Creativity and Affect

Edited by

Melvin P. Shaw
Mark A. Runco

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Dedications

To, for, and with my wife Bunny Miller-Shaw, who was the primary force in the creation of my career as a psychologist, and to our children, Mitch, Adam, Ronnie, and Evan.

—M.P.S.

For my favorite artist, Ann Runco.

—M.A.R.

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Preface

This volume is the offspring of several conversations between the editors and our colleagues about the role that *emotions, feelings,* and *moods* play in the creative process. These descriptors have often been used interchangeably with the word *affect* in the past; hence our choice of title.

The field of creativity has emerged of late with renewed vigor. In particular, the series in which our volume is included contains books on general theories of creativity, divergent thinking, genius, counseling the gifted, problem solving, and various other areas. Our focus is the affective component of creative behavior. Here the specific crucial topics are, among others, affect tolerance, resilience, mental health and illness, failure, frustration, elation, and hypomania. The chapters ask, What are the roles that these factors play in the generative or creative process, and how are they linked to the generation of a transcendence of existing structures?

One of the goals of this volume was to cohere the field of creativity and affect in a scholarly fashion by categorizing and characterizing some of its major features: environmental influences, underlying processes, specific affective states, the role of atypical or pathological personalities, unconscious processes, physiological components, proactive and reactive stimuli, intrinsic motivation, eminence versus everyday creativity, and testing or assessing the affective component of creativity. The book encompasses this broad variety of perspectives.

A second and significant goal of this book was to provide a vehicle for students, both undergraduate and graduate, as well as psychotherapists, with which they can fully appreciate the feelings generated by the creative process and its various stages. How does a creator feel during its more mundane phases? Can he or she tolerate the frustration of failing and being unsuccessful most of the time? What is the real joy of achievement, success, and ultimate acceptance by one's peers in a given field? Do we have to exhibit major psychopathological features in order to achieve eminence in specific fields? What is the role of mind-altering substances, mood disorders, and the like?

Family background and mentorship are very important, and coupled to these is the concept of appropriate mirroring via the necessary support and encouragement that, in many cases, is required. The converse is also significant in that the lack of appropriate mirroring is also sometimes a motivating factor. Indeed, the combination of major pathological personality features with other stabilizing

components within one individual is noted in several chapters. It seems that the identification of creative individuals often shows the common human trait of *and* rather than *or*. Individuals *feel* this way *and* that way, exhibit a broad spectrum of behaviors, and are most commonly capable of a wide variety of different moods, feelings, and emotions. Individuals deal with them in their own style, and at the present writing our ability to *predict* based on these styles is at a very primitive stage. However, it is very useful and informative to provide data, theoretical foundations, and information during our "bean-sorting" categorization stage prior to the eventual development of the structures required to form the basis of a science.

We have organized the book into three major foci. Part I focuses on specific affective states, and therefore on affect tolerance. Part II deals with intrinsic motivation, and Part III focuses on psychological and biological features.

Part I begins with Melvin Shaw's description of the spectrum of affective states that scientists and engineers deal with when they are in the throes of creating mathematical models of natural phenomena. He concludes that insufficient emphasis has been placed on the importance of feelings and emotions in describing what some believe to be a process devoid of these components. In the next two chapters Ruth Richards and Charles Bowden deal with the association between creativity and bipolar mood disorders. Creativity is often shown to be enhanced by state-dependent phenomena coupled with mild mood elevators. The experiential influence of the range of bipolar mood states is shown to be important, and Richards and Bowden each argue that creative behavior can be a *compensatory advantage*—a positive side to the pain of dealing with one's intense mood swings. David Schuldberg then uncovers the significance of both *giddiness* and *horror* in the creative process. The proximity of these states to psychoses is explored, along with the intermingling effect of these experiences. Mark Runco then ends Part I by focusing on the benefits of tension and conflict. He ties tension to intrinsic motivation, which leads directly to issues covered in Part II.

Part II focuses on the role of intrinsic motivation. Thomas Heinzen delves into issues of motivation as indicated by either a proactive or a reactive stance. A comparison of situationally driven versus personality-dependent phenomena is made in an attempt to develop a systematic distinction between two different motivating factors. Next, Gordon Becker argues that the present emphasis on individual creativity is far from an optimum configuration from a social standpoint, because its narcissistic components lead to enhanced suffering on a global scale. He suggests that a more humane world would result if we developed a team-oriented creative stance. Gudmund Smith and Gunilla van der Meer then develop the thesis that creative activity stems from an array of drivers and generative processes that are largely unconscious. This important chapter both stresses the importance of a mild, anticipatory anxiety and serves as a bridge between Part II and Part III.

Part III, on specific psychological and biological views, opens Henry and Andrew Krystals' imaginative work on dreams and neuroscience. Their view is that none of the major features of intrapsychic processing are linear, and the deterministic chaos is at the root of creative production. Warren TenHouten then deals with alexithymic personalities and split-brained patients in an attempt to characterize and categorize specific creative components via an experimental approach. The experience of symbolization is found to be vital, as is the ability to fantasize. Reporting another experimental study of split-brained patients, Klaus Hoppe continues on this theme, relating hemispherical specialization to affect. Joachim Scharfenberg ends this section with a fascinating view of the creativity of religious symbols, which, he argues, has been overlooked in recent years, at the peril of our species. Perhaps most importantly, the development of science as a separation of objective reality from subjective experience is explored with an eye toward integration of both components. This, of course, is the central theme of several chapters in our book.

A concluding chapter serves to explore, discuss, and cohere the salient features of the emotional components of creative behavior presented in this book. Before we turn to Chapter 1, the editors wish to express their gratitude to Terry Meerschaert and Sally Stallings for their assistance in the preparation of the manuscript; to Barbara Bernstein for ideas about organization and presentation; and to Klaus Hoppe for invaluable suggestions about topics and contributors.

