The goal of the *Handbook of Creativity* is to provide the most comprehensive, definitive, and authoritative single-volume review available in the field of creativity. To this end, the book contains 22 chapters covering a wide range of issues and topics in this field, all written by distinguished leaders. The chapters are intended to be accessible to all readers with an interest in creative thinking. Although the authors are leading behavioral scientists, people in all disciplines will find the coverage of creativity in the arts and sciences to be of interest. The volume's first part sets out the major themes and reviews the history of thinking about creativity. Subsequent parts deal with methods, origins, self and environment, special topics, and conclusions.

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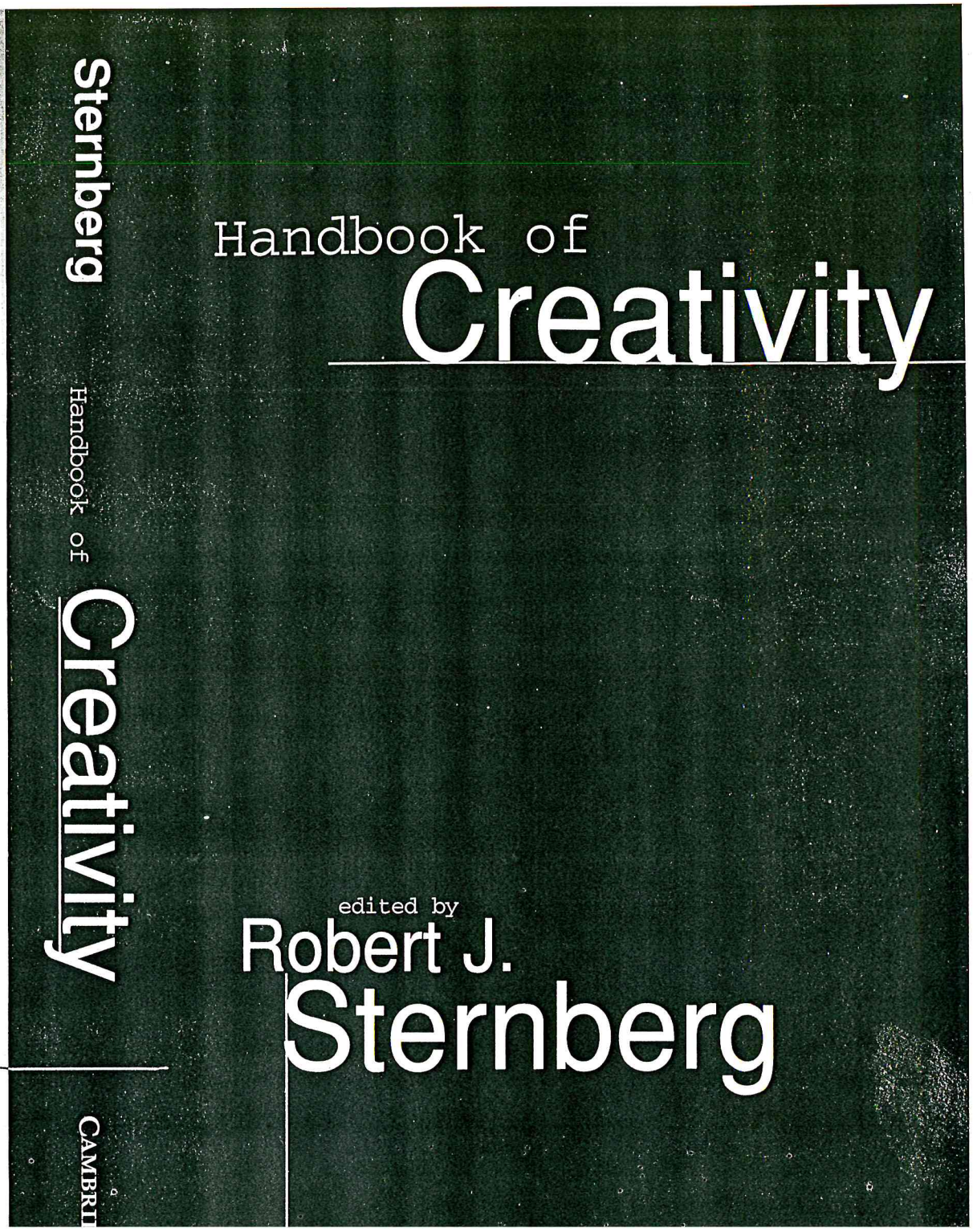

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16 *Implications of a Systems Perspective for the Study of Creativity*

MIHALY CSIKSZENTMIHALYI

Psychologists tend to see creativity exclusively as a mental process. In this chapter, I will propose that such an approach cannot do justice to the phenomenon of creativity, which is as much a cultural and social as it is a psychological event. To develop this perspective, I will use a "systems" model of the creative process that takes into account its essential features.

Creativity research in recent years has been increasingly informed by a systems perspective. Starting with the observations of Morris Stein (1953, 1963) and the extensive data presented by Dean Simonton (1988, 1990) showing the influence of economic, political, and social events on the rates of creative production, it has become increasingly clear that variables external to the individual must be taken into account if one wishes to explain why, when, and where new ideas or products arise from and become established in a culture (Gruber, 1988; Harrington, 1990). Magyari-Beck (1988) has gone so far as to suggest that because of its complexity, creativity needs a new discipline of "creatology" in order to be thoroughly understood.

The systems approach developed here has been described before and applied to historical and anecdotal examples, as well as to data collected to answer a variety of different questions (Csikszentmihalyi, 1988b, 1990, 1996; Csikszentmihalyi, Rathunde, & Whalen, 1993; Csikszentmihalyi & Sawyer, 1995; Feldman, Csikszentmihalyi, & Gardner, 1994). In the present context, I will expand the model more rigorously and develop its implications for a better understanding of how the work of genius can be studied.

WHY IS A SYSTEMS APPROACH NECESSARY?

When I started studying creativity more than 30 years ago, like most psychologists I was convinced that it consisted of a purely intrapsychic process. I assumed that one could understand creativity with reference to the thought processes, emotions, and motivations of individuals who produced novelty. But each year the task became more frustrating. In our longitudinal study of artists, for instance, it became increasingly clear that some of the potentially most creative persons stopped doing art and pursued ordinary occupations, while others who seemed to lack creative personal attributes persevered and eventually produced works of art that were hailed as important creative achievements (Csikszentmihalyi, 1990; Csikszentmihalyi & Getzels, 1988; Getzels & Csikszentmihalyi, 1976). To use just a single example, young women in art school showed as much creative potential as their male colleagues, or even more. Yet 20 years later, not one of the cohort of women had achieved outstanding recognition, whereas several in the cohort of men did.

Psychologists have always realized that good new ideas do not automatically translate into accepted creative products. Confronted with this knowledge, one of two strategies can be adopted. The first was articulated by Abraham Maslow (1963) and involves denying the importance of public recognition. In his opinion it is not the outcome of the process that

counts, but the process itself. According to this perspective a person who reinvents Einstein's formula for relativity is as creative as Einstein was. A child who sees the world with fresh eyes is creative; it is the quality of the subjective experience that determines whether a person is creative, not the judgment of the world. While I believe that the quality of subjective experience is the most important dimension of personal life, I do not believe that creativity can be assessed with reference to it. If creativity is to retain a useful meaning, it must refer to a process that results in an idea or product that is recognized and adopted by others. Originality, freshness of perceptions, divergent-thinking ability are all well and good in their own right, as desirable personal traits. But without some form of public recognition they do not constitute creativity. In fact, one might argue that such traits are not even necessary for creative accomplishment.

