pattern that flows seamlessly across the two rigid rectangles that comprise *Large Glass*. The cracks not only perfectly foreground the work’s

glass-ness, but resonate with its erotic theme, and the frozen immobility of its depicted mechanical apparatuses. “When one sees the ‘Large Glass,’ one doesn’t imagine it intact at all,” Cabanne observed to Duchamp, who replied, “No. It’s a lot better with the breaks, a hundred times better. . . . I have ended up loving [the intervention of chance]” (Cabanne, 1971, pp. 75–76).

Duchamp was so passionate about chance that it became one of his most important compositional devices. In *Three Standard Stoppages* (1913–1914), for example, Duchamp let a perpendicular one-meter-long thread fall from the height of one meter onto a horizontal canvass, “twisting as it pleases” (Duchamp, 1975a, p. 33), and then immobilized the idiosyncratic deformation of the thread by cutting the canvas around it, thereby creating new units for measuring a metre—a wonderfully humorous and elegant paradox. Such “canned chance” (Cabanne, 1971, p. 47) became a hallmark not only for Duchamp, but the entire Dada movement, who recognized the tremendous creative potential of using aleatoric principles. “Chance,” Dadaist Hans Richter (1888–1976) argued, “must be recognized as a new stimulus to artistic creation” (Richter, 1965/1978, pp. 15–16).

In the domain of science, chance has always been recognized as a transformative factor. Alexander Fleming, for example, discovered the antibacterial properties of penicillin quite unintentionally, by leaving his laboratory an untidy mess before embarking on an extensive vacation (Simonton, 2004, p. 9). Upon his return, his petri dishes had been covered by fungi and mould. On closer examination, he realized that the fungi could not expand into the areas of the petri dish covered by a certain type of mould. This, Fleming discovered, was due to the mould’s antibacterial properties—it was penicillin. Although his original investigations into staphylococci as a potential cure for typhoid remained unsuccessful, he managed to develop an antibiotic that cured scarlet fever, pneumonia, gonorrhoea, meningitis, and diphtheria. Pasteur’s aphorism is doubly applicable in this case, for not only did this discovery require the prepared mind of a pharmacologist, but chance also favored the prepared environment. The messiness of Fleming’s laboratory—similar to the defocused and indifferent mind of the creative thinker—allowed chance to reveal itself in unsuspecting ways; a more conscientious scientist may have poisoned serendipity with soap and water. Other examples of chance discoveries that significantly impacted on the course of cultural evolution include the interference of light, laughing gas, anaesthesia, electromagnetism, ozone, photography, dynamite, phonography, vaccination, saccharin, x-rays, radioactivity, classical conditioning, vitamin K, Teflon, Velcro, and the New World (Simonton, 2004, p. 9).

Although scientists very readily acknowledge the role of chance in creative discoveries, art historians are much

less appreciative of this formidable muse. T. J. Demos, for example, discussed Hans Arp's series of chance-based collages (see Figure 9)—composed by tossing clippings of coloured paper—as signifying “a profound doubt toward his own self as a creative subject: ‘cerebral intention’ would be abolished from his work” (Demos, 2005, p. 21), thus leading to “the denial of the singularity of artistic identity” (p.22). Demos noted that “while abstraction typically calls up the principles of purification and singularity, embracing originality and immanence, the readymade elements signal their very denial, instead eliciting the forces of heterogeneity, repetition, and mass production” (p. 22).

Although Demos' argument certainly accords with classic, romantic and psychoanalytic notions of creativity, abdicating from cerebral intentions can, in fact, enhance artistic identity. Intentions are fundamentally anticreative, as they focus attention, limit the exploration of conceptual spaces to well-trodden paths, and remain oblivious to the range of ideas and stimuli that a disinterested mind remains receptive to. Indeed, to understand Dada itself, one must abdicate from cerebral intentions if one is to make sense of Dada's nonsense, for it marks such a fundamental departure from the Western understanding of creativity and of human identity itself. Duchamp

provided good advice in this regard, because he was so acutely aware of the mind's difficulty in making conceptual leaps:

If someone brings me something extremely new, I'd be the first to want to understand it. But my past makes it hard for me to look at something, or to be tempted to look at something; one stores up in oneself such a language of tastes, good or bad, that when one looks at something, of that something isn't an echo of yourself, then you do not even look at it. But I try anyway. I've always tried to leave my old baggage behind, at least when I look at a so-called new thing. (Cabanne, 1971, p. 94)

Any radical conceptual shift causes outrage, unease, and misunderstanding, but the conceptual shift that Dada requires is more demanding still, for it does not push the boundaries of art, but backtracks and retreats to a much more basic level of cultural evolution. Original member Marcel Janco compared Dada to a “tabula rasa” (1971/2007, p. 36), and Richard Hülsenbeck (1920/1988) wrote that “there was something in the air of ageing Europe that demanded an attempt . . . to return to the old possibilities, from which, it was realized, the various styles had emanated hundreds of years ago” (p. 32). The baggage that had to be discarded involved not merely that of the previous generation, but of centuries; Dada stripped art quite literally of all habit, taste, and convention and laid bare creativity in its most basic form.

Traditionally, only scientists could enlist empirical support for their creative endeavours; artistic innovations, as Duchamp observed, have had to rely on society to sort the sugar from the molasses. The emergence of creativity as a field of scientific enquiry questions this old wisdom, and there remains a tremendous potential for instantiating scientific research on creativity into art historical methodologies. Dada's portrayal as nihilistic, neurasthenic, and bellicose ignores the procreative effusion of the seemingly anti-art, and conceals the watershed that Dada marks in the development of an enlightened and modern theory of creativity.

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FIGURE 9 Hans Arp, *Arranged According to the Laws of Chance* (ca. 1917). (Figure is provided in color online.)

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