


CREATIVITY

A hand is shown holding a glowing, crystalline structure that resembles a complex network of fibers or a small, intricate sculpture. The background is a light blue gradient with several bright, starburst-like light flares scattered across it. The overall aesthetic is clean, modern, and evocative of scientific discovery or creative thought.

FLOW AND THE
PSYCHOLOGY
OF DISCOVERY
AND INVENTION

AUTHOR OF **FLOW**

MIHALY CSIKSZENTMIHALYI

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DISCOVERY AND INVENTION

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HARPER PERENNIAL

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A hardcover edition of this book was published in 1996 by HarperCollins Publishers.

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First HarperPerennial edition published 1997.

Designed by Jessica Shatan

The Library of Congress has catalogued the hardcover edition as follows:

Csikszentmihalyi, Mihaly.

Creativity : flow and the psychology of discovery and invention / Mihaly Csikszentmihalyi — 1st ed.

p. cm.

Includes bibliographical references and index.

ISBN 0-06-017133-2

1. Creative ability. 2. Creative thinking. I. Title.

BF408.C77 1996

153.3'5—dc20

96-4116

ISBN 0-06-092820-4 (pbk.) ISBN 978-0-06-092820-9

05 06 07 08 09 10 ◆/RRD 30 29 28 27 26 25 24

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ACKNOWLEDGMENTS

The idea for this book emerged in a conversation with Larry Cremin, then president of the Spencer Foundation. We agreed that it would be important to study creativity as a process that unfolds over a lifetime, and that no systematic studies of living creative individuals existed. With its customary vision, the Spencer Foundation then financed a research project, which was to last four years, to remedy this gap in our understanding. Without this grant the laborious task of collecting, transcribing, and analyzing the lengthy interviews would have been impossible.

The other contribution without which this book could not have been written is the assistance of the ninety-one respondents whose interviews form the bulk of the book. All of them are extremely busy individuals, whose time is literally invaluable—thus I deeply appreciate their availability for the lengthy interviews. It is indeed difficult to express my gratitude for their help, and I can only hope that they will find the results were worth their time.

A number of graduate students helped with this project and often contributed creatively to it. Several have written or coauthored articles about the project in professional journals. Especially important

were four of my students who have been involved in the project since its inception and who have since earned their doctorates: Kevin Rathunde, Keith Sawyer, Jeanne Nakamura, and Carol Mockros. The others who took an active part are listed among the interviewers in appendix A, which describes the sample.

While we collected and analyzed the data, I had many opportunities to consult with fellow scholars whose specialty is creativity. I should mention at the very least Howard Gardner, David Feldman, Howard Gruber, Istvan Magyari-Beck, Vera John-Steiner, Dean Simonton, Robert Sternberg, and Mark Runco—all of whom contributed, knowingly or not, to the development of ideas in this book.

Several colleagues helped with earlier drafts of the manuscript. I am particularly glad to acknowledge the inspiration and critique of my old friend Howard Gardner, of Harvard University. As usual, his comments have been exactly on target. William Damon, of Brown University, made several excellent suggestions that helped reorganize the contents of the volume. Benő Csapó, from the University of Szeged, Hungary, brought a different cultural perspective to the work.

Three chapters of the book were drafted while I was a guest of the Rockefeller Foundation in its Italian Center at Bellagio. The rest were written while I was a fellow at the Center for Advanced Studies in the Behavioral Sciences in Palo Alto, with support from the John D. and Catherine T. MacArthur Foundation grant #8900078, and the National Science Foundation grant #SBR-9022192. I am grateful to them for the opportunity to concentrate on the manuscript without the usual interruptions—and in such glorious surroundings.

In the later stages of the work, Isabella Selega, who had the good grace to consent to marry me some thirty years ago, oversaw the editing of the manuscript and many other important details. She did the same when I wrote my doctoral dissertation in 1965 on the same topic. It is difficult for me to admit how much of whatever I have accomplished in the years in between I owe to her loving, if critical, help.

None of the shortcomings of this book should be attributed to any of those mentioned here, except myself. For whatever is good in it, however, I thank them deeply.

SETTING THE STAGE

This book is about creativity, based on histories of contemporary people who know about it firsthand. It starts with a description of what creativity is, it reviews the way creative people work and live, and it ends with ideas about how to make your life more like that of the creative exemplars I studied. There are no simple solutions in these pages and a few unfamiliar ideas. The real story of creativity is more difficult and strange than many overly optimistic accounts have claimed. For one thing, as I will try to show, an idea or product that deserves the label “creative” arises from the synergy of many sources and not only from the mind of a single person. It is easier to enhance creativity by changing conditions in the environment than by trying to make people think more creatively. And a genuinely creative accomplishment is almost never the result of a sudden insight, a lightbulb flashing on in the dark, but comes after years of hard work.

Creativity is a central source of meaning in our lives for several reasons. Here I want to mention only the two main ones. First, most of the things that are interesting, important, and *human* are the results of creativity. We share 98 percent of our genetic makeup with chim-

panzees. What makes us different—our language, values, artistic expression, scientific understanding, and technology—is the result of individual ingenuity that was recognized, rewarded, and transmitted through learning. Without creativity, it would be difficult indeed to distinguish humans from apes.