In practice, creativity research has always recognized this fact. Every creativity test, whether it involves responding to divergent-thinking tasks or whether it asks children to produce stories or designs with colored tiles, is assessed by judges or raters who weigh the originality of the responses. The underlying assumption is that an objective quality called "creativity" is revealed in the products, and that judges and raters can recognize it. But we know that expert judges do not possess an external, objective standard by which to evaluate "creative" responses. Their judgments rely on past experience, training, cultural biases, current trends, personal values, idiosyncratic preferences. Thus, whether an idea or product is creative or not does not depend on its own qualities, but on the effect it is able to produce in others who are exposed to it. Therefore it follows that what we call creativity is a phenomenon that is constructed through an *interaction between producer and audience.* Creativity is not the product of single individuals, but of social systems making judgments about individuals' products.

A second strategy that has been used to accommodate the fact that social judgments are so central to creativity is not to deny their importance, but to separate the process of creativity from that of persuasion, and then claim that both are necessary for a creative idea or product to be accepted (Simonton, 1988, 1991, 1994). However, this strategem does not resolve the epistemological problem. For if you cannot persuade the world that you had a creative idea, how do we know that you actually had it? And if you do persuade others, then of course you will be recognized as creative. Therefore it is impossible to separate creativity from persuasion; the two stand or fall together. The impossibility is not only methodological, but epistemological as well, and probably ontological. In other words, if by creativity we mean the ability to add something new to the culture, then it is impossible to even think of it as separate from persuasion.

Of course, one might disagree with this definition of creativity. Some will prefer to define it as an intrapsychic process, as an ineffable experience, as a subjective event that need not leave any objective trace. But any definition of creativity that aspires to objectivity, and therefore requires an intersubjective dimension, will have to recognize the fact that the audience is as important to its constitution as the individual to whom it is credited.

AN OUTLINE OF THE SYSTEMS MODEL

Thus, starting from a strictly individual perspective on creativity, I was forced by facts to adopt a view that encompasses the environment in which the individual operates. This environment has two salient aspects: a cultural, or symbolic, aspect which here is called the domain; and a social aspect called the field. Creativity is a process that can be observed only at the intersection where individuals, domains, and fields interact (Figure 16.1).

The domain is a necessary component of creativity because it is impossible to introduce a variation without reference to an existing pattern. "New" is meaningful only in reference to

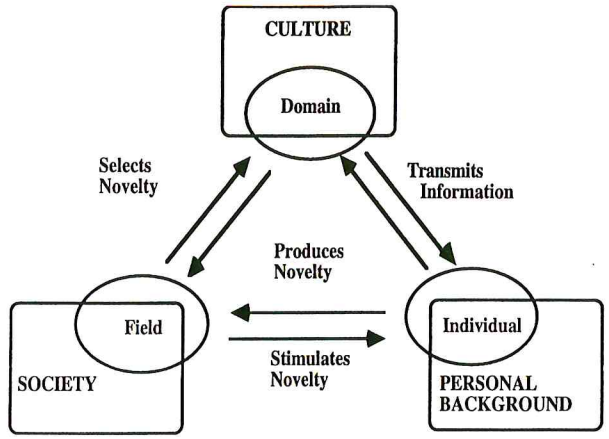

Figure 16.1. The systems view of creativity. For creativity to occur, a set of rules and practices must be transmitted from the domain to the individual. The individual must then produce a novel variation in the content of the domain. The variation then must be selected by the field for inclusion in the domain.

the "old." Original thought does not exist in a vacuum. It must operate on a set of already existing objects, rules, representations, or notations. One can be a creative carpenter, cook, composer, chemist, or clergyman because the domains of woodworking, gastronomy, music, chemistry, and religion exist and one can evaluate performance by reference to their traditions. Without rules there cannot be exceptions, and without tradition there cannot be novelty.

Creativity occurs when a person makes a change in a domain, a change that will be transmitted through time. Some individuals are more likely to make such changes, either because of personal qualities or because they have the good fortune to be well positioned with respect to the domain – they have better access to it, or their social circumstances allow them free time to experiment. For example, until quite recently the majority of scientific advances were made by men who had the means and the leisure: Clergymen like Copernicus, tax collectors like Lavoisier, or physicians like Galvani could afford to build their own laboratories and to concentrate on their thoughts. And, of course, all of these individuals lived in cultures with a tradition of systematic observation of nature and a tradition of record keeping and mathematical symbolization that made it possible for their insights to be shared and evaluated by others who had equivalent training.

But most novel ideas will be quickly forgotten. Changes are not adopted unless they are sanctioned by some group entitled to make decisions as to what should or should not be included in the domain. These gatekeepers are what we call here the field. The term *field* is often used to designate an entire discipline or kind of endeavor. In the present context, however, I want to define the term in a more narrow sense and use it to refer only to the social organization of the domain – to the teachers, critics, journal editors, museum curators, agency directors, and foundation officers who decide what belongs to a domain and what does not. In physics, the opinion of a very small number of leading university professors was enough to certify that Einstein's ideas were creative. Hundreds of millions of people accepted the judgment of this tiny field and marveled at Einstein's creativity without understanding what it was all about. It has been said that in the United States 10,000 people in Manhattan constitute

the field in modern art. They decide which new paintings or sculptures deserve to be seen, bought, included in collections – and therefore added to the domain.

Psychologists involved in creativity research also constitute a field in this sense. This field usually consists of teachers or graduate students who judge the products of children or other students. It is they who decide which test responses, mosaics, or portfolios are to be considered creative. So it is true that creativity tests can measure creativity – as long as it is recognized that what is meant by *creativity* is not a real objective quality, but refers only to the acceptance by a particular field of judges. Such creativity, while part of the domain of creativity research, may have nothing to do with creativity in any other domain outside of it. At every level, from considering Nobel Prize nominations to considering the scribbles of 4-year-olds, fields are busy assessing new products and deciding whether or not they are creative – in other words, whether they are enough of an improvement to deserve inclusion in the domain.

The systems model is analogous to the model that scholars have used to describe the process of evolution. Evolution occurs when an individual organism produces a variation which is selected by the environment and transmitted to the next generation (see, e.g., Campbell, 1976; Csikszentmihalyi, 1993; Mayr, 1982). The variation that occurs at the individual level corresponds to the contribution that a person makes to creativity; the selection is the contribution of the field, and the transmission is the contribution of the domain to the creative process (cf. Simonton, 1988; Martindale, 1989). Thus, creativity can be seen as a special case of evolution; specifically, it is to cultural evolution as the mutation, selection, and transmission of genetic variation is to biological evolution.

In biological evolution it makes no sense to say that a beneficial step was the result of a particular genetic mutation alone, without taking into account environmental conditions. For instance, a genetic change that improved the size or taste of corn would be useless if at the same time it made the corn more vulnerable to drought or disease. Moreover, a genetic mutation that cannot be transmitted to the next generation is also useless from the point of view of evolution. The same considerations apply to creativity when the latter is seen as the form that evolution takes at the cultural level: To be creative, a variation has to be adapted to its social environment, and it has to be capable of being passed on through time.

THE CULTURAL CONTEXT

What we call creativity always involves a change in a symbolic system, a change that in turn will affect the thoughts and feelings of the members of the culture. A change that does not affect the way we think, feel, or act will not be creative. Thus, creativity presupposes a community of people who share ways of thinking and acting, who learn from each other and imitate each other's actions. It is useful to think about creativity as involving a change in memes – the units of imitation that Dawkins (1976) suggested were the building blocks of culture. Memes are similar to genes in that they carry instructions for action. The notes of a song tell us what to sing; the recipe for a cake tells us what ingredients to mix and how long to bake it. But whereas genetic instructions are transmitted in the chemical codes that we inherit on our chromosomes, the instructions contained in memes are transmitted through learning. By and large we learn memes and reproduce them without change; when a new song or a new recipe is invented, then we have creativity.