Part I

Specific Affective States

1

Affective Components of Scientific Creativity*

Melvin P. Shaw

A formal heuristic investigation was performed to address the question: What is the experience of making a mathematical model of a natural phenomenon? The data analysis has been represented via a structural flow diagram in a prior publication (Shaw, 1989), which emphasized both the cognitive and emotional features of the scientifically creative process. In this chapter I compare and contrast our model

* I am very grateful to my 11 distinguished co-researchers: Mohammed Aslam, Associate Professor of Electrical and Computer Engineering, Michigan State University; Henry Bohm, Professor of Physics and former Provost, Wayne State University, and former President, Argonne University Associates; J.T. Chen, Professor of Physics, Wayne State University; Phillip Duxbury, Associate Professor of Physics, Michigan State University; Robert Erlandson, Professor of Electrical and Computer Engineering, Wayne State University, former Vice President, Detroit Metropolitan Center for High Technology; Lawrence Favro, Professor of Physics, Wayne State University; Julius Harwood, Director of Material Sciences (Retired), Ford Scientific Laboratories, and Member, National Academy of Engineering; Demetrius Lalas, Professor of Mechanical Engineering, The University of Athens, Greece; Martin McClain, Professor of Chemistry, Wayne State University; Brian Schwartz, Professor of Physics and former Vice President, Brooklyn College of the City University of New York, and Education Director, the American Physical Society; Marvin Silver, Professor of Physics (retired), The University of North Carolina.

I am also indebted to Colleen McNally, Paul Sporn, John Varani, and Sherwin Wine for critical evaluations of my work. The seminal ideas for this work were generated while I was a student at the Center for Humanistic Studies in Detroit, MI.

with other models, focusing on parameters such as intrinsic motivation and affect tolerance. We describe how the data were handled and presented, and display a substantial fraction of them in order to provide the reader with the richness of the emotional experiences described by the interviewees. Implications and applications emerged in the areas of creativity, validation, education, motivation, psychotherapy and spirituality. It was concluded that far too little emphasis has been placed on the affective components (feelings, emotions) of the creative process, and it was suggested that it is important to understand, teach, recognize, and tolerate our emotions in order to learn to trust our own natural abilities and intuition.

> It's an experience like no other experience I can describe, the best thing that can happen to a scientist, realizing that something that's happened in his or her mind exactly corresponds to something that happens in nature. It's startling every time it occurs. One is surprised that a construct of one's own mind can actually be realized in the honest-to-goodness world out there. A great shock, and a great, great joy.
>
> —Leo Kadanoff (Gleick, 1987, p. 189)

INTRODUCTION

Many of us who are involved with the tasks of research and development in science and engineering, and the production aspects of engineering technology, might agree that a reasonable view of the *creative* (see, e.g., Arieti, 1976; Runco & Albert, 1990) or *generative* (Epstein, 1990) process involves the following features: find the *"mess"*; find the *facts*; find the *problem*; find the *ideas*; find the *solution*; find the *acceptance* (Albert, 1990); find the new *mess*. Further, recent findings from a variety of disciplines (Runco & Albert, 1990) seem to be consistent with the view that there are at least three major features of the creative process from the standpoint of the individual: ideational fluency (see, e.g., Milgram, 1990), affect tolerance (e.g., Krystal, 1988), and intrinsic motivation (e.g., Amabile, 1990). Ideational fluency is important in finding the problem, generating ideas, and arriving at a solution. Affect tolerance is required in finding the solution and being accepted, and intrinsic motivation is fundamental to the process as a whole. It is also important to stress that the process is more than one just involved with the individual. Rather, the domain, field, and individual (Csikszentmihalyi, 1989, 1990) are all linked in a very complex manner. In the present study the *domain* is the area of creativity in making mathematical models of natural phenomena, the *field* is represented by our scientific peers and reviewers, and the *individual* is represented by someone who has the talent and motivation to work effectively in this specific area.

On the other hand, although the above parameters appear to be important in describing major requirements of the creative process, it is perhaps likely that human behavior, both personal and collective, might best be described by processes that encompass deterministic chaos (Gleick, 1987) as an appropriate

description (Krystal & Krystal, this volume). If this is the case, then the occurrence of creativity in an individual or social system will always contain unpredictable elements. However, the *onset* of creative behavior (Harrington, 1990) could be enhanced by optimizing appropriate critical parameters in nonlinear formulations that have yet to be determined.

Over the years, a great deal has been written on the creative process. Some authors have suggested that creativity is similar in a wide variety of disciplines such as art, literature, science, and music. Ghiselin (1952) edited a compendium of contributions from a broad spectrum of creative people. Their views, dating back through the 18th century, seem congruent with many features of extant models of the creative process (e.g., Albert, 1990; Amabile, 1990; Csikszentmihalyi, 1990; Epstein, 1990; Gruber, 1979; Hadamard, 1945; Harrington, 1990; Isen, Daubman, & Nowicki, 1987; Koestler, 1964; Milgram, 1990; Perkins, 1981; Richards, 1990; Weisberg, 1986; Wilson, 1986). Weisberg (1986) presented a useful review of ideas concerning the creative process. Herrmann (1988) recently outlined a novel four-segment model of the brain that couples the creative components in an interactive manner.

In the great majority of the above studies and models, the role of affect, emotion, and feelings has clearly played a secondary role. In an attempt to help fill this void, we presented (Shaw, 1989) a structural model for the integrated affective and cognitive components of the creative process in science and engineering that was based on a heuristic (Craig, 1978; Douglas & Moustakas, 1985; McNally, 1982) study of 12 male researchers. The results of the study are summarized in Figure 1.1, where the emotional structure is overlaid on the cognitive structure, with the latter represented by the heuristic process with feedback loops. (Feedback produces nonlinearities and can admit chaotic solutions—e.g., Krystal & Krystal, this volume.) This process involves the phases of immersion, incubation, illumination, explication, and creative synthesis. The validation processes are the major feedback loops.

Four unipolar and four bipolar affective components are noted in this structural diagram. The unipolar components exhibiting only positive components are the illumination and acceptance phases (stars). Those exhibiting negative polarity (dumbbells) are the illumination block (Maslow, 1968) and the acceptance block. The emotions associated with the positive unipolar components range from neutral to positive feelings; negative unipolar components range from neutral to negative feelings. The bipolar component (circles over the squares), with feelings experienced over the range from positive to negative, were formed in the immersion, incubation, explication, and creative synthesis phases. The immersion and incubation phases were strongly enmeshed with each other, as were the phases of explication and creative synthesis. In fact, the incubation phase seemed to be embedded inside the immersion phase. These bipolar modes seem to be synonymous with the flow states described by Czikszentmihalyi (1989).