The second reason creativity is so fascinating is that when we are involved in it, we feel that we are living more fully than during the rest of life. The excitement of the artist at the easel or the scientist in the lab comes close to the ideal fulfillment we all hope to get from life, and so rarely do. Perhaps only sex, sports, music, and religious ecstasy—even when these experiences remain fleeting and leave no trace—provide as profound a sense of being part of an entity greater than ourselves. But creativity also leaves an outcome that adds to the richness and complexity of the future.

An excerpt from one of the interviews on which this book is based may give a concrete idea of the joy involved in the creative endeavor, as well as the risks and hardships involved. The speaker is Vera Rubin, an astronomer who has contributed greatly to our knowledge about the dynamics of galaxies. She describes her recent discovery that stars belonging to a galaxy do not all rotate in the same direction; the orbits can circle either clockwise or counterclockwise on the same galactic plane. As is the case with many discoveries, this one was not planned. It was the result of an accidental observation of two pictures of the spectral analysis of the same galaxy obtained a year apart. By comparing the faint spectral lines indicating the positions of stars in the two pictures, Rubin noted that some had moved in one direction during the interval of time, and others had moved in the opposite direction. Rubin was lucky to be among the first cohort of astronomers to have access to such clear spectral analyses of nearby galaxies—a few years earlier, the details would not have been visible. But she could use this luck only because she had been, for years, deeply involved with the small details of the movements of stars. The finding was possible because the astronomer was interested in galaxies for their own sake, not because she wanted to prove a theory or make a name for herself. Here is her story:

It takes a lot of courage to be a research scientist. It really does. I mean, you invest an enormous amount of yourself, your life, your time, and nothing may come of it. You could spend five years

working on a problem and it could be wrong before you are done. Or someone might make a discovery just as you are finishing that could make it all wrong. That's a very real possibility. I guess I have been lucky. Initially I went into this [career] feeling very much that my role as an astronomer, as an observer, was just to gather very good data. I just looked upon my role as that of gathering valuable data for the astronomical community, and in most cases it turned out to be more than that. I wouldn't be disappointed if it were only that. But discoveries are always nice. I just discovered something this spring that's enchanting, and I remember how fun it was.

With one of the postdocs, a young fellow, I was making a study of galaxies in the Virgo cluster. This is the biggest large cluster near us. Well, what I've learned in looking at these nearby clusters is that, in fact, I have enjoyed very much learning the details of each galaxy.

I mean, I have almost gotten more interested in just their [individual traits], because these galaxies are close to us—well, close to us on a universal scale. This is the first time that I have ever had a large sample of galaxies all of which were close enough so that I could see lots of little details, and I have found that very strange things are happening near the centers of many of these galaxies—very rapid rotations, little discs, all kinds of interesting things—I have sort of gotten hung up on these little interesting things. So, having studied and measured them all and trying to decide what to do because it was such a vast quantity of interesting data, I realized that some of them were more interesting than others for all kinds of reasons, which I won't go into. So I decided that I would write up first those that had the most interesting central properties (which really had nothing to do with why I started the program), and I realized that there were twenty or thirty that were just very interesting, and I picked fourteen. I decided to write a paper on these fourteen interesting galaxies. They all have very rapidly rotating cores and lots of gas and other things.

Well, one of them was unusually interesting. I first took a spectrum of it in 1989 and then another in 1990. So I had two spectra of these objects and I had probably not measured them until 1990 or 1991. At first I didn't quite understand why it was so interesting, but it was unlike anything that I had ever seen. You know, in a galaxy, or in a spiral or disc galaxy, almost all of the stars are orbit-

ing in a plane around the center. Well, I finally decided that in this galaxy some of the stars were going one way and some of the stars were going the other way; some were going clockwise and some were going counterclockwise. But I only had two spectra and one wasn't so good, so I would alternately believe it and not believe it. I mean, I would think about writing this one up alone and then I would think that the spectra were not good enough, and then I would show it to my colleagues and they would believe it and they could see two lines, or they couldn't, and I would worry about whether the sky was doing something funny. So I decided, because the 1991 applications for using the main telescopes had already passed, that in the spring of '92 I would go and get another spectrum. But then I had an idea. Because there were some very peculiar things on the spectrum and I suddenly . . . I don't know . . . months were taken up in trying to understand what I was looking at. I do the thinking in the other room. I sit in front of this very exotic TV screen next to a computer, but it gives me the images of these spectra very carefully and I can play with them. And I don't know, one day I just decided that I had to understand what this complexity was that I was looking at and I made sketches on a piece of paper and suddenly I understood it all. I have no other way of describing it. It was exquisitely clear. I don't know why I hadn't done this two years earlier.

And then in the spring I went observing, so I asked one of my colleagues here to come observing with me. He and I occasionally do things together. We had three nights. On two of them we never opened the telescope, and the third night was a terrible night but we got a little. We got enough on this galaxy that it sort of confirmed it. But on the other hand it really didn't matter because by then I already knew that everything was right.

So that's the story. And it's fun, great fun, to come upon something new. This spring I had to give a talk at Harvard and of course I stuck this in, and in fact it was confirmed two days later by astronomers who had spectra of this galaxy but had not [analyzed them].

This account telescopes years of hard work, doubt, and confusion. When all goes well, the drudgery is redeemed by success. What is remembered are the high points: the burning curiosity, the wonder

at a mystery about to reveal itself, the delight at stumbling on a solution that makes an unsuspected order visible. The many years of tedious calculations are vindicated by the burst of new knowledge. But even without success, creative persons find joy in a job well done. Learning for its own sake is rewarding even if it fails to result in a public discovery. How and why this happens is one of the central questions this book explores.