Memes seem to have changed very slowly in human history. One of the earliest memes was the shape that our ancestors gave to the stone tools they used for chopping, carving, scraping, and pounding. The shape of these flint blades remained almost unchanged during the Paleolithic, or Old Stone Age, for close to a million years – which is roughly $\frac{199}{200}$ of human history. It is not until about 50,000 years ago, during the Upper Paleolithic era, that humans

began to use new tools: blades specialized for performing specific functions, and even tools for making other tools. The first change in the meme of the tool took almost a million years to develop; once this first step was taken, however, new shapes followed each other in increasingly rapid succession. For thousands of generations, men looked at the stone blades they held in their hands, and then reproduced ones exactly like them, which they passed on to their children. The meme of the tool contained the instructions for its own replication. But then someone discovered a more efficient way of chipping stone blades, and a new meme appeared that started reproducing itself in the minds of men, and generating offspring – that is, new tools that had not existed before – which were increasingly different from their parents.

The meme of a flint scraper or a flint axe is part of the domain of technology, which includes all the artifacts that humans use to achieve control over their material environment. Other early domains were those of language, art, music, religion – each including a set of memes related to each other by rules. Since the recession of the last Ice Age about 15,000 years ago, memes and corresponding domains have of course proliferated to an extent that would have been impossible to foresee only a few seconds earlier in evolutionary time. Nowadays the single domain of technology is subdivided into so many subdomains that no single individual can master even a minute fraction of it.

Cultures as a Set of Domains

It is useful in this context to think about cultures as systems of interrelated domains. This is not to claim that culture is nothing but a system of interrelated domains – after all, there are over a hundred different definitions of culture being used by anthropologists, and no single definition can be exhaustive. The claim is simply that in order to understand creativity, it is useful to think of culture in this way. Table 16.1 presents some questions and hypotheses that follow from this definition of culture, and which have a bearing on the understanding of creativity.

Cultures differ in the way that memes (i.e., technical procedures, kinds of knowledge, styles of art, belief systems) are stored. As long as they are recorded orally and can be transmitted only from the mind of one person to another, traditions must be strictly observed so as not to lose information. Therefore, creativity is not likely to be prized, and it would be difficult to determine in any case. Development of new media of storage and transmission (e.g., books, computers) will have an impact on rates of novelty production and its acceptance.

Another dimension of cultural difference is the accessibility of information. With time, people who benefit from the ability to control memes develop protective boundaries around their knowledge, so that only a few initiates at any given time will have access to it. Priestly castes around the world have evolved to keep their knowledge esoteric and out of reach of the masses. Even in the times of the Egyptian civilization, craft guilds kept much of their technical knowledge secret. Until recently in the West, knowledge of Latin and Greek was used as a barrier to prevent the admittance of the masses to professional training. The more such barriers, the less likely it becomes that potentially creative individuals will be able to contribute to a domain.

Similarly, how available memes are also bears on the rate of creativity. When knowledge is concentrated in a few centers, libraries, or laboratories, or when books and schools are rare, most potentially creative individuals will be effectively prevented from learning enough to make a contribution to existing knowledge.

Cultures differ in the number of domains they recognize and in the hierarchical relationship among them. For example, in Western cultures philosophy tended to develop out of religion, and then the other scholarly disciplines separated out of philosophy. For a long time

Table 16.1. *Questions and Hypotheses Concerning How Culture Affects the Incidence of Creativity*

1. How is information stored (e.g., oral vs. written records)?

   The more permanent and accurate the storage, the easier it is to assimilate past knowledge, and hence to be well positioned for the next step in innovation.

2. How accessible is the information (e.g., are there restrictions based on esoteric language, limited training, or inherited status)?

   The more accessible the information, the wider the range of individuals who can participate in creative processes.

3. How available is the information (e.g., is diffusion restricted because of material or social constraints)?

   See Question 2.

4. How differentiated is the culture (i.e., how many separate domains such as religion, philosophy, and mathematics does it contain)?

   The more differentiated the domains that the culture contains, the more specialized the information; hence, advances should be made more readily.

5. How integrated is the culture (i.e., can the contents of the various domains be translated into each other's terms; e.g., is science consistent with religion)?

   The more integrated the culture, the more relevant an advance in one domain will be to the culture as a whole. This may make it more difficult for an innovation in any one domain to be accepted, but once accepted, it will be diffused more readily.

6. How open is the culture to other cultures?

   The more exposed the culture is to information and knowledge from other cultures, the more likely it is that innovation will arise.

religion was the queen of disciplines, and it dictated which memes could be included in different domains; now scholarly domains are much more autonomous, although it could be claimed that mathematics has become the benchmark by which other domains are judged.

The multiplication and gradual emancipation of domains has been one of the features of human history. For a long time almost every aspect of cultural thought and expression was unified in what we would call a religious domain. Art, music, dance, narrative, protophilosophy and protoscience were part of an amalgam of supernatural beliefs and rituals. Now every domain strives to achieve independence from the rest and to establish its own rules and legitimate sphere of authority.

Cultures in which the separate domains are clearly related to each other – and these tend to be the simpler ones – are likely to resist novelty in any one area, since it would involve a readjustment of the entire culture. On the other hand, once a change is accepted in one domain of such a culture, the effect of that change is likely to reverberate across the entire system.

New memes most often arise in cultures that, either because of geographical location or economic practices, are exposed to different ideas and beliefs. The Greek traders collected information from Egypt, the Middle East, the north coast of Africa, the Black Sea, Persia, and even from Scandinavia, and this disparate information was amalgamated in the crucible of the Ionian and Attic city-states. In the Middle Ages, the Sicilian court welcomed techniques and knowledge from China and Arabia, as well as from Normandy. Florence in the Renaissance was a center of trade and manufacture, and so was Venice; later the maritime trade of the Iberian Peninsula, the Netherlands, and Great Britain moved the center of

Table 16.2. *Questions and Hypotheses Concerning How the Domain Affects the Incidence of Creativity*

1. How is information recorded?

   The more clear and accurate the system of notation, the easier it is to assimilate past knowledge, and hence to take the next step in innovation.

2. How well integrated is the information in the domain?

   If the information is very tightly integrated, it might be difficult to change it; but if it is too loosely organized, it will be difficult to recognize valuable innovations.

3. How central is the domain to the culture?

   At different times, one or another domain will take precedence in the culture (e.g., religion in the Middle Ages, physics in the early part of the twentieth century), and it will attract the more talented minds to it, thereby making creativity more likely.

4. How accessible is the domain?

   When because of accident or planning a domain becomes identified with an elite, it becomes more difficult to introduce innovation within it.

5. How autonomous is the domain from the rest of the culture?

   At different times, one domain may achieve hegemony over the others (e.g., religion or politics over arts or the sciences), in which case it is more difficult to produce variations in the subordinate domain.

information exchange to those regions. Even now, when the diffusion of information is almost instantaneous, useful new ideas are likely to arise from centers where people from different cultural backgrounds are able to interact and exchange ideas.

The Role of the Domain in the Creative Process

Cultures are made up of a variety of domains: music, mathematics, religion, various technologies, and so on. Innovations that result in creative contributions do not take place directly in the culture, but in one of such domains. Table 16.2 presents some considerations that are relevant to understanding the role of domains in this process.

It is usually the case that, with time, a domain develops its own memes and system of notation. Natural languages and mathematics underlie most domains. In addition there are formal notation systems for music, dance, and logic, as well as other less formal ones for instructing and assessing performance in a great variety of different domains. For instance Jean Piaget (1965) gave a detailed description of how rules are transmitted in a very informal domain, that of the game of marbles played by Swiss children. This domain has endured over several generations of children, and it consists of specific names for marbles of different sizes, color, and composition. Furthermore, it contains a variety of arcane rules that children learn from each other in the course of play. So even without a notation system, domains can be transmitted from one generation to the next through imitation and instruction.