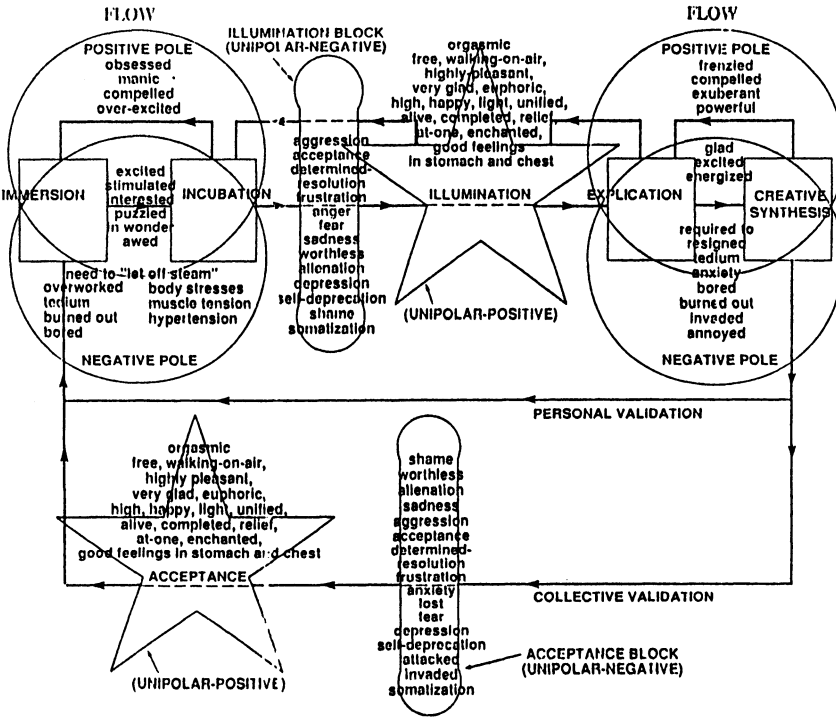

Figure 1.1. A model of the creative process.

There was a constant interplay between conscious immersion and unconscious incubation. The incubation phase flitted around inside the immersion phase like a bubble in a very viscous liquid filling an enclosed container. Illumination seemed to occur at the instant that the bubble touched the surface. Here, the blockage evaporated and everything fell into place. A cognitive model for this process has been discussed by Caulfield (1992), among others.

The enmeshment of the explication and creative synthesis phases is not as dramatic or dynamic. These phases occur following the first unipolar-positive phase. They are often anticlimactic. The next blockage or resistance only appears when collective validation is sought. With acceptance by others a fundamental need, then, if we do not receive appropriate acceptance, we can use our own egos, if they are firmly established, to sustain us via personal validation during those trying times. But this is not an easy thing for human beings to endure for a sustained duration.

The structural model does not explicitly show the embeddedness of the incubation phase in the immersion phase. This is done for clarity; the diagram is

cumbersome enough. It is in some ways a superposed projection of the left and right side functions of the brain (Hoppe, this volume; Herrmann, 1988), or an overlay of its cortical and precortical components (Basch, 1988).

Figure 1.1 is an integrated view of the various important components of the creative process: flow, illumination, acceptance. It was developed by focusing on both the *thoughts* and *feelings* reported by scientists and engineers as they recalled the experiences they had during creative investigations (Shaw, 1989). They were asked to address the question: What is the experience of making a mathematical model of a natural phenomenon? A formal heuristic procedure was used to gather and analyze the data by tape recording and transcribing, and then searching for general themes and viewpoints. One of the more significant features of the study was the raw affective data; it is the purpose of this chapter to present them for scrutiny, and reexamine the potential comprehensiveness of the model. I do this in the next section, and then discuss the implications, applications and conclusions.

THE HANDLING AND PRESENTATION OF THE DATA

The object is to describe how the transcribed tapes of 11 interviews (over 200 pages of data transcriptions) were treated, and how they were employed to reveal what the experience of mathematical modelling actually is. The reader should be aware that it is not possible to be objective. One's own prejudices and experiences surely interfered as significant features of the data were examined, as well as during the interviewing process. But indeed, such interference is intrinsic to heuristics.

The goal was to analyze the data as one would when dealing with data obtained from experiments in the natural sciences (Polanyi, 1958). Keen's (1975) characteristics of description (see Gottlieb, 1986), namely, vividness (making the experiences live in the present moment), accuracy, richness (in that it captures nuances), and elegance (providing a depth of meaning and structures), were employed.

Physics was once described as being beautiful, useful, expensive, hard, and fun. The handling of the present data was viewed in a similar fashion, albeit it is much less expensive than doing physics. The rudiments of a quasiformal way to handle scientific data often center on the following. Be careful when you take data to avoid artifacts. Make sure that you're measuring the phenomenon you think you're measuring. Be aware of your sources of error and analyze them carefully so that you can provide appropriate quantitative limits for the errors in your measurements. This is where our education about data usually ends. Once the garnered data seem to be "real," what is usually done next is to try to make sense out of it. To that end several parts of a technique that Moustakas (see McNally, 1982) termed the heuristic process were employed:

1. Place all the data before you.
2. Immerse yourself fully in the material.
3. Put the data aside for a few days. Let the material settle in you. Live with the data, without particular attention or focus. Return to the immersion process. Continue the rhythm of immersion and rest until an awareness emerges, an illumination that enables you to write a clear and full reflective description of the experience.
4. Depict the highlights of the experience for each protocol, for each participant in your study. Include verbatim samples and illustrations.
5. Examine the reflective descriptions for themes.
6. Describe each theme fully. Illustrate.
7. Seek connecting linkages of the themes. Describe and illustrate.
8. Write a creative synthesis of the essence of the experience. Depict and illustrate in such a way that the phenomenon and the people you are portraying emerge as real.

After the data were gathered, the specific interaction with each participant was deemphasized; a search for themes that appeared throughout the study was undertaken. These were relatively easy to describe and often were connected intimately to and overlapped with other themes. Once this was accomplished a model emerged (Figure 1.1) that seemed to describe the essence of the experience in a fairly "neat" way.

The organization of my themes fell into the two broad categories: structural and textural. Two structures emerged. The first (cognitive) is reflected in the structure of the basic heuristic model with feedback (Shaw, 1989). Superimposed on this structure is the structure of the feelings evoked during the experience, the essence of the experience: the polarities, blockages, bipolar components, and unipolar components. Finally, the textural quality appeared primarily as the components of emotions and feelings associated with the complete experience (Figure 1.1). The emotional structure is then a description of how the texture is organized. Because we have a cognitive structure here too, then thinking (Gleitman, 1986, chap. 8) clearly plays an important role in the study.