EVOLUTION IN BIOLOGY AND IN CULTURE

For most of human history, creativity was held to be a prerogative of supreme beings. Religions the world over are based on origin myths in which one or more gods shaped the heavens, the earth, and the waters. Somewhere along the line they also created men and women—puny, helpless things subject to the wrath of the gods. It was *only very recently in the history of the human race* that the tables were reversed: It was now men and women who were the creators and gods the figments of their imagination. Whether this started in Greece or China two and a half millennia ago, or in Florence two thousand years later, does not matter much. The fact is that it happened quite recently in the multimillion-year history of the race.

So we switched our views of the relationship between gods and humans. It is not so difficult to see why this happened. When the first myths of creation arose, humans were indeed helpless, at the mercy of cold, hunger, wild beasts, and one another. They had no idea how to explain the great forces they saw around them—the rising and setting of the sun, the wheeling stars, the alternating seasons. Awe suffused their groping for a foothold in this mysterious world. Then, slowly at first, and with increasing speed in the last thousand years or so, we began to understand how things work—from microbes to planets, from the circulation of the blood to ocean tides—and humans no longer seemed so helpless after all. Great machines were built, energies harnessed, the entire face of the earth transformed by human craft and appetite. It is not surprising that as we ride the crest of evolution we have taken over the title of creator.

Whether this transformation will help the human race or cause its downfall is not yet clear. It would help if we realized the awesome responsibility of this new role. The gods of the ancients, like Shiva,

like Yehova, were both builders and destroyers. The universe endured in a precarious balance between their mercy and their wrath. The world we inhabit today also teeters between becoming either the lovely garden or the barren desert that our contrary impulses strive to bring about. The desert is likely to prevail if we ignore the potential for destruction our stewardship implies and go on abusing blindly our new-won powers.

While we cannot foresee the eventual results of creativity—of the attempt to impose our desires on reality, to become the main power that decides the destiny of every form of life on the planet—at least we can try to understand better what this force is and how it works. Because for better or for worse, our future is now closely tied to human creativity. The result will be determined in large part by our dreams and by the struggle to make them real.

This book, which attempts to bring together thirty years of research on how creative people live and work, is an effort to make more understandable the mysterious process by which men and women come up with new ideas and new things. My work in this area has convinced me that creativity cannot be understood by looking only at the people who appear to make it happen. Just as the sound of a tree crashing in the forest is unheard if nobody is there to hear it, so creative ideas vanish unless there is a receptive audience to record and implement them. And without the assessment of competent outsiders, there is no reliable way to decide whether the claims of a self-styled creative person are valid.

According to this view, creativity results from the interaction of a system composed of three elements: a culture that contains symbolic rules, a person who brings novelty into the symbolic domain, and a field of experts who recognize and validate the innovation. All three are necessary for a creative idea, product, or discovery to take place. For instance, in Vera Rubin's account of her astronomical discovery, it is impossible to imagine it without access to the huge amount of information about celestial motions that has been collecting for centuries, without access to the institutions that control modern large telescopes, without the critical skepticism and eventual support of other astronomers. In my view these are not incidental contributors to individual originality but essential components of the creative process, on a par with the individual's own contributions. For this reason, in this book I devote almost as much attention to the domain

and to the field as to the individual creative persons.

Creativity is the cultural equivalent of the process of genetic changes that result in biological evolution, where random variations take place in the chemistry of our chromosomes, below the threshold of consciousness. These changes result in the sudden appearance of a new physical characteristic in a child, and if the trait is an improvement over what existed before, it will have a greater chance to be transmitted to the child's descendants. Most new traits do not improve survival chances and may disappear after a few generations. But a few do, and it is these that account for biological evolution.

In cultural evolution there are no mechanisms equivalent to genes and chromosomes. Therefore, a new idea or invention is not automatically passed on to the next generation. Instructions for how to use fire, or the wheel, or atomic energy are not built into the nervous system of the children born after such discoveries. Each child has to learn them again from the start. The analogy to genes in the evolution of culture are *memes*, or units of information that we must learn if culture is to continue. Languages, numbers, theories, songs, recipes, laws, and values are all memes that we pass on to our children so that they will be remembered. It is these memes that a creative person changes, and if enough of the right people see the change as an improvement, it will become part of the culture.

Therefore, to understand creativity it is not enough to study the individuals who seem most responsible for a novel idea or a new thing. Their contribution, while necessary and important, is only a link in a chain, a phase in a process. To say that Thomas Edison invented electricity or that Albert Einstein discovered relativity is a convenient simplification. It satisfies our ancient predilection for stories that are easy to comprehend and involve superhuman heroes. But Edison's or Einstein's discoveries would be inconceivable without the prior knowledge, without the intellectual and social network that stimulated their thinking, and without the social mechanisms that recognized and spread their innovations. To say that the theory of relativity was created by Einstein is like saying that it is the spark that is responsible for the fire. The spark is necessary, but without air and tinder there would be no flame.

This book is not about the neat things children often say, or the creativity all of us share just because we have a mind and we can think. It does not deal with great ideas for clinching business deals,

new ways for baking stuffed artichokes, or original ways of decorating the living room for a party. These are examples of creativity with a small c , which is an important ingredient of everyday life, one that we definitely should try to enhance. But to do so well it is necessary first to understand Creativity—and that is what this book tries to accomplish.