One obvious factor is the stage of development that the domain has attained. There are times when the symbolic system of a domain is so diffuse and loosely integrated that it is almost impossible to determine whether a novelty is or is not an improvement on the status quo. Chemistry was in such a state before the adoption of the periodic table, which integrated and rationalized knowledge about the elements. Earlier centuries may have had many potentially creative chemical scientists, but their work was too idiosyncratic to be evaluated against a common standard. Or, conversely, the symbolic system may be so tightly

organized that no new development seems possible; this resembles the situation in physics at the end of the preceding last century, before the revolution in thinking brought about by quantum theory. Both of these examples suggest that creativity is likely to be more difficult before a paradigmatic revolution. On the other hand, the need for a new paradigm makes it more likely that if a new viable contribution does occur despite the difficulty, it will be hailed as a major creative accomplishment.

At any given historical period, certain domains will attract more gifted young people than at other times, thus increasing the likelihood of creativity. The attraction of a domain depends on several variables: its centrality in the culture, the promise of new discoveries and opportunities that it presents, the intrinsic rewards accruing from working in the domain. For instance, the Renaissance in early-fifteenth-century Florence would have not happened without the discovery of Roman ruins, which yielded a great amount of new knowledge about construction techniques and sculptural models and motivated many young people, who otherwise would have gone into the professions, to become architects and artists instead. The quantum revolution in physics at the beginning of this century was so intellectually exciting that, for several generations, some of the best minds flocked to physics or applied its principles to neighboring disciplines such as chemistry, biology, medicine, and astronomy. Nowadays similar excitement surrounds the domains of molecular biology and computer science.

As Thomas Kuhn (1962) remarked, potentially creative young people will not be drawn to domains where all the basic questions have been solved and which, therefore, appear to be boring – that is, offer few opportunities to obtain the intrinsic and extrinsic rewards that follow from solving important problems. A domain in which novelty can be evaluated objectively, and which has clear rules, a rich and complex symbolic system, and a central position in the culture will be more attractive than one lacking such characteristics.

Domains also vary in terms of their accessibility. Sometimes rules and knowledge become the monopoly of a protective class or caste, and others are not admitted to it. Creative thought in Christianity was renewed by the Reformation, which placed the Bible and its commentaries in reach of a much larger population, which earlier had been excluded by an entrenched priestly caste from perusing it directly. The enormously increased accessibility of information on the Internet might also bring about a new peak in creativity across many different domains, just as the printing press did over four centuries ago.

Finally, some domains are easier to change than others. This depends in part on how autonomous a domain is from the rest of the culture or social system that supports it. Until the seventeenth century in Europe it was difficult to be creative in the many branches of science that the Church had a vested interest in protecting – as the case of Galileo illustrates. In Soviet Russia, the Marxist-Leninist dogma took precedence over scientific domains, and many new ideas that conflicted with it were not accepted. The most notorious case, of course, was Lysenko's application of the Lamarckian theory of evolution to the development of new strains of grain, because this theory was more "Marxist" than the Darwinian-Mendelian paradigm. Even in our time, some topics in the social (and even in the physical and biological) sciences are considered less politically correct than others and are given scant research support as a consequence.

Creativity is the engine that drives cultural evolution. The notion of evolution does not imply that cultural changes necessarily follow some single direction or that cultures are getting any better as a result of the changes brought about by creativity. Following its use in biology, evolution in this context means increasing complexity over time. In turn, complexity is defined in terms of two complementary processes (Csikszentmihalyi, 1993, 1996). First, it means that cultures tend to become differentiated over time; that is, they develop increasingly independent and autonomous domains. Second, the domains within a culture become increasingly integrated, that is, related to each other and mutually supportive of each others' goals, which is analogous to the differentiated organs of the physical body that help each others' functioning.

In this sense creativity does not always support cultural evolution. It generally contributes to differentiation, but it can easily work against integration. New ideas, technologies, or forms of expression often break down the existing harmony between different domains, and thus might, at least temporarily, jeopardize the complexity of a culture. The separation of physics from the tutelage of religion that was accomplished by Galileo's discoveries ushered in an era of tremendous differentiation in science, but at the expense of a corresponding loss of integration in Western culture. Presumably – if the evolution of culture is to continue – creative insights will in the future restore the relationship between the currently divergent domains, this integration thus temporarily restoring the complexity of the culture, at least until new steps in differentiation again break it apart.

THE SOCIAL CONTEXT

Even the most individually oriented psychologists agree that in order to be called creative, a new meme must be socially valued. Without some form of social valuation it would be impossible to distinguish ideas that are simply bizarre from those that are genuinely creative. But this social validation is usually seen as something that follows the individual's creative act and can be – at least conceptually – separated from it. The stronger claim made here is that there is no way, even in principle, to separate the reaction of society from the person's contribution: The two are inseparable. As long as the idea or product has not been validated, we might have originality, but not creativity.

Nowadays everyone agrees that van Gogh's paintings show that he was a very creative artist. It is also fashionable to sneer at the ignorant bourgeoisie of his period for failing to recognize van Gogh's genius and letting him die alone and penniless. The implication, of course, is that we are much smarter, and if we had been in their place we would have loved van Gogh's paintings. But we should remember that a hundred years ago those canvases were just the hallucinatory original works of a sociopathic recluse. They became creative only after a number of other artists, critics, and collectors interpreted them in terms of new aesthetic criteria and transformed them from substandard efforts into masterpieces.

Without this change in the climate of evaluation, van Gogh would not be considered creative even now. But would he have been creative anyway, even if we didn't know it? In my opinion, such a question is too metaphysical to be considered part of a scientific approach. If the question is unanswerable in principle, why ask it? The better strategy is to recognize that in the sciences as well as in the arts, creativity is as much the result of changing standards and new criteria of assessment, as it is of novel individual achievements.

Societal Conditions Relevant to Creativity

The second main element of the systems model is society, or the sum of all fields that operate within a time–space framework. Fields are made up of individuals who practice a given domain and have the power to change it. For example, all the accountants who practice by the same rules comprise the field of accountancy, and it is they who have to endorse a new way of keeping accounts if it is to be accepted as a creative improvement. A society can then be defined as the sum of the individuals in its interrelated fields – from architects to zookeepers, from mothers to consumers of computer peripherals.

Table 16.3 suggests some of the ways a society might influence the frequency and intensity of new memes. Again, as in the previous tables, the list should be useful both as a heuris-

Table 16.3. *Questions and Hypotheses Concerning How Society Affects the Incidence of Creativity*

1. Is surplus energy available?	A society where all of the physical and mental energy must be invested in survival tasks is less likely to encourage or recognize innovation.
2. Does society value and encourage creativity?	Regardless of material conditions, societies differ in terms of how much value is placed on innovation.
3. Is the social and economic organization conducive to change?	Certain types of economies (e.g., rentier) have no interest in allowing change to occur; mercantile societies might be more open to change.
4. How much mobility and conflict is there?	Both the external threats to and internal strife of a society seem to encourage the generation and the acceptance of novelty; the same might be true of social mobility.
5. How complex is the social system?	Both differentiation and integration within society affect the rate of generation and adoption of novelty.

tic device to familiarize the reader with some of the implications of the systems perspective, and as a source of hypotheses for further study that might enrich the field of creativity research.

Other things being equal, a society that enjoys a material surplus is in better position to help the creative process. A wealthier society is able to make information more readily available, allows for a greater rate of specialization and experimentation, and is better equipped to reward and implement new ideas. Subsistence societies have fewer opportunities to encourage and reward novelty, especially if it is expensive to produce. Only societies with ample material reserves can afford to build great cathedrals, universities, scientific laboratories. Even the composition of music, the writing of poetry, or the painting of pictures require a market where subsistence needs are not primary. But it seems that there is often a lag between social affluence and creativity; the impact of wealth may take several generations to manifest itself. So the material surplus of the nineteenth-century United States was first needed to build a material infrastructure for society (canals, railroads, factories), before it was invested in supporting novel ideas such as the telephone or the mass production of cars and planes.

