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UNDERSTANDING CREATIVITY

David W. Galenson

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ABSTRACT

The discipline of economics has traditionally refused to study the behavior and achievements of specific individuals. Yet creativity – a primary source of the technological change that drives economic growth – is largely the domain of extraordinary individuals or small groups. For the first time in the history of the discipline, within the last decade economists have begun to study how these extraordinary individuals make their discoveries, and the results have been dramatic.

Research done to date has demonstrated that artistic innovators can usefully be divided into two types. Experimental innovators seek to record their perceptions. They proceed tentatively, by trial and error, building their skills gradually, and making their greatest contributions late in their lives. In contrast, conceptual innovators use their art to express ideas and emotions. The precision of their goals allows them to plan their work, and execute it decisively. Their most radical new ideas, and consequently their greatest innovations, occur early in their careers.

The research that has established these patterns has several central components. A key element is the systematic measurement of an artist's creativity over the course of the life cycle: this not only establishes when the artist made his greatest contribution, but also provides an objective identification of his greatest innovation. This facilitates another key element of the research, the categorization of the artist as experimental or conceptual. This effectively depends on whether the artist works inductively, building his contribution incrementally from observation, or deductively, creating his innovation as a consequence of a new idea.

These patterns have been established empirically, by a large number of studies of important practitioners of a wide range of arts. It is now time to extend economic research on creativity, by applying this analysis to other intellectual domains. It is important to recognize that economists' failure to study individuals has prevented them from understanding the sources of the contributions of the most productive people in our society. Breaking this disciplinary taboo may now allow us not only to understand, but perhaps also to increase, the creativity of these remarkable individuals, and to help others to follow them.

David W. Galenson
Department of Economics
University of Chicago
1126 East 59th Street
Chicago, IL 60637
and NBER
galenson@uchicago.edu

Introduction

Economists have long believed that innovation is a primary source of economic development: their theoretical models consistently identify technological change as a key engine of economic growth, and their empirical studies regularly confirm that innovation is a leading source of improving standards of living. Most innovations are made by individuals – artists, scholars, scientists, entrepreneurs – or by small groups working together. Nobel prizes and many other celebrated honors recognize the vast contribution of these individuals to our society and economy. In view of the enormous importance of innovation, we might naturally assume that economists would devote a great deal of attention to understanding the methods these extraordinary individuals use to produce their discoveries: how artists create masterpieces, how medical scientists develop vaccines and treatments for diseases, how scholars devise new methods of inquiry and analysis, how engineers and entrepreneurs create new technologies and products. Remarkably, however, this is not the case; economists have shown virtually no interest in the technologies underlying the vast productivity of these exceptional individuals. It is past time to recognize that economists' refusal to study individuals is a disciplinary prejudice that will prevent us from ever understanding how gifted innovators increase the productive capacity of our economy, and even worse, that may consequently prevent us from increasing the creativity of the most productive people in our society.

Great artists themselves have occasionally touched on the question of how they effectively accomplish what medieval alchemists failed to do, in turning such base materials as canvas and paint into objects worth large quantities of gold. A famous instance occurred in 1878,

when in the course of a libel suit he had brought against a critic, the painter James McNeill Whistler was challenged to justify the high price of his work. When asked by opposing counsel whether he really charged purchasers of his paintings the large sum of 200 guineas for the labor of just two days, Whistler replied, “No, I ask it for the knowledge of a lifetime.”¹ In 1884, Vincent van Gogh suggested a very different source for artistic value, when he wrote to a fellow painter of his belief that “art is something greater and higher than our own adroitness or accomplishments or knowledge;...art is something which although produced by human hands, is not created by these hands alone, but something which wells up from a deeper source in our souls.”² In 1961, Piero Manzoni contended that artistic value was a product of “something intimate, something truly personal from the artist,” so he made a series of small sealed cans, each numbered and signed by the artist, titled *Merda d’artista*, with labels reading “Contents: 30 gr. net; freshly preserved.” In an apparent nod to alchemy, Manzoni sold these cans at prices equal to the current market value of 30 grams of gold.³

Whether artistic innovations – or those in other intellectual domains – stem from the accumulation of human capital, divine intervention, or some other, more organic source, is an important question. Recent studies have taken significant steps toward a systematic understanding of human creativity. This work has focused on the arts. We can briefly summarize the nature of the investigations before describing their results.