ATTENTION AND CREATIVITY

Creativity, at least as I deal with it in this book, is a process by which a symbolic domain in the culture is changed. New songs, new ideas, new machines are what creativity is about. But because these changes do not happen automatically as in biological evolution, it is necessary to consider the price we must pay for creativity to occur. It takes effort to change traditions. For example, memes must be learned before they can be changed: *A musician must learn the musical tradition, the notation system, the way instruments are played before she can think of writing a new song; before an inventor can improve on airplane design he has to learn physics, aerodynamics, and why birds don't fall out of the sky.*

If we want to learn anything, we must pay attention to the information to be learned. And attention is a limited resource: There is just so much information we can process at any given time. Exactly how much we don't know, but it is clear that, for instance, we cannot learn physics and music at the same time. Nor can we learn well while we do the other things that need to be done and require attention, like taking a shower, dressing, cooking breakfast, driving a car, talking to our spouse, and so forth. The point is, a great deal of our limited supply of attention is committed to the tasks of surviving from one day to the next. Over an entire lifetime, the amount of attention left over for learning a symbolic domain—such as music or physics—is a fraction of this already small amount.

Some important consequences follow logically from these simple premises. To achieve creativity in an existing domain, there must be surplus attention available. This is why such centers of creativity as Greece in the fifth century B.C., Florence in the fifteenth century, and Paris in the nineteenth century tended to be places where wealth allowed individuals to learn and to experiment above and beyond what was necessary for survival. It also seems true that centers of cre-

activity tend to be at the intersection of different cultures, where beliefs, lifestyles, and knowledge mingle and allow individuals to see new combinations of ideas with greater ease. In cultures that are uniform and rigid, it takes a greater investment of attention to achieve new ways of thinking. In other words, creativity is more likely in places where new ideas require less effort to be perceived.

As cultures evolve, it becomes increasingly difficult to master more than one domain of knowledge. Nobody knows who the last Renaissance man really was, but sometime after Leonardo da Vinci it became impossible to learn enough about all of the arts and the sciences to be an expert in more than a small fraction of them. Domains have split into subdomains, and a mathematician who has mastered algebra may not know much about number theory, combinatorix, topology—and vice versa. Whereas in the past an artist typically painted, sculpted, cast gold, and designed buildings, now all of these special skills tend to be acquired by different people.

Therefore, it follows that as culture evolves, specialized knowledge will be favored over generalized knowledge. To see why this must be so, let us assume that there are three persons, one who studies physics, one who studies music, and one who studies both. Other things being equal, the person who studies both music and physics will have to split his or her attention between two symbolic domains, while the other two can focus theirs exclusively on a single domain. Consequently, the two specialized individuals can learn their domains in greater depth, and their expertise will be preferred over that of the generalist. With time, specialists are bound to take over leadership and control of the various institutions of culture.

Of course, this trend toward specialization is not necessarily a good thing. It can easily lead to a cultural fragmentation such as described in the biblical story of the building of the Tower of Babel. Also, as the rest of this book amply demonstrates, creativity generally involves crossing the boundaries of domains, so that, for instance, a chemist who adopts quantum mechanics from physics and applies it to molecular bonds can make a more substantive contribution to chemistry than one who stays exclusively within the bounds of chemistry. Yet at the same time it is important to recognize that given how little attention we have to work with, and given the increasing amounts of information that are constantly being added to domains, specialization seems inevitable. This trend might be

reversible, but only if we make a conscious effort to find an alternative; left to itself, it is bound to continue.

Another consequence of limited attention is that creative individuals are often considered odd—or even arrogant, selfish, and ruthless. It is important to keep in mind that these are not traits *of* creative people, but traits that the rest of us attribute to them on the basis of our perceptions. When we meet a person who focuses all of his attention on physics or music and ignores us and forgets our names, we call that person “arrogant” even though he may be extremely humble and friendly if he could only spare attention from his pursuit. If that person is so taken with his domain that he fails to take our wishes into account we call him “insensitive” or “selfish” even though such attitudes are far from his mind. Similarly, if he pursues his work regardless of other people’s plans, we call him “ruthless.” Yet it is practically impossible to learn a domain deeply enough to make a change in it without dedicating all of one’s attention to it and thereby appearing to be arrogant, selfish, and ruthless to those who believe they have a right to the creative person’s attention.

In fact, creative people are neither single-minded, specialized, nor selfish. Indeed, they seem to be the opposite: They love to make connections with adjacent areas of knowledge. They tend to be—in principle—caring and sensitive. Yet the demands of their role inevitably push them toward specialization and selfishness. Of the many paradoxes of creativity, this is perhaps the most difficult to avoid.

WHAT’S THE GOOD OF STUDYING CREATIVITY?

There are two main reasons why looking closely at the lives of creative individuals and the contexts of their accomplishments is useful. The first is the most obvious one: The results of creativity enrich the culture and so they indirectly improve the quality of all our lives. But we may also learn from this knowledge how to make our own lives directly more interesting and productive. In the last chapter of this volume I summarize what this study suggests for enriching anyone’s everyday existence.