But it is not enough to have the material resources to implement new ideas – it is also important to be interested in them. Societies that had great resources and were located at the confluence of trade routes have sometimes shunned new ideas. In Egypt, for example, after a unique burst of creativity that resulted in astonishing accomplishments in architecture, engineering, art, technology, religion, and civic administration, the leaders of society apparently agreed that the best policy was to leave well enough alone. Thus, most of Egyptian art for thousands of years was produced in a few central workshops supervised by priests or bureaucrats and was done by relying on universally binding rules, common models, and uniform methods. The sociologist of art Arnold Hauser (1951) writes that "originality of subject-matter was never very much appreciated in Egypt, in fact was generally tabooed; the whole ambition of the artist was concentrated on thoroughness and precision of execution" (p. 36).

Whether a society is open to novelty or not depends in part on its social organization. A farming society with a stable feudal structure, for instance, would be one where tradition counts more than novelty. Societies based on commerce, with a strong bourgeois class trying to be accepted by the aristocracy, have on the other hand been usually favorable to novelty. Whenever the central authority tends toward absolutism, it is less likely that experimentation will be encouraged (Therivel, 1995). Ancient Chinese society is a good example of a central authority supported by a powerful bureaucracy that was able to resist for centuries the spread of new ideas. Despite enormous early cultural advances and a great number of creative individuals, Chinese society believed that the use of gunpowder for weapons and that of movable type for the printing of books were bad ideas. Of course, they might have been right; nevertheless, currently China is trying to catch up as fast as possible with the new ideas that in the past it had politely ignored.

Rentier societies, where the ruling classes lived off the profits of land rent, pensions, or stable investments, have been historically reluctant to change because any novelty was seen to potentially threaten the status quo that provided the livelihood of the oligarchy. This condition might become relevant again as the United States moves more toward an economy where pensions and retirement plans are a major source of income for an increasing number of people.

A different and more controversial suggestion is that egalitarian societies are less likely to support the creative process than those where relatively few people control a disproportionate amount of the resources – especially in artistic domains. Aristocracies or oligarchies may be better able to support creativity than democracies or socialist regimes, simply because when wealth and power are concentrated in a few hands, it is easier to use part of it for risky or "unnecessary" experiments. Also, the development of a leisure class often results in a refinement of connoiseurship that in turn provides more demanding criteria by which a field evaluates new contributions.

Societies located at the confluence of diverse cultural streams can benefit more easily from that synergy of different ideas that is so important for the creative process. It is for this reason that some of the greatest art, and the earliest science, developed in cities that were centers of trade. The Italian Renaissance was in part due to the Arab and Middle Eastern influences that businessmen and their retinues brought into Florence and the seaports of Venice, Genoa, and Naples. The fact that periods of social unrest often coincide with creativity (Simonton, 1991) is probably due to the synergy resulting when the interests and perspectives of usually segregated classes are brought to bear on each other. The Tuscan cities supported creativity best during a period in which noblemen, merchants, and craftsmen fought each other bitterly and when every few years, as a different political party came to power, a good portion of the citizenry was banished into exile.

External threats also often mobilize society to recognize creative ideas that otherwise might not have attracted much attention. Florence in the fifteenth century spent so many resources on the arts in part because the leaders of the city were competing against their enemies in Siena, Lucca, and Pisa and tried to outdo them in the beauty of their churches and public squares (Heydenreich, 1974). The reason that high-energy physics became such an important field after World War II is that practically every nation wished to have the technology to build its own nuclear arsenal.

Finally, the complexity of a society also bears on the rates of innovation it can tolerate. Too much divisiveness, as well as its opposite, too much uniformity, are unlikely to generate novelty that will be accepted and preserved. Ideal conditions for creativity would be a social sys-

tem that is highly differentiated into specialized fields and roles, yet is held together by what Durkheim (1912/1967) called the bonds of "organic solidarity."

The Role of the Field

The recognition that culture and society are as involved in the constitution of creativity as the individual may set the course of investigation on the right footing, but it certainly does not answer all the questions. In fact, it brings a host of new questions to light. New ideas often arise in the process of artistic or scientific collaboration (Csikszentmihalyi & Sawyer, 1995; Dunbar, 1993), and peers play an important role in supporting the creativity of individuals (Mockros & Csikszentmihalyi, in press).

Perhaps the major new question this perspective brings to light is: Who is entitled to decide what is creative? According to the individual-centered approach, this issue is not problematic. Since it assumes that creativity is located in the person and expressed in his or her works, all it takes is for some "expert" to recognize its existence. So if some kindergarten teachers agree that a child's drawing is creative, or a group of Nobel Prize physicists judge a young scientist's theory creative, then the issue is closed, and all we need to find out is how the individual was able to produce the drawing or the theory.

But if it is true, as the systems model holds, that attribution is an integral part of the creative process, then we must ask, What does it take for a new meme to be accepted into the domain? Who has the right to decide whether a new meme is actually an improvement, or simply a mistake to be discarded? How are judgments of creativity influenced by the attributional process (Kasof, 1995)?

In the systems model, the gatekeepers who have the right to add memes to a domain are collectively designated the field. Some domains, such as Assyrian languages and literature, may have a very small field consisting of a dozen or so scholars across the world. Others, such as electronic engineering, may include many thousands of specialists whose opinion would count in recognizing a viable novelty. For mass-market products such as soft drinks or motion pictures, the field might include not only the small coterie of product developers and critics, but the public at large. For instance, if New Coke is not a part of the culture, it is because although it passed the evaluation of the small field of beverage specialists, it failed to pass the test of public taste.

Table 16.4 presents some of the ways in which fields influence the likelihood that novelty will be produced and accepted. The first issue to be considered is the field's access to economic resources. In some domains it is almost impossible to do novel work without access to capital. To build a cathedral or to make a movie requires the collaboration of people and materials, and these must be made available to the would-be creative artist. Even to publish poetry, surely one of the least expensive domains, requires access to a press, paper, and distribution outlets. Not surprisingly, creativity in the arts and sciences has flourished historically in societies that had enough surplus capital to finance experimental work. The masterpieces of Florence were built with the profits that the city's bankers made throughout Europe; the masterpieces of Venice were the fruit of that city's seagoing trade. Dutch painters and scientists blossomed after Dutch merchants began to dominate the sea-lanes; then it was the turn of France, England, Germany, and, finally, the United States. As resources accumulate in one place, they lay down the conditions that make innovation possible.

A field is likely to attract original minds to the extent that it can offer scope for a person's experimentations and promises rewards in case of success. As we shall see, even though individuals who try to change domains are in general intrinsically motivated – that is, they enjoy

Table 16.4. *Questions and Hypotheses Concerning How the Field Affects the Incidence of Creativity*

1. Is the field able to obtain resources from society?	A field is likely to stagnate if it cannot provide either financial or status rewards to its practitioners.
2. Is the field independent of other societal fields and institutions?	When a field is overly dependent for its judgments on religious, political, or economic considerations, it is unlikely to select the best new memes. On the other hand, being completely independent of the rest of society also reduces the field's effectiveness.
3. How much does the domain constrain the judgments of the field?	When the criteria of a domain do not specify which novelty is an improvement, the field has more discretion in determining creativity. It is likely that both too little and too much freedom for the field are inimical to creativity.
4. How institutionalized is the field?	A certain amount of internal organization is needed for a field to exist. Too much energy invested in self-preservation usually results in a field that becomes highly bureaucratic and impervious to change.
5. How much change does the field support?	Criteria that are too liberal for accepting novelty may end up debasing the domain; criteria that are too narrow result in a static domain.

working in the domain for its own sake – the attraction of extrinsic rewards such as money and fame are not to be discounted.

Leonardo da Vinci, one of the most creative persons on record in terms of his contributions to the arts and the sciences, constantly moved during his lifetime from one city to another, in response to changing market conditions. The leaders of Florence, the dukes of Milan, the popes of Rome, and the king of France waxed and waned in terms of how much money they had to devote to new paintings, sculptures, or cutting-edge scholarship; and as their fortunes changed, Leonardo moved to wherever he could pursue his work with the least hindrance.