The interviewees thought in a variety of ways: images, symbols such as mathematics, and words. Some thought in more than one way at different times. However, the study did not focus on this problem, which is the subject of considerable interest (e.g., Gleitman, 1986; Tank & Hopfield, 1987). Rather, it focused on what is apparently an equally important problem, one that is often neglected at the peril of our species: emotional reactions. For example, the basic and quite popular textbook *Psychology* (Gleitman, 1986) devotes less than one page in Chapter 8 to a subject called *creative thinking*. This is certainly not an oxymoron, but the results of the study clearly point out that creative thinking involves much more than just thinking in a conscious sense. Unconscious

processes, and the conscious awareness of feelings, are also of the utmost importance.

Once all the material was transcribed, it was read carefully and specific themes were noted; 19 of them stood out. Some remained as major themes; others became minor themes. Some disappeared in coalescing with others.

The data analysis started by first trying to highlight a major trait or view that each interviewee brought to the process. Some focused on thinking, others on feeling. Next, major and minor themes were culled, and personal experiences reflected on and compared with the data. Other pertinent sources were occasionally employed.

During the process of the study two periods of illumination were experienced. The first came very early, when the similarity between the heuristic process, the creative process, and the way scientific research is often done became clear. The second came after the completion of the first few interviews. The cognitive structure of the process was revealed after the first phase; the emotional structure after the second phase.

In general, the response obtained during the interviews began with the theme that the creative process in science followed a vague methodology that could not clearly be delineated or defined. From that starting point, the interview was often directed with a very sketchy outline of some of the preliminary features of personal views of what occurred—the heuristic process. All of the interviewees responded to this lead, when given, in a positive fashion. After a short while their recalled feelings during the different stages of their work started to emerge. Little or no opposition to my preliminary portrait of the workings of the process, either from a cognitive or emotional perspective was found. Indeed, the personal views were generally either supported or embellished.

The basic contributions of each interviewee, the part of the process that predominated for each, and the highlight of the experience for each, did not emerge as a fundamental contribution to the work. Rather, the similarities and congruencies between the experiences were overwhelming. Indeed, the major feature was the constant awareness of how similar the experiences were for all co-researchers. However, there were specific parts of some interviews that were sufficiently different from my personal experiences that they are worth noting. In several cases it was surprising how much the interviewees belittled themselves in comparison to those whom they considered "really" smart people. In one case the highlight of a dignified career occurred when a deep understanding emerged from a standard, but complex, textbook problem. Another interviewee kept insisting that he was unaware of his feelings and completely unemotional; yet his interview belied that self-image. Another argued and debated everything that was said, whether he agreed with it or not. He noticed that his wife often complained about this aspect of his personality. She would say "Hey, how about not qualifying something, anything, just once?" He said "yes, but" constantly. "Just think," he said, "maybe we'd make better lawyers than lawyers." Perhaps.

Two other interviewees, both of whom were previously in therapy for difficult situational problems in their lives, were very good at describing how they felt and had actually thought about the process quite a bit in the past. They needed little prodding. Most of the time mixed feelings of arrogance, humility, humbleness, and narcissism—a surprising mix—were presented.

Most of the interviewees also wanted to discuss their own work, rather than their experiences, and it was often difficult to keep them on track. Three of them had experienced severe somatization (hypertension, ulcers, acid stomach, colitis) to being either "stuck" or "unaccepted." However, they were not any better than others at describing the anguish of these phases. It was also somewhat shocking to note the intensity of two descriptions of failure that were presented. Both were quite debilitated for an extended period of time. Most of the interviewees were aware of reality in a rather firm way. For example, one said:

> That's right. You and I study the real world and we know it's imperfect. People make ideal models, but we know that they're wrong. So we also have to see ourselves as imperfect and we have to see ourselves as involved in these emotional imperfections. That's how we are.

The following 10 major themes emerged from my study: the requirements for becoming immersed, the trusting of intuition, the role of unconscious incubation, getting stuck, letting go and the use of recreation, illumination, emotional reaction to illumination and body sensations, explication and creative synthesis, rejection, and validation and acceptance. I also found five minor themes: recognizing the problem, pushing for a solution, external pressure, failure, and the general subject of creativity.

Competitiveness and aggression (Lorenz, 1963) were themes that arose only sporadically during the interviews. This is surprising, because a large number of scientists and engineers are intensely competitive. Perhaps these issues did not emerge because they felt ashamed of their aggressive drives, or they were taught that the expression of these feelings is taboo, or that it is such a natural part of us that it is implicit in our behavior.

The Requirements for Becoming Immersed

It is generally accepted that it is of major importance to be as much aware as you possibly can of a subject in order to generate new ideas, concepts, and models. The results certainly support this view. In my personal journal of November 30, 1978, I found the following entry:

> Why hadn't I known of this work? When I saw it I devoured it. Damn, it had the ring of truth to it. I couldn't believe what I was reading. He was right, and I felt it.

There is a warmth in the stomach that begins when you know something is correct, some data are important. I had the warmth. The clue was "inhomogeneity."

The paper I had read then took me off center. It got me unstuck and on my way toward the development of a mathematical model. The interviewees reported the following experiences:

When you're doing this, doing the experiments and reading the literature, then you're working on it. You keep thinking and wake up in the middle of the night and you feel that you're obsessed. You're real immersed in it; you're buried.

* * *

We only develop tremendous skills through hard work and study. It is no different in that sense than the guy who likes sports, or painters. What happens if you're good at something is that you like to do it, because for you it feels easy to do. It's not a struggle. So, once we develop our skills in science, then we like to do science.

* * *

There's a requisite that I know the current status of the field I'm working in.

* * *

But the ideas came from working on it, and sometimes from not working on it, not consciously, but clearly working on it subconsciously because all of a sudden it comes to you.

* * *

And the more sophisticated and detailed your language is, the more flexibility for creativity [there will be] in this language and the better your thinking will be.

* * *

My approach was always to [simultaneously] simplify the problem and almost be part of the problem.

* * *

You just go off in ten thousand directions, and it's the discipline [that you need] that's going to give form to it, the follow through and the carry through. It's the discipline that gets you through the immersion phase, as you call it. If you didn't have the discipline you wouldn't stick it out at that point, because you're structuring, forcing, looking for structure.

* * *

I think there are two kinds of immersion phases. One is a more formal schooling, you say that you're going to learn this or that. Then there is the applying it to a particular problem. You're trying to understand a phenomenon to narrow it down.

* * *

It's sort of like using a stethoscope. You hear sounds in it by just moving it over someone's body, but how to understand what the sounds mean depends on your experience. You really have to be experienced to know how to identify signals.