Some people argue that studying creativity is an elite distraction from the more pressing problems confronting us. We should focus all our energies on combating overpopulation, poverty, or mental retardation instead. A concern for creativity is an unnecessary luxury,

according to this argument. But this position is somewhat shortsighted. First of all, workable new solutions to poverty or overpopulation will not appear magically by themselves. Problems are solved only when we devote a great deal of attention to them and in a creative way. Second, to have a good life, it is not enough to remove what is wrong from it. We also need a positive goal, otherwise why keep going? Creativity is one answer to that question: It provides one of the most exciting models for living. Psychologists have learned much about how healthy human beings think and feel from studying pathological cases. Brain-damaged patients, neurotics, and delinquents have provided contrasts against which normal functioning may better be understood. But we have learned little from the other end of the continuum, from people who are extraordinary in some positive sense. Yet if we wish to find out what might be missing from our lives, it makes sense to study lives that are rich and fulfilling. This is one of the main reasons for writing the book: to understand better a way of being that is more satisfying than most lives typically are.

Each of us is born with two contradictory sets of instructions: a conservative tendency, made up of instincts for self-preservation, self-aggrandizement, and saving energy, and an expansive tendency made up of instincts for exploring, for enjoying novelty and risk—the curiosity that leads to creativity belongs to this set. We need both of these programs. But whereas the first tendency requires little encouragement or support from outside to motivate behavior, the second can wilt if it is not cultivated. If too few opportunities for curiosity are available, if too many obstacles are placed in the way of risk and exploration, the motivation to engage in creative behavior is easily extinguished.

You would think that given its importance, creativity would have a high priority among our concerns. And in fact there is a lot of lip service paid to it. But if we look at the reality, we see a different picture. Basic scientific research is minimized in favor of immediate practical applications. The arts are increasingly seen as dispensable luxuries that must prove their worth in the impersonal mass market. In one company after another, as downsizing continues, one hears CEOs report that this is not an age for innovators but for bookkeepers, not a climate for building and risking but for cutting expenses. Yet as economic competition heats up around the globe, exactly the opposite strategy is needed.

And what holds true for the sciences, the arts, and for the economy also applies to education. When school budgets tighten and test scores wobble, more and more schools opt for dispensing with frills—usually with the arts and extracurricular activities—so as to focus instead on the so-called basics. This would not be bad if the “three Rs” were taught in ways that encouraged originality and creative thinking; unfortunately, they rarely are. Students generally find the basic academic subjects threatening or dull; their chance of using their minds in creative ways comes from working on the student paper, the drama club, or the orchestra. So if the next generation is to face the future with zest and self-confidence, we must educate them to be original as well as competent.

HOW THE STUDY WAS CONDUCTED

Between 1990 and 1995 I and my students at the University of Chicago videotaped interviews with a group of ninety-one exceptional individuals. The in-depth analysis of these interviews helps illustrate what creative people are like, how the creative process works, and what conditions encourage or hinder the generation of original ideas.

There were three main conditions for selecting respondents: The person had to have made a difference to a major domain of culture—one of the sciences, the arts, business, government, or human well-being in general; he or she had to be still actively involved in that domain (or a different one); and he or she had to be at least sixty years old (in a very few cases, when circumstances warranted, we interviewed respondents who were a bit younger). A list of the respondents interviewed thus far is in appendix A.

The selection process was slow and lengthy. I set out to interview equal numbers of men and women who met our criteria. A further desideratum was to get as wide a representation of cultural backgrounds as possible. With these conditions in mind, I began generating lists of people who met these attributes. In this task I availed myself of the best advice of colleagues and experts in different disciplines. After a while the graduate students involved in the project also suggested names, and other leads were provided by the respondents after each interview, producing what is sometimes called a “snowball sample.”

When the research team agreed that the achievements of a person nominated for the sample warranted inclusion, he or she was sent a letter that explained the study and requested participation. If there was no response within three weeks or so, we repeated the request, and then tried to contact the person by phone. Of the 275 persons initially contacted, a little over a third declined, the same number accepted, and a quarter did not respond or could not be traced. Those who accepted included many individuals whose creativity had been widely recognized; there were fourteen Nobel prizes shared among the respondents (four in physics, four in chemistry, two in literature, two in physiology or medicine, and one each in peace and in economics). Most of the others' accomplishments were of the same order, even if they were not as widely recognized.

A few declined for health reasons, many more because they could not spare the time. The secretary to novelist Saul Bellow wrote: "Mr. Bellow informed me that he remains creative in the second half of life, at least in part, because he does not allow himself to be the object of other people's 'studies.' In any event, he's gone for the summer." The photographer Richard Avedon just scrawled the answer "Sorry—too little time left!" The secretary of composer George Ligeti had this to say:

He is creative and, because of this, totally overworked. Therefore, the very reason you wish to study his creative process is also the reason why he (unfortunately) does not have the time to help you in this study. He would also like to add that he cannot answer your letter personally because he is trying desperately to finish a Violin Concerto which will be premiered in the Fall. He hopes very much you will understand.

Mr. Ligeti would like to add that he finds your project extremely interesting and would be very curious to read the results.

Occasionally the refusal was due to the belief that studying creativity is a waste of time. Poet and novelist Czeslaw Milosz wrote back: "I am skeptical as to the investigation of creativity and I do not feel inclined to submit myself to interviews on that subject. I guess I suspect some methodological errors at the basis of all discussions about 'creativity.'" The novelist Norman Mailer replied: "I'm sorry but I

never agree to be interviewed on the process of work. Heisenberg's principle of uncertainty applies." Peter Drucker, the management expert and professor of Oriental art, excused himself in these terms:

I am greatly honored and flattered by your kind letter of February 14th—for I have admired you and your work for many years, and I have learned much from it. But, my dear Professor Csikszentmihalyi, I am afraid I have to disappoint you. I could not possibly answer your questions. I am told I am creative—I don't know what that means. . . . I just keep on plodding. . . .