The great flowering of Impressionism in Paris was due in part to the willingness of the new middle classes to decorate their homes with canvasses; this in turn attracted ambitious young painters from every corner of the world. It is true that the first beneficiaries of the new affluence were academic painters; but as their craft became so perfect that it became boring – and especially as the new photographic techniques made lifelike pictures no longer unique – the painters who benefited were those who broke the tradition and introduced new memes.

The centrality of a field in terms of societal values will also determine how likely it is to attract new persons with an innovative bent. In this particular historical period, bright young men and women are attracted to the field of computer sciences because it provides the most exciting new intellectual challenges; others to oceanography because it might help to save the planetary ecosystem; some to currency trading because it provides access to financial power; and some to family medicine, because it is the medical specialty most responsive to societal needs. Any field that is able to attract a disproportionate number of bright young persons is more likely to witness creative breakthroughs.

Every field needs a certain degree of autonomy in order to make its assessments purely in terms of excellence within the domain instead of extraneous considerations, but the amount

of autonomy might vary considerably. Occasionally fields become extensions of political power, responsible to society at large rather than to the domain. For instance, the works of Renaissance artists were not evaluated by a separate aesthetic field, but had to pass muster from ecclesiastical authorities. When Caravaggio painted his vigorously original portrait of St. Matthew in a relaxed pose, it was not accepted by the prior of the church that had commissioned it because it looked too unsaintly. In the Soviet Union, specially trained party officials had the responsibility of deciding which new paintings, books, music, movies, and even scientific theories were acceptable, based on how well they supported political ideology.

The autonomy of a field is to a certain extent a function of the codification of the domain it serves. When the domain is arcane and highly codified, like Assyriology or molecular biology, then the decision as to which new meme is worth accepting will be made by a relatively small field that is committed to following the traditions and rules of the domain. On the other hand, in the domains of movies or popular music, which are much more accessible to the general public, the specialized field is notoriously unable to enforce a decision as to which works will be creative. For the same reasons, creativity is more ephemeral in the arts than in the sciences. Works of art that seemed to shine with originality to audiences at the beginning of this century may seem trite and pointless to us. It is instructive to compare the list of Nobel Prize winners in literature with those in the sciences; few of the writers from years past are now recognized as creative compared with the scientists.

In order to establish and preserve criteria, a field must have a minimum of organization. However, it is often the case that instead of serving the domain, members of the field devote most of their energies to serving themselves, making it difficult for new ideas to be evaluated on their merits. It is not only the Church that has hindered the spread of new ideas for fear of losing its privileges. Every industry faces the problem that better ideas that require changing the status quo will be ignored, because so much effort and capital has been invested in existing production methods.

Another important dimension along which fields vary is the extent to which they are ideologically open or closed to new memes. The openness of a field depends in part on its internal organization, in part on its relation to the wider society. Highly hierarchical institutions, where knowledge of the past is greatly valued, generally see novelty as a threat. For this reason churches, academies, and certain businesses based on tradition seek to promote older individuals to leadership positions as a way of warding off excessive change. Also, creativity is not welcome in fields whose self-interest requires keeping a small cadre of initiates performing the same routines, regardless of efficiency; some of the trade unions come to mind in this context.

But caution is important for a field, and it is not always dictated by self-interest. When a field is too open and accepts every novelty indiscriminately, the domain risks losing its credibility, and its internal structure is likely to get confusing and unmanageable. It requires an adroit balancing act for those responsible for evaluating novelty to decide which new ideas are worth preserving. If a historical period is stagnant, it is probably not because there were no potentially creative individuals around, but because of the ineptitude of the relevant fields.

It might be objected that some of the most influential new ideas or processes seem to occur even though there is no existing domain or field to receive them. For instance, Freud's ideas had a wide impact even before there was a domain of psychoanalysis or a field of analysts to evaluate them. Personal computers were widely adopted before there was a tradition and a group of experts to judge which were good, which were not. But the lack of a social context in such cases is more apparent than real. Freud, who was immersed in the already-existing domain of psychiatry, simply expanded its limits until his conceptual contributions could stand on their own as a separate domain. And the first field of psychoanalysis was composed of medical men who met with Freud to discuss his ideas and were convinced by them to the point of identifying themselves as practitioners of the new domain. Without peers and without disciples, Freud's ideas might have been original, but they would not have had an impact on the culture, and thus would have failed to be creative. Similarly, personal computers would not have been accepted had there not been a domain – computer languages that allowed the writing of software and, therefore, various applications – and an embryonic field – people who had experience with mainframe computers, with video games, and so on who could become "experts" in this emerging technology.

In any case, the point is that how much creativity there is at any given time is not determined just by how many original individuals are trying to change domains, but also by how receptive the fields are to innovation. It follows that if one wishes to increase the frequency of creativity, it may be more advantageous to work at the level of fields than at the level of individuals. For example, some large organizations such as Motorola, where new technological inventions are essential, spend a large quantity of resources in trying to make engineers think more creatively. This is a good strategy as far as it goes, but it will not result in any increase in creativity unless the field – in this case, management – is able to recognize which of the new ideas are good and has ways for implementing them, that is, including them in the domain. Whereas engineers and managers are the field who judge the creativity of new ideas within an organization such as Motorola, the entire market for electronics becomes the field that evaluates the organization's products once these have been implemented within the organization. Thus, at one level of analysis the system comprises the organization, with innovators, managers, and production engineers as its parts; but at a higher level of analysis the organization becomes just one element of a broader system that includes the entire industry.

THE INDIVIDUAL IN THE CREATIVE PROCESS

When we get to the level of the person, we are immediately on more familiar ground. After all, the great majority of psychological research assumes that creativity is an individual trait, to be understood by studying individuals. For example, a recent analysis of doctoral dissertations on the topic found that 6 out of 10 theses written by psychology Ph.D.'s in 1986 were focused on individual traits (Wehner, Csikszentmihalyi, & Magyari-Beck, 1991), and none dealt with the effects of culture and social groups. Cognitive processes, temperament, early experiences, and personality were the most frequently studied topics.

The systems model makes it possible to see the contributions of the person to the creative process in a theoretically coherent way. In the first place, it brings to attention the fact that before a person can introduce a creative variation, he or she must have access to a domain, and must want to learn to perform according to its rules. This implies that motivation is important – a topic already well understood by scholars in the field of creativity. But it also suggests a number of additional factors that are usually ignored, for instance, that cognitive and motivational factors interact with the state of the domain and the field.

Second, the system model reaffirms the importance of individual factors that contribute to the creative process. Persons who are likely to innovate tend to have personality traits that favor breaking rules and early experiences that make them want to do so. Divergent thinking, problem finding, and all the other factors that psychologists have studied are relevant in this context.

Finally, the ability to convince the field about the virtue of the novelty one has produced is an important aspect of personal creativity. The opportunities that one has to get access to the field, the network of contacts, the personality traits that make it possible for one to be

taken seriously, the ability to express oneself in such a way as to be understood, are all part of the individual traits that make it easier for someone to make a creative contribution.

But none of these personal characteristics are sufficient, and probably they are not even necessary. Conservative and unimaginative scientists have made important contributions to science by stumbling on important new phenomena, and primitive painters like Rousseau le Douanier or Grandma Moses, who were trying to be traditional but could not quite paint realistically enough, have been seen as having contributed to the history of art. At the same time, it is probably true that persons who can master a domain, and then want to change it, will have a higher proportion of their efforts recognized as creative. So we shall review briefly now what the characteristics of such persons are, starting with a consideration of the background factors that have a bearing on the production of novelty.

The Background of Creative Individuals

One of the first issues to consider is whether an individual is born in an environment that has enough surplus energy to encourage the development of curiosity and interest for its own sake (Table 16.5). Even though it is said that necessity is the mother of invention, too much deprivation does not seem to lead to innovative thinking. When survival is precarious – as it has been and still is in most of the world – there is little energy left for learning and experimenting. The lack of books, schooling, and intellectual stimulation will have obvious detrimental effects. It is not impossible for a talented person to emerge from a ghetto or a third-world country, but much potential is lost for lack of access to the basic tools of a domain.