* * *

Well, there's this long, long process of getting very familiar with the material. You don't have creative ideas with the material until you are totally saturated with it. And if they come, they come kind of without effort, because they just happen, there's something natural that happens. But it comes, I think, from immersing yourself in material that seems related. You have to see that it's related, but not necessarily how it's going to be related, and you get in there and learn as much as you can.

* * *

That can't have the same kind of intensity of emotion as if you're involved over a long period of time, involving a hell of a lot of putting puzzle pieces together, and getting closer and closer, and then having it blow up or fit. The final feelings must be a function of the passion you're invested to begin with.

The Trusting of Your Intuition

In the middle of December 1968, Peter Solomon said to me, "I think that my intuition is better than yours at the present moment. Shouldn't we do it my way?" I *felt* that he was right, so we did it his way. Here are other comments:

People have tried models that seem inadequate. I feel that I know something, or have a technique or idea that no one else has had. I feel confident that I might make some progress. I have a technique, I think, which intuitively I feel may lead to something in the problem, even though I don't know exactly how to apply it yet. At this point I reject everything else ever done before. I feel that I understand what has already been done.

* * *

You just know. It feels right.

* * *

Intuitively I feel that my model will lead to the physical effects that I'm trying to find.

* * *

I feel that I write down a model that has new physics in it quite easily. The trick is to go through the model to the results that I intuitively expect.

* * *

That is the intuition bit...I know intuitively that I can start it, I have all the ingredients. I just have to put it together in the right order, or right combination. If I

go away and do something else for a while, then the combination tends to fall together.

* * *

It's like a shifting process, it's like when I assimilate a whole field, there's just lots and lots of data and consciously I cannot sift out what's most important. Unconsciously, I seem to be able to do it. That's the process of it.

* * *

So there are two parallel processes. One of the artisan, and the other of the poet or "matchmaker," or whatever you're doing... they go together, and the pleasures you get from each other are independent... you may be successful in one and not the other. You might formulate the problem, come up with an equation, and then you feel you don't know how to solve it... [you feel like] you failed on one side but put together a good model.

* * *

You have some sense that there's an answer. And if you don't have the sense that there's an answer, it doesn't become an obsession. It only becomes an obsession when you have a hint that it's there.

* * *

Yes, sometimes intuition, sometimes even more than that. More... in the sense that you know similar problems where there's a result.

* * *

Intuition is just simply a word people use to describe a cumulative effect of their experiences.

* * *

It's what makes you go off in a particular direction to begin with. It's a feeling, a sense. I've got cognitive answers that it is going to come from your past experiences, it's going to come from everything you are and know.

* * *

I think anyone who has ever done it will tell you that you just don't sit down and follow the scientific method.

* * *

It's based on experiences, of having seen a similar phenomenon, of working hard and knowing you're on the right track.

* * *

I think intuition is related to attitude. It grows with my years. I tend not to dismiss anything, either my results or the results of others.

* * *

Yes, it involves a great deal of priority and bet placing.

The Role of Unconscious Incubation

On December 12, 1978, I wrote:

> I finished the manuscript, but I'm not happy, and it's ready to be sent out.

Later I wrote:

> Just before going to bed so that I could get some sleep, something started to go on with me.

Here is what the interviewees said:

> It just pops out of nowhere.
>
> * * *
>
> I haven't the faintest idea how it works.
>
> * * *
>
> If we knew all about that goddamn head of ours, this interview wouldn't be necessary.
>
> * * *
>
> The same as the tennis analogy. You keep practicing and then you make the great shot, unconsciously. It comes.
>
> * * *
>
> This obsession sometimes really keeps me from doing the things I should be doing. Sometimes I don't prepare my lectures the way I should because I'm thinking about the problems even when I'm not.
>
> * * *
>
> That often [just] comes to me. It's like I'll be doing this assimilation process... this will sort of brew for a while. Typically the answer will come to me when I'm at home, doing something else, or if I've had a good night's sleep and came to it very fresh.
>
> * * *
>
> The ideas come... but clearly working at it unconsciously.
>
> * * *
>
> I don't think I used to get obsessed with it. It happens. You're out of control.
>
> * * *
>
> At some point it gets out of control, and you're stuck in it.
>
> * * *
>
> I've even dreamed of problems. I once had a breakthrough in a dream, but the ones you usually get in dreams, when you try them they don't work.

* * *

You can find contradicting experiments by legitimate people that are contradictions of understanding within myself, and I get to a point where I'm so damned confused that I don't know where to go. And that's a point where I just put it behind me and I evaluate it.

* * *

Research wise, I tend to do a little bit better in the winter, when I can concentrate fully. I do it almost like on a 24-hour basis. I get a lot of my great ideas during my sleep. Yeah, I wake up in the middle of the night and say, "Oh." I wake up, and sometimes go to the lab.

* * *

Sure, it's like a crossword puzzle. Sometimes the word will come to you when you're not involved with the puzzle. Once you've got your mind in a certain framework of thinking and looking for a word, it's hard to get yourself off a certain track.

Getting Stuck

You stop. You can't get anywhere. Everything stops. You feel that you are ready to come apart. There is a sense of agitation. Frustration starts to appear, along with some anger.

That's how I feel. Here are the feelings of others:

I can only express it by the way we use the word *shit.*

* * *

It's like in sports. You strike out in a baseball game, but you say, "Wait till I get up again next time."

* * *

You often take a new approach, get determined again. And if you're lucky you might say, "Oh man, this is the way it really *should* be."

* * *

Screw it. I'm not going to stand up to that thing my whole life. The hell with it. There's, of course, emotional strain and tiredness.

* * *

That feels terrible. I feel defeated, scared and angry. I'm mad that the model wouldn't succumb. I feel like I have failed.

* * *

You can't come up with an appropriate mathematical formulation of it. You start to worry. "What the hell is going on"; you get frustrated.

* * *

I am an addict. It drives me crazy and I stay up half the night. I get up at 5:00 in the morning and go downstairs to try.

* * *

I go crazy in the sense that I... get up in the middle of the night. I get obsessed.

* * *

You get stuck and say, "OK, I won't go that way." You stand back and see if there's something else you can do.

* * *

Frustrated, but not that it bothers me or anything. I just go do something else.

* * *

What goes on before in every case is enormous frustration, tenseness, hard work and, "Oh my god, I'll never understand, I'll never get it, there's something wrong, I'm too stupid."

* * *

Figuratively speaking, you go home and beat your wife.

* * *

It's more of the feeling, "Goddamn it this thing isn't going to beat me, it's got to work, I know it's got to. What am I doing wrong?"