. . . I hope you will not think me presumptuous or rude if I say that one of the secrets of productivity (in which I believe whereas I do not believe in creativity) is to have a VERY BIG waste paper basket to take care of ALL invitations such as yours—productivity in my experience consists of NOT doing anything that helps the work of other people but to spend all one's time on the work the Good Lord has fitted one to do, and to do well.

The rate of acceptance varied among disciplines. More than half of the natural scientists, no matter how old or busy they were, agreed to participate. Artists, writers, and musicians, on the other hand, tended to ignore our letters or declined—less than a third of those approached accepted. It would be interesting to find out the causes of this differential attrition.

The same percentage of women and men accepted, but since in certain domains well-known creative women are underrepresented, we were unable to achieve the fifty-fifty gender ratio we were hoping for. Instead, the split is about seventy-thirty in favor of men.

Usually in psychological research, you must make sure that the individuals studied are "representative" of the "population" in question—in this case, the population of creative persons. If the sample is not representative, what you find cannot be generalized to the population. But here I don't even attempt to come up with generalizations that are supposed to hold for all creative persons. What I try to do occasionally is to *disprove* certain widespread assumptions. The advantage of disproof over proof in science is that whereas a single case can disprove a generalization, even all the cases in the world are not enough for a conclusive positive proof. If I could find just one white raven, that would be enough to disprove the statement: "All

ravens are black.” But I can point at millions of black ravens without confirming the statement that all ravens are black. Somewhere there may be a white raven hiding. The same lack of symmetry between what is called falsification and proof holds even for the most sacred laws of physics.

For the purposes of this book, the strategy of disproof is amply sufficient. The information we collected could not prove, for instance, that all creative individuals had a happy childhood, even if all the respondents had said that their childhood had been happy. But even one unhappy child can disprove that hypothesis—just as one happy child could disprove the opposite hypothesis, that creative individuals must have unhappy childhoods. So the relatively small size of the sample, or its lack of representativeness, is no real impediment to deriving solid conclusions from the data.

It is true that in the social sciences statements are usually neither true nor false but only claim the statistical superiority of one hypothesis over another. We would say that there are so many more black ravens than white ravens that chance alone cannot account for it. Therefore, we conclude that “most ravens are black,” and we are glad that we can say this much. In this book I do not avail myself of statistics to test the comparisons that will be reported, for a variety of reasons. First of all, the ability to disprove some deeply held assumptions about creativity seems to me sufficient, and here we are on solid ground. Second, the characteristics of this unique sample violate most assumptions on which statistical tests can be safely conducted. Third, there is no meaningful “comparison group” against which to test the patterns found in this sample.

With a very few exceptions, the interviews were conducted in the offices or homes of the respondents. The interviews were videotaped and then transcribed verbatim. They generally lasted about two hours, although a few were shorter and some lasted quite a bit longer. But the interviews are only the tip of the iceberg as far as information about this sample is concerned. Most of the respondents have written books and articles; some have written autobiographies or other works that could be inspected. In fact, each of them left such an extensive paper trail that to follow it all the way would take several lifetimes; however, the material is extremely useful to round out our understanding of each person and his or her life.

Our interview schedule had a number of common questions that

we tried to ask each respondent (a copy of it is in appendix B). However, we did not necessarily ask the questions in the same order, nor did we always use exactly the same wording; my priority was to keep the interview as close to a natural conversation as possible. Of course, there are advantages and disadvantages to both methods. I felt, however, that it would be insulting, and therefore counterproductive, to force these respondents to answer a mechanically structured set of questions. Because I hoped to get genuine and reflective answers, I let the exchanges develop around the themes I was interested in, instead of forcing them into a mold. The interviews are rich as well as being comprehensive—thanks in large measure also to the excellent cadre of graduate students who helped collect them.

When I started to write the book I was confronted with an embarrassment of riches. Thousands of pages clamored for attention, yet I could not do justice to more than a tiny fraction of the material. *The choices were often painful—so many beautiful accounts had to be dropped or greatly compressed.* The interviews I quote extensively are not necessarily those from the most famous or even the most creative people but the ones that most clearly address what I thought were important theoretical issues. So the choice is personal. Yet I am confident that I have not distorted the meaning of any of the respondents or the consensus of the group as a whole.

Even though the voice of some respondents is not represented by even a single quotation, the content of their statements is included in the generalizations that occasionally are presented, in verbal or numerical form. And I hope that either I, my students, or other scholars will eventually tap those parts of this rich material that I was forced to shortchange.

TOO GOOD TO BE TRUE?

Contrary to the popular image of creative persons, the interviews present a picture of creativity and creative individuals that is upbeat and positive. Instead of suspecting these stories of being self-serving fabrications, I accept them at face value—provided they are not contradicted by other facts known about the person or by internal evidence.

Yet many social scientists in the last hundred years have made it their task to expose the hypocrisy, self-delusion, and self-interest

underlying human behavior traits that were never questioned scientifically before the end of the nineteenth century. Poets like Dante or Chaucer were of course intimately acquainted with the foibles of human nature. But it was not until Freud explained the possibility of repression, Marx argued the power of false consciousness, and sociobiologists showed how our actions are the outcome of selective pressures that we had systematic insights into why our reports about ourselves may be so deceptive.