Artistic Importance

A critical initial step in studying artistic creativity is to avoid the widespread confusion over what determines the quality of art. Although many different attributes of art can be considered, the overall importance of art is a function of innovation. Important artists are

innovators whose work changes the practices of their successors; important works of art are those that embody innovations. Artists have made innovations in many areas, including subject matter, composition, style, materials, and technique. But whatever the nature of an artist's innovation, its importance, and that of the artist, ultimately depends on the extent of its influence on other artists. Recognition of this relationship allows us to measure the timing of an artist's creativity by determining when in his career he produced his best work.

Process

The research I have done to date has several components. A central element is the systematic measurement of an artist's creativity over the course of the life cycle. For painters, this began with regression estimation of age-price profiles for individual artists, that used auction data to measure the value of an artist's work throughout his career. To test the robustness of these results, this market evidence on prices was then complemented by data that effectively surveyed the opinions of art scholars on the importance of an artist's work over the course of his career. The two main sources for this were the illustrations of the work of each artist reproduced in all available textbooks of art history, and the paintings selected for inclusion in major retrospective exhibitions of the artist's work.

These three sources tend to agree closely in identifying each artist's peak period. So for example the highest average price of paintings by Paul Cézanne sold at auction during 1970-97, holding constant support, size, and sale date, was for those he executed at age 67. Paintings from that age – the last year of his life – were also illustrated more frequently than those from any other year in 33 textbooks published in English since 1968, as well as in 31 textbooks published in French since 1963. And the most recent retrospective exhibition of Cézanne's work in 1996

included more paintings he produced at age 67 than in any other year. The estimated age-price profile for Pablo Picasso peaked at age 26, the same age from which both sets of textbooks included the largest number of illustrations of his work, and the same age from which the latest full retrospective of his work, in 1980, presented the largest number of his paintings.⁴

I have now extended the measurement of individual artists' creative life cycles to other arts. For poets, I compiled age distributions of the poems reprinted in large numbers of anthologies. For novelists, I measured the amount of space devoted to individual novels in scholars' studies of each writer's oeuvre. For architects, sculptors, and photographers, I analyzed the age distributions of works illustrated in textbooks, as for painters. For movie directors, I used surveys of critical evaluations of individual films, including polls of large numbers of critics and directors.⁵

Measurement of an artist's life cycle of creativity immediately allows the identification of his greatest innovation, or innovations. For each artist, it is important to study the work executed at these times, in order to understand what the artist's most important innovation was, and why this was the case. Understanding the latter requires analysis of whom the innovation influenced, and how.

Identifying and understanding an artist's major contribution facilitates categorization of the artist. I have discovered that important artists can be divided into two types, on the basis of differences in their goals, methods, and achievements. *Experimental* innovators seek to record their perceptions. They work tentatively, by trial and error. The imprecision of their goals rarely allows them to feel they have succeeded, so they often have trouble finishing individual works, and generally spend their careers pursuing a single objective. They consider making art a process

of searching, in which they wish to make discoveries in the course of executing their works. They build their skills gradually, and their innovations appear incrementally in a body of work. In contrast, *conceptual* innovators use their art to express ideas or emotions. Their goals are precise, so they plan their works, and execute them systematically. Their innovations are conspicuous, transgressive, and often irreverent. These innovations appear suddenly, as a new idea produces a result different not only from other artists' work, but also from the artist's own previous work.

Categorization is normally straightforward once the artist's peak period, and the nature of his innovation, are known. So for example late in his life Cézanne painted visually, from a model, and directly, without preparatory drawings, and thus he was clearly an experimental innovator. In contrast, Picasso did not work from models – he explained that he painted what he knew, not what he saw – and he planned his paintings carefully, with preparatory studies and meticulous underdrawing. Cubism, his great early innovation, did not imitate the appearance of objects, but represented them symbolically. Picasso thus was clearly a conceptual innovator.

It was not accidental that the experimental Cézanne made his greatest contribution late in his life, or that the conceptual Picasso made his very early in his career. The long periods of trial and error typically required for important experimental innovations generally cause them to occur late in an artist's life. Radical conceptual innovations depend on the ability to recognize the gains from extreme departures from existing conventions, and this ability declines with experience, as fixed habits of thought develop. The most important conceptual innovations consequently occur early in an artist's career.