Ethnic groups, and families within them, differ in the amount of importance they place on different domains. Jewish tradition has emphasized the importance of learning, and Asian-American families have instilled strong academic and artistic motivation in their children (Kao, 1995). Some cultural groups emphasize musical abilities, others focus on engineering or technology. Such traditions help to focus a child's interest on a particular domain, thus providing the preconditions for further innovation.

Cultural capital consists in the educational aspirations of one's parents, the nonacademic knowledge one absorbs in the home, the informal learning that one picks up from home and community. Moreover, it involves the learning opportunities that include schooling, the availability of mentors, exposure to books, computers, museums, musical instruments, and so forth. Even in very poor families, when the parents read books to children, this seems to help the latter to become involved in intellectual pursuits and to break away from their destitute conditions (Beattie & Csikszentmihalyi, 1981). Parental expectations for educational attainment are also an important component of a child's cultural capital.

Another important aspect of personal background that has bearing on creativity is whether the child will have access to the field. In many domains it is indispensible for a young person to be trained by experts as soon as possible (Bloom, 1985). To study physics or music long enough to be able to innovate in it depends in part on whether there are laboratories or conservatories in which one can practice and learn state-of-the-art knowledge in the particular domain. Parents have to be able to afford tutors, as well as have the time and resources needed to drive the child back and forth to lessons and competitions. The careers of creative individuals are often determined by chance encounters with mentors who will open doors for them, and such encounters are more likely in places where the field is more densely represented – certain university departments, laboratories, or centers of artistic activity.

It has been observed that many creative individuals grew up in atypical conditions, on the margins of the community. Many of them were orphaned early, had to struggle against relative poverty and prejudice, or were otherwise singled out as different from their peers (Csikszentmihalyi & Csikszentmihalyi, 1993). For example, all seven of the creative geniuses

Table 16.5. *Questions and Hypotheses Concerning How Personal Background Affects the Incidence of Creativity*

1. Do the family and community have surplus energy available?	A child is likely to be discouraged from expressing curiosity and interest if the material conditions of existence are too precarious.
2. Is there a tradition of respect for learning and culture in the child's environment?	Ethnic and family traditions can have a very important role in directing the child's interest toward specific domains.
3. Is the family able to introduce the child to a domain?	Cultural capital (i.e., home learning, schooling) is essential for a child to develop expertise in a domain.
4. Is the family able to connect the child with the field?	Tutors, mentors, and connections are often indispensable for advancing far enough to have one's ideas recognized.
5. Do early conditions support conformity or innovation?	Marginality (social, ethnic, economic, religious) seems to be more conducive to wanting to break out of the norm than a conventional, middle-class background.

of this century described by Gardner (1993) were outsiders to the societies in which they worked: Einstein moved from Germany to Switzerland, Italy, and the United States; Gandhi grew up in South Africa; Stravinsky left Russia; Eliot settled in England; Martha Graham as a child moved from the South to California, where she became exposed to and influenced by Asian art. Freud was Jewish in Catholic Vienna; and Picasso left Spain for France. It seems that a person who is comfortably settled in the bosom of society has fewer incentives to change the status quo.

Personal Qualities

Having the right background conditions is indispensible but certainly not sufficient for a person to make a creative contribution. He or she must also have the ability and inclination to introduce novelty into the domain. These are the traits that psychologists have most often studied, and it is to these that we shall now turn (Table 16.6). Because the individual traits of creative people have been so widely studied, I shall touch on them only briefly and without being able to do them justice.

Talent, or innate ability, refers to the fact that it is easier to be creative if one is born with a physical endowment that helps to master the skills required by the domain. Great musicians seem to be unusually sensitive to sounds even in their earliest years, and artists seem to be sensitive to color, light, and shapes even before they start practicing their craft. If we extend the definition of creativity to domains such as basketball – and in principle there is no reason for not doing so – then it is clear that a creative player like Michael Jordan benefits from unusual physical coordination. At this point, we know very little about the relationship between brain organization and the ability to perform in specific domains. It would not be surprising, however, to find that interest or skill in certain domains can be inherited. Howard Gardner's (1983, 1993) postulate of seven or more separate forms of intelligence also seems to support the notion that each of us might be born with a propensity to respond to a different slice of reality, and hence to operate more effectively in one domain rather than another. Many creative individuals display unusual early abilities that are almost at the

Table 16.6. *Questions and Hypotheses Concerning How Individual Qualities Affect the Incidence of Creativity*

1. Does the person have special talents?
In certain domains (e.g., music, mathematics), genetic inheritance may play an important role in directing interest to the domain and in helping to master it.
2. Is the person curious, interested, intrinsically motivated?
A great deal of intrinsic motivation is needed to energize the person to absorb the relevant memes and to persevere in the risky process of innovation.
3. Is the person a divergent thinker interested in discovery?
Cognitive abilities such as fluency, flexibility, and discovery orientation seem necessary to engage successfully in the process of generating novelty.
4. Does the person have the relevant personality traits?
To be able to innovate successfully, a person needs to have appropriate traits – which may vary depending on the field and the historical period. In general, one must persevere and be open to experience, as well as adopt apparently contradictory behaviors.

level of the child prodigies described by Feldman (1986). On the other hand, a roughly equal number who have achieved comparable creative contributions appear to have had rather undistinguished childhoods and were not recognized as exceptional until early adulthood.

Clearly very little is known as yet about the relationship of central nervous system structures and creativity, although many claims are being made these days with limited support. For instance, cerebral lateralization research has led many people to claim that left-handers or ambidextrous individuals, who are presumed to be using the right side of their brains more than right-handers, are more likely to be creative. Left-handers are apparently overrepresented in such fields as art, architecture, and music; many exceptional individuals from Alexander the Great to Leonardo, Michelangelo, Raphael, Picasso, Einstein, and the three presidential candidates of the 1992 election – Clinton, Bush, Perot – were all left-handers (Coren, 1992; Paul, 1993). Suggestive as such trends might be, there is also evidence that left-handed persons are much more prone to a variety of unusual pathologies (Coren, 1992 pp. 197–220); thus, whatever neurological difference handedness makes might not be directly linked to creativity, but rather to deviancy from the norm that can take either a positive or a negative value.

Perhaps the most salient characteristic of creative individuals is a constant curiosity, an ever renewed interest in whatever happens around them. This enthusiasm for experience is often seen as part of the "childishness" attributed to creative individuals (Csikszentmihalyi, 1996; Gardner, 1993). Without this interest, a person would be unlikely to become immersed deeply enough in a domain to be able to change it. Another way of describing this trait is that creative people are intrinsically motivated. They find their reward in the activity itself, without having to wait for external rewards or recognition. A recurring refrain among them goes something like this: "You could say that I worked every day of my life, or with equal justice you could say that I never did any work in my life." Such an attitude greatly helps a person to persevere during the long stretches of the creative process when no external recognition is forthcoming.

The importance of motivation for creativity has long been recognized. Cox (1920) advised that if one had to bet on who is more likely to achieve a creative breakthrough, a highly intelligent but not very motivated person, or one less intelligent but more motivated, one should always bet on the second. Because introducing novelty in a system is always a risky and usually an unrewarded affair, it takes a great deal of motivation to persevere in the effort. One recent formulation of the creative person's willingness to take risks is the "economic" model of Sternberg and Lubart (1995).

Probably the most extensively studied attributes of the creative cognitive style are divergent thinking (Guilford, 1967) and discovery orientation (Getzels & Csikszentmihalyi, 1976). Divergent thinking – usually indexed by fluency, flexibility, and originality of mental operations – is routinely measured by psychological tests given to children; such tests show modest correlations with childish measures of creativity, such as the originality of stories told or pictures drawn (Runco, 1991). Whether these tests also relate to creativity in "real" adult settings is not clear, although some claims to that effect have been made (Milgram, 1990; Torrance, 1988). Discovery orientation, or the tendency to find and formulate problems where others have not seen any, has also been measured in selected situations, with some encouraging results (Baer, 1993; Runco, 1995). As Einstein and many others have observed, the solution of problems is a much simpler affair than their formulation. Anyone who is technically proficient can solve a problem that is already formulated; but it takes true originality to formulate a problem in the first place (Einstein & Infeld, 1938).