* * *

Frustration... it's more exhaustion. Because I've worked to exhaustion.

* * *

Usually I go through a period of [being] just real bitter. A lot of times I'm so intensely caught up that I start dreaming about it. I have sort of wild fragmented dreams. I think I have solutions, and I don't have solutions. There's a frantic pace to the dreams that is almost a kaleidoscopic kind of thing. It's just going round and round and nothing seems to go. I can't grab anything. I can't contour it. I can't make any sense out of it.

* * *

Anxious, but sometimes there's some anger. I slam books around... frustration, and so forth... And at a certain point I just wind up saying, "The hell with it." That's when it's put away, and that's when the real incubation starts... sometimes.

* * *

The anger is there, but it's not predominant. More so are feelings of fragmentation, confusion... things sort of don't want to go together. There's another feeling, and it's the feeling that all the god damned pieces are there, but I can't get them all together. The ideas are moving around under my head. The kaleidoscope again, it keeps turning.

* * *

And then you get a much longer stress because you don't understand many things. When I'm looking for a possible solution of our experimental problem, I feel kind of under stress.

* * *

Then I couldn't get to sleep, and my stomach was suffering, and this makes me very angry. I go study something.

* * *

Depression then comes too. A strange feeling. You are at a much lower level. When you are under stress you get angry. Then the depression comes... somehow then you don't care. Depression then sort of relieves the anger, the frustration.

* * *

I normally don't feel frustrated. I'll keep trying. I will not be frustrated because I don't set up expectations and goals. But, when I can't make sense out of my data, out of the things I've measured, then I get frustrated because I don't know the meaning of the data.

* * *

There is also an advantage during the [stuck] period, depending where you are, what the problem is... If you can bring an outside opinion to view it from a less involved point of view... you get assistance. How to start again? It's difficult to discount everything you've done and start again. It really helps to get external help, if you can do it.

* * *

You feel, goddammit, it should work. Like kicking the tire of a car. It's all those things, with variation. If not, if you don't, it seems to me that you're really not involved.

* * *

To do that you [often] need multiple illuminations. It's a long process, and also you may end up getting stuck... running into a brick wall.

Letting Go and the Use of Recreation

It has always been very important for me to try to let up, let go of the problem for some time. My athletic interests often helped a great deal. Here are the opinions of others:

We were walking along, it was a beautiful day, and then you said that those guys were really very bright too. Maybe you're both right. Then I saw a whole new way of thinking... we're both right.

* * *

I'll be working on another problem and I'll sit back, and I'll be tired of the other problem then, and I'll sit back and start thinking about something [else], and it will just come to me. "Oh, now I know how to get around that road block."

* * *

The next step... often, but not always occurs in the layoff... I'll dump it all and go home, and later, when I'm just sitting around, it will come to me.

* * *

Yes. That tends to happen too, with lots of other aspects of life, like personal interactions, where, say, you can't stand some guy, or an interaction feels negative to you and you don't know why; then you go away and worry about it for a bit, and then you forget about it, and then it will come to you: "I know what was bugging me about that."

* * *

So you're playing [a sport], but you're not playing well because, unconsciously, you feel that you're still worrying about something else. So your unconscious mind is not focused on the game, which would allow you to play well if it was. You would be playing well if your unconscious were focused on the game, but it is focused on the problem.

* * *

I was sleeping. I just sat up in the middle of the bed.

* * *

I will be stuck on something, so I just go to bed. I may have worked many, many hours, and felt very, very stuck. But then in the morning somehow I know.

Illumination

May, Angel, and Ellenberger (1958) used the description "when eternity touches time" to describe the peak experiences. The interviewees add the following descriptions:

I mean, it's a real emotional high. It's the fourth best thing after an orgasm, having a good shit, or interacting with a good friend. It depends upon your age and the day of the week. I feel like I really stuck my head out above the crack.

* * *

But if you have that one orgasm, which is "seeing this thing"... then creative people don't necessarily need drugs. They turn themselves on their way.

* * *

There are multiple illuminations.

* * *

Great! That's really exciting. That's fantastic. It's like when you play music or something. You get in a whole lot of practice, and you always miss a note or do something wrong, and then, suddenly, you play it right. Then you feel that you can play this right forever. That feeling is great.

* * *

I know it doesn't come in a continuous fashion. It discontinues... driving down the freeway all of a sudden in the background of your mind... a thought breaks the surface and out it comes.

* * *

Or you may be actively working the problem and all of a sudden your brain takes off on a tangent and becomes unstable and separates.

* * *

All of a sudden... boom!

* * *

It happens suddenly, but it's based on knowledge. There's a lot of stuff out there [to learn].

* * *

But the first time you can go through and understand, that's a fine feeling. Who the hell knows? It's just so beautiful. The thing works.

* * *

I was going to play squash, and I just sat straight upright at the table and it was a sense of "Oh," and a physical relief. I felt like a load came off my back. Tension left my stomach and back. There was also a mental sort of feeling of relief. I felt how all the pieces had to go together. And I didn't have all the answers. I had about 6 or 7 months of working with the data, very intensive work, but it was very directed, very focused. I knew exactly where I was going with it—no more floundering around. I knew how all the pieces would be put together. It was simply a matter of getting it all together to make the case in a rational, logical fashion, that I knew was there.

* * *

Terribly sick, was driving home, and I was throwing up, and it was just terrible. And it was later that night. I just sat up in bed, and it was that same feeling again. I was sick, but there was this sense of everything clicking, relief, a fragmented thing went *snap*. The kaleidoscope became a picture. When I recovered I just starting working for many months to do the mathematics.

* * *

I know when it comes. It's happened many times. I was frustrated and unsuccessful, and then maybe the next day I am maybe in the bathroom or somewhere, and suddenly an idea comes, and that's how the problem was solved.

* * *

Most of the time when I get a new or good idea, it comes after I have dealt with all the stress and anger. Then I'm not bothered by them anymore... then I get a pleasing idea.

* * *

Oh, then I'm excited. I have all the information that others have not realized.

* * *

They all fell back into the same place that they came from, and to me that was still the most amazing feeling of elation. I can still remember; I knew a secret of nature that nobody else knew.

* * *

I can remember the room I was in, the chair I was sitting in, and many other little details just at the moment when all those ideas came together. Of course, I was pretty sure that I knew which way it was going to come out, and when it came out differently, there was that elation. It sure was quite an interesting week.