Once artists are categorized, these predictions about the timing of their life cycles can be

tested in light of the measurement of their creative life cycles. In addition to determining whether conceptual artists tend to make their greatest contributions earlier in their careers than their experimental counterparts, other implications of the analysis can be considered. So for example the clarity of their goals means that conceptual artists are more likely to conceive and produce dominant individual works, whereas experimental artists often produce bodies of work in which no single piece emerges as the most important. The greatest individual masterpieces in our history are consequently disproportionately the products of conceptual innovators.⁶

Products

The results of my research can be illustrated through reference to the methods and innovations of important practitioners of each of the arts I have studied. In each case, these individuals were included in larger samples of prominent practitioners of these arts, so analyses of the careers of other important figures in each art can be found in the studies cited below.

Paul Cézanne (1839-1906) was an experimental painter, who declared “I seek in painting.”⁷ He was perennially frustrated with his inability to achieve the vague goal he referred to as “realization,” and less than a month before his death, he wrote to his son that “I am so slow in expressing myself that it makes me very sad.”⁸ Ironically, when he wrote these words he was working on the paintings that embodied new means of representing the process of perception that would directly influence the greatest discoveries of Picasso, Matisse, and virtually every other important artist of the next generation. In contrast, Pablo Picasso (1881-1973) was a conceptual innovator, who confidently declared “I don’t seek; I find.”⁹ At the age of 26, he painted *Les Femmes d’Alger*, which declared a radical new symbolic representation of forms and space and which initiated Cubism, the most revolutionary stylistic innovation since the

Renaissance. The *Demoiselles* has been widely recognized by art scholars as “the watershed between the old pictorial world and the new,” and is illustrated in more textbooks of art history than any other work of the modern era.¹⁰

Auguste Rodin (1840-1917) was an experimental sculptor, who believed that “art is only a close study of nature.”¹¹ He was committed to the conviction that good art required patience: “only slowly, little by little, by continual effort, can one make anything well.”¹² His single sculpture that is most frequently reproduced in art history textbooks is his *Monument to Balzac*, which he completed at the age of 58, and considered the “result of a lifetime of effort.”¹³ Robert Smithson (1938-1973) was a conceptual sculptor, who considered that “an object...is the product of a thought.”¹⁴ Early in his career Smithson invented a new genre of art called *earthworks*, large structures that he and other artists would create in, and from, the landscape, often in remote areas. At the age of 32, he hired a contractor to move more than 6,000 tons of mud and rock to create a 1,500-foot-long promontory at the north end of Great Salt Lake. *Spiral Jetty* is now illustrated in more textbooks of art history than any other work ever produced by an American artist, and it secured Smithson’s fame in spite of his premature death only three years later, in the crash of the small plane from which he was filming his plan for a new earthwork.¹⁵

Virginia Woolf (1882-1941) was an experimental novelist, who confessed in her diary that she was never able to reach any definitive conclusion: “I have some restless searcher in me.” She did not believe in fixed vantage points, for “if honestly examined life presents question after question.”¹⁶ Her work is valued for her graceful prose and the realism and subtlety of her characters. Just a week before she finished *To the Lighthouse*, she noted in her diary that she did not know how to conclude it, but was “casting about for an end;” the novel, written when she

was 44, is now generally considered her most important.¹⁷ F. Scott Fitzgerald (1896-1940) wrote *The Great Gatsby*, which many scholars consider the greatest novel ever written by an American, at the age of 29.¹⁸ *Gatsby* was a conceptual masterpiece, that used lyrical prose and simplified characters in the service of an allegorical plot. Fitzgerald's fiction deteriorated precipitously after *Gatsby*. Like many other conceptual writers late in their lives, he wondered where his gift had gone, as in a letter to his daughter, he observed that "The talent that matures early is usually of the poetic, which mine was in large part."¹⁹

T.S. Eliot (1888-1965) wrote "The Love Song of J. Alfred Prufrock," one of the most important American poems of the twentieth century, at the age of 23, while he was a graduate student in philosophy at Harvard, and he wrote *The Waste Land*, widely considered the greatest American poem of the century, at 34. In contrast, Robert Frost (1874-1963) wrote his most frequently anthologized poem, "Stopping by Woods on a Snowy Evening," at the kitchen table of his Vermont farm at 48. Eliot was a conceptual poet: the writer Malcolm Cowley observed that he regarded his poems "as intellectual problems – having solved one problem, he devoted himself to another."²⁰ Frost, an experimental poet who was inspired by the real speech of residents of rural New England, explained that his art was the product of listening: "I would never use a word or combination of words that I hadn't *heard* used in running speech."²¹