Unfortunately, the understanding for which we owe Freud and the rest of those great thinkers an immense intellectual debt has been marred to a certain extent by the indiscriminate application of their ideas to every aspect of behavior. As a result, in the words of the philosopher Hannah Arendt, our discipline runs the risk of degenerating into a “de-bunking enterprise,” based more on ideology than evidence. Even the novice student of human nature learns to distrust appearances—not as a sensible methodological precaution that any good scientist would endorse but as a certainty in the dogma that nothing can be trusted at face value. I can imagine what some sophisticated colleagues would do with the following claim made by one of our respondents: “I have been married for forty-four some years to someone I adore. He is a physicist. We have four children, each of whom has a Ph.D. in science; each of whom has a happy life.”

They would probably smile with refined irony and see in these sentences an attempt on the speaker’s part to deny an unhappy family life. Others would see it as an attempt to impress the audience. Still others may think that this person’s optimistic outburst is simply a narrative device that arose in the context of the interview, not because it is literally true, but because conversations have their own logic and their own truth. Or they would see it as the expression of a bourgeois ideology where academic degrees and comfortable middle-class status are equated with happiness.

But what if there is actual evidence that this woman has been married for forty-four years, that despite her busy schedule as a leading scientist she brought up four children who worked themselves into demanding professional careers, and that she spends most of her free time with her husband at home or traveling? And that her children appear contented with their lives, visit her often, and are in frequent contact with the parents? Should we not relent and admit, however

grudgingly, that the meaning of the passage is closer to what the speaker intended than to the alternative meanings I attributed to the imaginary critic?

Let me present a passage from another interview that also illustrates the optimism that is typical of these accounts. This is from the sculptor Nina Holton, married to a well-known (and also creative) scholar.

I like the expression "It makes the spirit sing," and I use it quite often. Because outside my house on the Cape we have this tall grass and I watch it and I say "It is singing grass, I hear it singing." I have a need inside me, of a certain joy, you see? An expression of joy. I feel it. I suppose that I am glad to be alive, glad that I have a man whom I love and a life that I enjoy and the things which I work on which sometimes make my spirit sing. And I hope everybody has that feeling inside. I am grateful that I have a spirit inside me which often sings.

I feel that I do things that make a difference to me and give me great satisfaction. And I can always discuss things with my husband, and we find great parallels, you see, of when he has an idea when he works on something and when we come together and discuss our days and what we have been doing. Not always but often. It is a great bond between us. And also he has been very interested in what I am doing and so in a way he is very much involved in my world. He photographs the things which I do and he is very, very much interested. I can discuss everything with him. It is not like I am working in the dark. I can always come to him and he will give me some advice. I may not always take it, but still there it is. Life feels rich with it. It does.

Again, a cynical reading might lead one to conclude that, well, it must be nice for a two-career couple to have a good time while being creative, but isn't it common knowledge that to achieve anything new and important, especially in the arts, a person must be poor and suffering and tired of the world? So lives like these either represent only a small minority of the creative population, or they must not be accepted at face value, even if all the evidence suggests their truth.

I am not saying that all creative persons are well-off and happy.

Family strain, professional jealousies, and thwarted ambitions were occasionally evident in the interviews. Moreover, it is probable that a selection bias has affected the sample I have collected. Focusing on people beyond sixty years of age eliminated those who may have led a more high-risk lifestyle and thus died early. Some of the individuals we asked to participate and who did not respond or refused may have been less happy and less adjusted than those who accepted. Two or three of those who initially agreed to be interviewed became so infirm and despondent that after the appointment was made they asked to be excused. Thus the individuals who ended up as part of the sample are skewed in the direction of positive health, physical and psychological.

But after several years of intensive listening and reading, I have come to the conclusion that the reigning stereotype of the tortured genius is to a large extent a myth created by Romantic ideology and supported by evidence from isolated and—one hopes—atypical historical periods. In other words, if Dostoyevsky and Tolstoy showed more than their share of pathology it was due less to the requirements of their creative work than to the personal sufferings caused by the unhealthful conditions of a Russian society nearing collapse. If so many American poets and playwrights committed suicide or ended up addicted to drugs and alcohol, it was not their creativity that did it but an artistic scene that promised much, gave few rewards, and left nine out of ten artists neglected if not ignored.

Because of these considerations, I find it more realistic, if more difficult, to approach these interviews with an open skepticism, keeping in mind the bias in favor of happiness these people display and what we have learned about the human tendency to disguise and embellish reality. Yet at the same time, I am ready to accept a positive scenario when it appears to be warranted. It seems to me a risk worth running because I agree with these sentiments of the Canadian novelist Robertson Davies:

Pessimism is a very easy way out when you're considering what life really is, because pessimism is a short view of life. If you look at what is happening around us today and what has happened just since you were born, you can't help but feel that life is a terrible complexity of problems and illnesses of one sort or another. But if you look back a few thousand years, you realize that we have

advanced fantastically from the day when the first amoeba crawled out of the slime and made its adventure on land. If you take a long view, I do not see how you can be pessimistic about the future of man or the future of the world. You can take a short view and think that everything is a mess, that life is a cheat and a deceit, and of course you feel miserable. And I become very much amused by some of my colleagues, particularly in the study of literature, who say the pessimistic, the tragic view, is the only true key to life—which I think is just self-indulgent nonsense. It's very much easier to be tragic than it is to be comic. I have known people to embrace the tragic view of life, and it is a cop-out. They simply feel rotten about everything, and that is terribly easy. And if you try to see things a little more evenly, it's surprising what complexities of comedy and ambiguity and irony appear in it. And that, I think, is what is vital to a novelist. Just writing tragic novels is rather easy.