* * *

Oh, it's a terrific sense of enthusiasm. In a way, it's almost like a revelation. You've done something unique, something different, something that nobody has done before. You get a very high sense of elation, obviously depending on the value of the discovery. It's a sense of completion. There's almost a cabalistic connection to it. You put two and two together, and it's now complete. That's a great feeling. That's what science is: You've developed an interrelationship. You put together a set of things. It's like having an orgasm. Oh, you're floating on air and have made everything complete. It's a very great feeling of rosiness.

* * *

When you get it, you realize that it's much more general than what you started with. The understanding you developed just flows and you feel that you can apply it to everything else. It has a wonderful worldliness. You feel that you can slay dragons with it.

Emotional and Body Reactions to Illumination

My journal entry for December 20, 1978, reads:

This was the best morning of my life. I had it. The... model worked! I knew it when I awoke to play tennis at 6 a.m. with Jeff Tenenbaum. I beat the tough little monkey undergraduate 6–4, 6–4, 6–6 (time ran out). I got home at about 8 a.m., and then had the best breakfast I ever had in my life: fresh ground coffee; scrambled eggs with curry, chives, and onions; a toasted bagel with cream cheese. I was saddened when the meal ended. Christmas flowers arrived from ECD—azaleas, fresh and crisp, in a soft wicker basket.

Here are the opinions of the interviewees:

...and then you go up again, and then you understand. Sometimes on the down slope you go through a disappointing period of really understanding and realizing that it may not be important. But then you think again that it might be important. So you have all these wavy kind of emotions that you go through, and these wavy emotions often reach a fairly high amplitude, both up and down.

* * *

Then, in doing that, you run into mathematical, technical problems that you need to solve or go crazy.

* * *

Well, when it works it's a titillation...a relief. It is a relief of getting off the pressure. It's not bothering your brain any more. The elation comes later on.

* * *

The pressure is gone.

* * *

You've heard Paul Simon's latest album, "Graceland"...He describes a feeling of doing something very, very nice. It's like climbing Mt. Everest...At one point he says, "Turn around jump shot." I empathize with Dennis Rodman [Detroit Piston]...back with his fists up in the air. I mean it's exactly that feeling. You realize that it's not the end of life. It's something you might have to do again. It's not unique, but it's something you've done, not exactly a lay up, although it counts as much as a lay up. But in your mind it counts much more. And that's the feeling you get after the feeling of relief has gone by.

* * *

It feels as if...right after I prove this theorem or solve this equation I'll make every jump shot I'll try, I'll kill them. It's a euphoria that will carry on.

* * *

There are other situations where you also get that feeling...the level of pleasure is not as high, because you realize it's only a means to an end, and the end is not until you really complete the problem.

* * *

The elation comes when you start to show the story to someone else, to your close peers...collaborators.

* * *

It makes you feel good, a kind of euphoria. Like that son of a bitch finally gave up after all the effort you put into it.

* * *

There's a great deal of satisfaction in doing something like that.

* * *

It feels like when your constipation is relieved, that's what it feels like. There is a lightness you feel, like you're kind of floating.

* * *

By the way, I know another way of getting that feeling. It took a while to develop. About an hour after running, jogging, I get that light feeling. It lasts for maybe an hour or so.

* * *

A feeling of a job well done. I think there's some exhilaration; it's just a kind of pride.

* * *

I compare some of my jogging experiences to that.

* * *

When things are floating around [in my head], there's an anxiousness that I want it to go together and the fear that it won't. The fear is that I have a preoccupation here that I'm wrong and am going to have to rethink the whole thing.

* * *

As I get older I stay more calm. When I was a postdoc or like that, I wanted to write it up right away.

* * *

The way that I feel when I'm doing what I intuit is the right physics is very good. Light.

* * *

The good feeling is like a warm, fuzzy feeling. It's security I think. I get the feeling in the stomach and upper chest.

* * *

I don't think there's any part of your body where you feel specifically stronger... you feel that way all over. I mean you feel as if your arms are stronger, and your legs are stronger... I do want to express it physically. I want to get up and jump, throw something as far as you can, the way you throw something into the sea. I also get the same feelings when I'm stuck.

* * *

There is something, really something, going on [before you get it]. The pressure is building that's contributing to muscle tone. And you sense it in your skeletal system, your muscular system. Then you have the sense of orgasmic relief. Except you're not [very] aware of the foreplay. It occurs probably on the order of a microsecond, a blink of the eye. There's like a time compression that goes on here. It's like being in an accident. Time slows down, it's got an elasticity to it. There's these incredible amount of things that seem to happen in this expanded time... and then [later] you're back on real time again.

* * *

In the stomach. I'm the kind of person who gets more acid in the stomach. Then it goes away.

* * *

There is a freedom... there is the freedom to feel this high.

* * *

You just feel great.

* * *

That's a fantastic feeling. People are going to love me. They're going to think I'm brilliant.

* * *

That's why we laughed for 2 hours. We were hysterical.

* * *

I vocalize sometimes. I say, "God damn" or "Oh yeah," when I'm by myself.

* * *

I sat up in the middle of the bed.

* * *

But the beauty and elegance of that just hit me so hard I was on a high.

* * *

Relief? Yes. And you are in a good mood, your surroundings benefit most... your students... and your wife. You are very relaxed and in a very satisfactory mood.

Explication and Creative Synthesis

At the moment I wrote this, I was feeling burned out. I was bored with writing all this stuff and organizing the data. I knew what I had; it's hard to explain, but I have to do it. I'm required to do it, and so are the interviewees. If we don't explain it, synthesize it, and tell others, it's not enough. In fact, we want to do that very much, we need to do that, but it's not great fun, it's the hard part.

Then you call up your buddies and, if there is some criticism, it's done in the best spirit, like within the family. One of two things will happen: there will be an acceptance of your ideas; questions will be raised that show weakness.

* * *

Then you say, "OK, this is as far as I can go in the development of these ideas at this stage; now it's time to communicate." You give seminars, you start to write, which is often a chore.

* * *

In the process of trying to explain it to them, you see things that you didn't see when you were trying to do it for yourself. That effect is very, very real. In the midst of trying to think of how to explain myself, what I'm doing, to the person, I see: "Oh that's what I should be doing."

* * *

And comingled with that is the building of another sense of anxiety and a sense of purpose. It's the anxiety that comes with purposeful direction. You know that you got a job ahead of you now... you got to roll up your sleeves and go to work. The fun is over with.

* * *

That's the boring phase.

* * *

Then you have to write it up, and I don't like to do that.

* * *

That phase is a royal pain in the ass.