Le Corbusier (1887-1965), wrote a book titled *Creation Is a Patient Search*, and late in his life described himself as "A visual man, working with his eyes and his hands."²² His primary concern for his buildings always involved their appearance, for he valued beauty above all. He was an experimental innovator, whose greatest achievements came late in his life: he completed the chapel of Notre Dame du Haut at Ronchamp at 63, and it is illustrated in more textbooks of

the history of art and architecture than any other building of the twentieth century. The chapel's bulging, curved roof, which has inspired generations of younger architects to experiment with irregular forms, was suggested by the shape of a crab shell Le Corbusier found on the beach. Renzo Piano (1937-) achieved instant fame in 1971, at the age of 34, when he and his 38-year-old partner Richard Rogers won a competition to design a new Parisian cultural center. Their design embodied the idea of the building as a machine, made from standardized parts, that could readily be adapted to a variety of uses, and the appearance of the building mimicked a factory. Many observers were outraged by the building's intrusion on an old Paris neighborhood, and Piano himself has described the Pompidou Center, which remains the conceptual architect's most famous building, as "a huge joke, a kind of face pulled at the cultural establishment."²³

There is remarkably widespread agreement that *Citizen Kane* is the most important movie ever made: so for example it has placed first in each of the five decennial polls the British Film Institute has conducted of movie critics since 1962. The film was directed and coauthored by Orson Welles (1915-1985), when he was just 26. It was Welles' first film, and is a conceptual masterpiece: thus the French director François Truffaut remarked that "when I see *Kane* again for perhaps the thirtieth time, it is its twofold aspect as fairy tale and moral fable that strikes me most forcefully."²⁴ John Ford (1894-1973) received the first Life Achievement Award ever given by the American Film Institute; the citation declared that "No individual has more fully explored on film the American experience." Interestingly, however, the citation did not mention any of Ford's movies by name, but referred to them collectively as "a creative tapestry representing over 50 years of work."²⁵ Ford believed that "Pictures, not words, should tell the story," and he was celebrated for his skillful use of images: thus Alfred Hitchcock stated that "A John Ford film

was a visual gratification.”²⁶ Ford’s experimental craftsmanship grew over time, and his film that received the most votes in the 2002 British Film Institute poll of critics, *The Searchers*, was made when he was 62.

Irving Berlin (1888-1989) was an experimental songwriter whose goal was to write songs so simply and clearly that they would be whistled and sung by millions of people. At the age of 54, he wrote “White Christmas,” which became the top-selling popular song in history. Berlin believed that its success was a result of his development of the ability, after decades of painstaking effort, to write “in the simplest way...as simple as writing a telegram.”²⁷ In 1965, at the age of 24, Bob Dylan (1941-) wrote “Like a Rolling Stone.” Dylan described the song as his breakthrough into “a whole new category.”²⁸ “Like a Rolling Stone” rejected the traditional clarity and universality of popular music, using a novel synthesis of folk music, blues, and Symbolist poetry to create a personal, complex song that became a radical new model for rock music. It led directly to the introspective and elusive imagery of the Beatles’ *Sgt. Pepper’s Lonely Hearts Club Band*, and inspired generations of singer-songwriters.²⁹ When Dylan was inducted into the Rock and Roll Hall of Fame in 1988, the singer Bruce Springsteen hailed him for creating a conceptual revolution: “Bob freed your mind the way Elvis freed your body. He showed us that just because the music was innately physical did not mean that it was anti-intellectual.”³⁰

Alfred Stieglitz (1864-1946) declared at the age of 28 that “My sole aim in making pictures is to reproduce what I see,” and more than three decades later, at 60, he complained, “Could I but photograph what I *see!*”³¹ His goal was to use photography to make people aware of the beauty around them, and he never wavered in his experimental belief in the importance of

experience, as late in his life he wrote that “My teachers have been life – work – experiment.”³² He made *The Steerage*, his most celebrated photograph, at 43. Cindy Sherman (1954-) went to college intending to become a painter, but a course in photography changed her mind: “I realized I could just use a camera and put my time into an idea instead.”³³ The year after she graduated from college, Sherman began to make the series of 69 photographs, collectively called the *Untitled Film Stills*, that made her the most influential artist of the late 20th century; each picture portrayed Sherman, alone, wearing a different costume, in settings that appeared to be taken from movies of the 1940s and ‘50s. The conceptual Sherman intended the *Stills* as a comment on “the fakeness of role-playing,” and they inspired many young conceptual artists to produce works that told stories.³⁴ Sherman completed the *Stills* at the age of 25.