Davies's critique applies more broadly, and not just to the literary field. It is equally easy to explain creativity in a way that only exposes, debunks, reduces, deconstructs, and rationalizes what creative persons do, while ignoring the genuine joy and fulfillment their life contains. But to do so blinds us to the most important message we can learn from creative people: how to find purpose and enjoyment in the chaos of existence.

I did not, however, write this book to prove a point. The findings I discuss emerged from the data. They are not my recycled preconceptions, nor those of anyone else. It is the extraordinary people whose voices fill these pages who tell the story of the unfolding of creativity. Its plot cannot be reduced to glib definitions or superficial techniques. But in its richness and complexity, it is a story that reveals the deep potentials of the human spirit. Having introduced some of the themes that the following chapters will develop, it is now time to get on with the show.

PART I

THE CREATIVE
PROCESS

WHERE IS CREATIVITY?

The answer is obvious: Creativity is some sort of mental activity, an insight that occurs inside the heads of some special people. But this short assumption is misleading. If by creativity we mean an idea or action that is new and valuable, then we cannot simply accept a person's own account as the criterion for its existence. There is no way to know whether a thought is new except with reference to some standards, and there is no way to tell whether it is valuable until it passes social evaluation. Therefore, creativity does not happen inside people's heads, but in the interaction between a person's thoughts and a sociocultural context. It is a systemic rather than an individual phenomenon. Some examples will illustrate what I mean.

When I was a graduate student I worked part-time for a few years as an editor for a Chicago publishing house. At least once a week we would get in the mail a manuscript from an unknown author who claimed to have made a great discovery of one sort or another. Perhaps it was an eight-hundred-page tome that described in minute detail how a textual analysis of the *Odyssey* showed that, contrary to received opinion, Ulysses did not sail around the Mediterranean.

Instead, according to the author's calculations, if one paid attention to the landmarks, the distances traveled, and the pattern of the stars mentioned by Homer, it was obvious that Ulysses actually traveled around the coast of Florida.

Or it might be a textbook for building flying saucers, with extremely precise blueprints—which on closer inspection turned out to be copied from a service manual for a household appliance. What made reading these manuscripts depressing was the fact that their authors actually believed they had found something new and important and that their creative efforts went unrecognized only because of a conspiracy on the part of philistines like myself and the editors of all the other publishing houses.

Some years ago the scientific world was abuzz with the news that two chemists had achieved cold fusion in the laboratory. If true, this meant that something very similar to the perpetual motion machine—one of the oldest dreams of mankind—was about to be realized. After a few frenetic months during which laboratories around the world attempted to replicate the initial claims—some with apparent success, but most without—it became increasingly clear that the experiments on which the claims were based had been flawed. So the researchers who at first were hailed as the greatest creative scientists of the century became somewhat of an embarrassment to the scholarly establishment. Yet, as far as we know, they firmly believed that they were right and that their reputations had been ruined by jealous colleagues.

Jacob Rabinow, himself an inventor but also an evaluator of inventions for the National Bureau of Standards in Washington, has many similar stories to tell about people who think they have invented perpetual motion machines:

I've met many of these inventors who invent something that cannot work, that is theoretically impossible. But they spent three years developing it, running a motor without electricity, with magnets. You explain to them it won't work. It violates the second law of thermodynamics. And they say, "Don't give me your goddamn Washington laws."

Who is right: the individual who believes in his or her own creativity, or the social milieu that denies it? If we take sides with the

individual, then creativity becomes a subjective phenomenon. All it takes to be creative, then, is an inner assurance that what I think or do is new and valuable. There is nothing wrong with defining creativity this way, as long as we realize that this is not at all what the term originally was supposed to mean—namely, to bring into existence something genuinely new that is valued enough to be added to the culture. On the other hand, if we decide that social confirmation is necessary for something to be called creative, the definition must encompass more than the individual. What counts then is whether the inner certitude is validated by the appropriate experts—such as the editors of the publishing house in the case of far-out manuscripts, or other scientists in the case of cold fusion. And it isn't possible to take a middle ground and say that sometimes the inner conviction is enough, while in other cases we need external confirmation. Such a compromise leaves a huge loophole, and trying to agree on whether something is creative or not becomes impossible.

The problem is that the term “creativity” as commonly used covers too much ground. It refers to very different entities, thus causing a great deal of confusion. To clarify the issues, I distinguish at least three different phenomena that can legitimately be called by that name.

The first usage, widespread in ordinary conversation, refers to persons who express unusual thoughts, who are interesting and stimulating—in short, to people who appear to be unusually bright. A brilliant conversationalist, a person with varied interests and a quick mind, may be called creative in this sense. Unless they also contribute something of permanent significance, I refer to people of this sort as *brilliant* rather than creative—and by and large I don't say much about them in this book.

The second way the term can be used is to refer to people who experience the world in novel and original ways. These are individuals whose perceptions are fresh, whose judgments are insightful, who may make important discoveries that only they know about. I refer to such people as *personally creative*, and try to deal with them as much as possible (especially in chapter 14, which is devoted to this topic). But given the subjective nature of this form of creativity, it is difficult to deal with it no matter how important it is for those who experience it.

The final use of the term designates individuals who, like