Some scholars dispute the notion that problem finding and problem solving involve different thought processes; for example the Nobel Prize–winning economist and psychologist Herbert Simon (1985, 1989) has claimed that all creative achievements are the result of normal problem solving. However, the evidence he presents, based on computer simulation of scientific breakthroughs, is not relevant to the claim, since the computers are fed preselected data, preselected logical algorithms, and a routine for recognizing the correct solution – all of which are absent in real historical discoveries (Csikszentmihalyi, 1988a, 1988c).

The personality of creative persons has also been exhaustively investigated (Barron, 1969, 1988). Psychoanalytic theory has stressed the ability to regress into the unconscious while still maintaining conscious ego controls as one of the hallmarks of creativity (Kris, 1952). The widespread use of multifactor personality inventories suggest that creative individuals tend to be strong on certain traits, such as introversion and self-reliance, and low on others, such as conformity and moral certainty (Csikszentmihalyi & Getzels, 1973; Getzels & Csikszentmihalyi, 1976; Russ, 1993).

There is a long tradition of associating creativity with mental illness, or genius with insanity (Jacobson, 1912; Lombroso, 1891). Recent surveys have added new credence to this tradition by demonstrating rather convincingly that the rate of various pathologies such as suicide, alcoholism, drug addiction, and institutionalization for nervous diseases is much higher than expected in certain "creative" domains, such as drama, poetry, and music (Jablow & Lieb, 1988; Jamison, 1989; Martindale, 1989; Richards, 1990). These results, however, demonstrate only that some fields, ones that in our culture get little support, are associated with pathology either because they attract persons who are exceptionally sensitive (Mitchell, 1972; Piechowski, 1991) or because they can offer only depressing careers. They may have little or nothing to say about creativity itself.

One view I have developed on the basis of my studies is that creative persons are characterized not so much by single traits, as by their ability to operate through the entire spectrum of personality dimensions. So they are not just introverted, but can be both extroverted and introverted, depending on the phase of the process they happen to be involved in at the moment. When gathering ideas, a creative scientist is gregarious and sociable; when starting to work, he or she might become a secluded hermit for weeks on end. Creative individuals are sensitive and aloof, dominant and humble, masculine and feminine, as the occasion demands (Csikszentmihalyi, 1996). What dictates their behavior is not a rigid inner structure, but the demands of the interaction between them and the domain in which they are working.

In order to want to introduce novelty into a domain, a person should first of all be dissatisfied with the status quo. It has been said that Einstein explained why he spent so much time developing a new physics by saying that he could not understand the old physics. Greater sensitivity, naiveté, arrogance, impatience, and higher intellectual standards have all been adduced as reasons why some people are unable to accept the conventional wisdom in a domain and feel the need to break out of it.

Values also play a role in developing a creative career. There are indications that if a person holds financial and social goals in high esteem, it is less likely that he or she will continue for long to brave the insecurities involved in the production of novelty, and will tend to settle instead for a more conventional career (Csikszentmihalyi, Getzels, & Kahn, 1984; Getzels & Csikszentmihalyi, 1976). A person who is attracted to the solution of abstract problems (theoretical value) and to order and beauty (aesthetic value) is more likely to persevere.

How these patterns of cognition, personality, and motivation develop is still not clear. Some may be under heavy genetic control, while others develop under the conscious direction of the self-organizing person. In any case, the presence of such traits is likely to make a person more creative if the conjunction with the other elements of the system – the field and the domain – happen to be propitious.

INTERNALIZING THE CREATIVE SYSTEM

In order to function well within the creative system, one must internalize the rules of the domain and the opinions of the field, so that one can choose the most promising ideas to work on, and do so in a way that will be acceptable to one's peers. Practically all creative individuals say that one advantage they have is that they are confident that they can tell which of their own ideas are bad, and thus they can forget the bad ones without investing too much energy in them. For example Linus Pauling, who won the Nobel Prize twice, was asked at his 60th birthday party how he had been able to come up with so many epochal discoveries. "It's easy," he is said to have answered. "You think of a lot of ideas, and throw away the bad ones." To be able to do so, however, implies that one has a very strong internal representation of which ideas are good and which are bad, a representation that matches closely the one accepted by the field.

An extremely lucid example of how a person internalizes the system is given by the inventor Jacob Rabinow, who has over 200 patents on a variety of very different inventions (Csikszentmihalyi, 1996). In addition to being a prolific inventor himself, he is also prominent in the field because he works for the Patent Office, and hence decides which inventions by other individuals deserve recognition. In describing what it takes to be an original thinker, Rabinow mentions first the importance of the domain:

> So you need three things to be an original thinker. First, you have to have a tremendous amount of information – a big database if you like to be fancy. If you're a musician, you should know a lot about music, that is, you've heard music, you remember music, you could repeat a song if you have to. In other words, if you were born on a desert island and never heard music, you're not likely to be a Beethoven. You might, but it's not likely. You may imitate birds but you're not going to write the Fifth Symphony. So you're brought up in an atmosphere where you store a lot of information.
>
> So you have to have the kind of memory that you need for the kind of things you want to do. And . . . you get better and better by doing the things you do well, and eventually you become either a great tennis player or a good inventor or whatever, because you tend to do those things which you do well and the more you do, the easier it gets, and the easier it gets, the better you do it, and eventually you become very one-sided but you're very good at it and you're lousy at everything else because you don't do it well. This is what engineers call positive feedback. The small differences at the beginning of life become enormous differences by the time you've done it for 40, 50, 80 years as I've done it. So anyway, first you have to have the big database. (p. 48)

Next Rabinow brings up what the person must contribute, which is mainly a question of motivation, or the enjoyment one feels when playing (or working?) with the contents of the domain:

> Then you have to be willing to pull the ideas, because you're interested. Now, some people could do it, but they don't bother. They're interested in doing something else. So if you ask them, they'll, as a favor to you, say: "Yeah, I can think of something." But there are people like myself who like to do it. It's fun to come up with an idea, and if nobody wants it, I don't give a damn. It's just fun to come up with something strange and different. (p. 48)

Finally he focuses on how important it is to reproduce in one's mind the criteria of judgment that the field uses:

> And then you must have the ability to get rid of the trash which you think of. You cannot think only of good ideas, or write only beautiful music. You must think of a lot of music, a lot of ideas, a lot of poetry, a lot of whatever. And if you're good, you must be able to throw out the junk immediately without even saying it. In other words, you get many ideas appearing and you discard them because you're well trained and you say, "that's junk." And then you see the good one, you say, "Oops, this sounds interesting. Let me pursue that a little further." And you start developing it. . . . And by the way, if you're not well trained, but you've got ideas, and you don't know if they're good or bad, then you send them to the Bureau of Standards, National Institute of Standards, where I work, and we evaluate them. And we throw them out. (p. 49)

CONCLUSION

It is certain that psychologists interested in the phenomenon of creativity will continue to focus on the individual and his or her thought processes. After all, the unique qualities of creative geniuses are so attractive that we can't curb our curiosity about them. What the present chapter seeks to accomplish, however, is to point out that creativity cannot be recognized except as it operates within a system of cultural rules, and it cannot bring forth anything new unless it can enlist the support of peers. If these conclusions are accepted, then it follows that the occurrence of creativity is not simply a function of how many gifted individuals there are, but also of how accessible the various symbolic systems are and how responsive the social system is to novel ideas. Instead of focusing exclusively on individuals, it will make more sense to focus on communities that may or may not nurture genius. In the last analysis, it is the community and not the individual who makes creativity manifest.

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