These examples have now been multiplied many times over by systematic studies of innovative individuals. The regularity with which artists whose goal is to represent their perception of an external world make their greatest contributions late in their lives, after long periods of development, and that with which artists who wish to express their own ideas make their greatest contributions early in their careers, before they have adopted existing conventions and developed fixed habits of thought, have made it clear that these are consistent patterns.

Applications

It may be valuable now to consider undertaking studies that apply the economic analysis of creativity to solve significant problems. I have done one large-scale study of this kind, also in the area of the arts. Specifically, in a new book I have offered a reinterpretation of the history of art in the twentieth century. What I discovered is that experimental and conceptual innovators had coexisted on relatively even terms for centuries, during which all their innovations were

constrained by the artists' need to satisfy powerful patrons – individuals or institutions – who effectively controlled the demand for advanced art. This situation changed in the late nineteenth century, as a government monopoly of the market for fine art was replaced by a competitive market. With this new market structure, artists gained unprecedented freedom. Dealers and collectors soon recognized that the most innovative art would in time become the most valuable. In a market setting that rewarded conspicuous innovation, conceptual artists who could innovate rapidly and decisively gained a clear advantage over their experimental counterparts. The art of the twentieth century became completely different from that of all earlier times, as artists produced a rapid sequence of conceptual revolutions, that continue today.³⁵

Many possible applications of the experimental-conceptual analysis of creativity lie outside the arts. One obvious possibility is in the study of business. It may be more difficult to measure the creative life cycles of entrepreneurs, because the innovations of individuals cannot always be disentangled from those of others within firms. The journalist Malcolm Gladwell has suggested one possible solution to this problem, by treating entire firms as experimental or conceptual: in his example, “Apple is Picasso; Dell is Cézanne.”³⁶ In today's frenetic world of instant internet links, in which Bill Gates, Steve Jobs, Sergey Brin, Larry Page, and a long line of other young geniuses have gained fame and fortune at very early ages, it might be tempting to think that great entrepreneurs are all necessarily conceptual innovators. Yet this is clearly not the case. In 1974, Muhammad Yunus was happily teaching economic theory at provincial Chittagong University in Bangladesh, when a devastating famine struck. He recalled that he began to dread his own lectures: “What good were all my complex theories when people were dying of starvation on the sidewalks and porches across from my lecture hall?” In desperation,

Yunus put aside his theories and textbooks, and went to talk to suffering villagers about their problems. In his book *Banker to the Poor*, he tells us that “The poor taught me an entirely new economics.” In classic experimental language, Yunus recalled that when he first began making small loans to the poor, violating the fundamental banking premise of collateral, “I did not know if I was right. I had no idea what I was getting into. I was walking blind and learning as I went along.”³⁷ In 1983, when he was 43 years old, Yunus founded the Grameen Bank on the pragmatic experimental belief that experience is a better guide than theory. Today, Grameen is the largest bank in Bangladesh, and in 2006 Yunus and the Grameen Bank shared the Nobel Peace Prize for their success in reducing poverty.

The economic analysis of creativity may have significant applications in a number of other domains, including notably education. Its value in these other spheres remains to be demonstrated. Yet perhaps the central point to emphasize in closing is that the study of creativity by economists is a very new activity. We do not know whether, and how much, it will help us to increase the contributions of innovative individuals. The only certainty is that if economists choose to continue to ignore the subject of creativity, they will make no contribution to understanding – and perhaps increasing – it.

Footnotes

This paper was prepared for the Center for Creativity Economics, Universidad del CEMA, Buenos Aires, to be inaugurated in August, 2010. I thank Carlos Rodriguez, president of Universidad del CEMA, for the opportunity.

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