* * *

The process of writing and getting it published and having it appear in print or making a presentation is really pretty anticlimactic. It's a sense of just cleaning it up.

* * *

This is divided into two parts. A paper at a conference, and a written paper. The first part is more exciting and more stressful.

* * *

I will try to write something, because I have the desire to let people know.

* * *

You want to publish it and let people know what you've accomplished.

* * *

You could get dejected again, depending on the significance of what you're doing. The dejection stage may very well last longer than the euphoric phase. After a while you get pragmatic. You become involved with the nitty gritty of writing up, publishing it, presenting it. The worst part of writing a paper is looking up references.

Rejection

We often have to show the world what we've done. Sometimes, the world doesn't like it. Klein (1970) reflects on the suicide of Ludwig Boltzmann:

Boltzmann was sixty two. He had suffered for years from periods of serious depression, and from the perhaps not unrelated burden of severe asthma. During his later years he was plagued by "the worst sickness that can strike a professor—the fear of lecturing." He could not overcome the anxiety that his wits and his memory would suddenly leave him in the midst of a lecture. This anxiety had kept him from enjoying the Leipzig professorship he had looked forward to with so much pleasure in 1900, and had helped to drive him back to Vienna only two years after he had left. The combination of his recurrent depressions and fears became too much for him to bear, and he took his own life while on summer vacation at Duino, near Trieste....

Ehrenfest had, of course, known Boltzmann only in his last years. Boltzmann then felt, with some justice, that he was scientifically isolated, since his views had been under a vigorous attack for some years. He actually felt himself to be fighting a rearguard action in defense of a traditional atomic and mechanical view of nature against the onslaughts of what seemed to him to be the victorious barbarian hordes of the energeticists. "I might say that I am the only one left of those who embraced the old theories with all their hearts; at least the only one left to fight for them with all my strength." (p. 76)

The interviewees added the following descriptions:

I talked about the anger [I feel] at why people don't accept all my ideas.

* * *

What if we're both right and they don't see it?

* * *

There's this fighting with referees. It's a pain in the ass; I don't like it. Frustrated. It's painful.

* * *

This student said to me, "I decided to leave you and go work with someone else." I really felt incredibly rejected. It was a terrible feeling that I was rejected by a student.

* * *

They cut me out of the program. I wouldn't be on TV. I felt like shit, really worthless. I had very high expectations, and then suddenly, nothing. Really worthless. I was angry and sad, but it was more worthlessness.I do have the sense of enormous fear of publishing stuff and being held up as a fool... on many things.

* * *

And the fear, it's a real insecurity of: My God, am I so stupid that I've blown it?

* * *

You get very mad when people do this to you. Because you hurt. I was hurt that people were making all those negative comments.

* * *

All those people just had a superficial understanding... and all they could do was make superficial arguments.

* * *

I went to tell my professor, and he was, of course, very skeptical. There was this feeling of tremendous disappointment.

* * *

I sent the papers to the wrong journals and got brutal reviews. That sent my blood pressure so high that I had to go on some blood pressure medication. I hate to admit just how much it affected me.

* * *

I felt embarrassment, I suppose. Shame. But they were understandable mistakes; ultimately they were not important.

* * *

It's more than frustration, it's a little bit of despair in the sense like, why can't I get the recognition that I obviously deserve?

* * *

At the conference you have to give almost spontaneous answers. Sometimes people are impolite in asking questions. People are trying to attack you from all directions... but they are also providing new ideas for you. In the case of publication you get criticism but have time to read. You have a lot of time in that. In this case the stresses are not so strong.

Validation and Acceptance

Jim Czekaj finished his Ph.D. dissertation a few years ago. We submitted and presented papers at two or three conferences based on our work, but only submitted our first short paper for journal publication in September 1987. We sent it to *Applied Physics Letters*. The first referee said that it was old stuff; don't bother to publish it. The second referee suggested that we submit a more complete paper to the *Journal of Applied Physics*. I became frustrated and angry. I felt rejected. I sent it off to a new journal, *Microwave and Optical Technology Letters*, because I felt the paper was newsworthy and should be published in a Letters journal first. More people read it, and it comes out much faster. It was accepted, and soon after it appeared in print I received a letter from Sweden. A group in Goteborg finds our paper very interesting and wants a copy of Czekyj's dissertation. I felt good, very good. I felt accepted... I also felt like sending a copy of the letter from Sweden to *Applied Physics Letters* (the Talionic impulse).

It's appropriate for some of us to validate ourselves. We have at least two validation paths. We can validate and accept ourselves; others can. This is what seems to happen when validation occurs:

It's like making a really great remark at a party; everybody laughs, you get recognition, only here it's self-recognition, and you feel great.

* * *

I need more feedback in order to get to the next stage... The first stage is where I do something, and then there's the second stage which is feedback from other people, which is becoming to me more and more important.

* * *

If the right people validate my work, it adds to the good feeling.

* * *

But the elation comes typically when you try to explain to somebody what you've done.

* * *

It is also very narcissistic in a sense that you sit back and say, "Look how clever I've been. Look how intuitive I've been," or whatever.

* * *

You've already done the problem and already feel good about yourself. But the idea of showing somebody else that you've done the problem, and sharing the scientific mystery of it, the mystery of discovery, or whatever it is... it's a pleasure to show what you've done to people you've been talking to.

* * *

Look, this problem has been bothering me. Isn't it neat that it's finished?

* * *

Gee, I just have to tell somebody... you need to be alone and you need to be in a community.

* * *

Ah, wait till I tell the son of a bitch. Wait till I show him this... you know, that's part of the arrogance of I'm better than you are.

* * *

An awful lot of what I've done I had to just find out for myself. And once I've found out I don't care if anyone else knows about it or not.

* * *

There's another period of exhilaration when you go to a meeting and give a talk, and people appreciate what was done. But that's creative, too. Explaining it well to others is very important too.

* * *

It was elegant, it was simple, it was straightforward, it was pretty. The esthetics were there. I could sit down and explain how this stuff works in 1 or 2 pages. Five years ago we had 10 or 12 pages that couldn't explain it nearly as well.

* * *

Then my professor thought it over and was convinced. It was a high emotional feeling.

* * *

Let me tell you—a couple of days ago, when I talked to you, I was feeling very depressed. Today, I'm not depressed. Here is the statement that comes with my proposal that recommends full funding for the next 3 years, with a very good priority number. Suddenly, the world, the sky is blue.

* * *

It would be very, very rare to have applause before a speech. I have seen it. Once I saw a standing ovation at a scientific meeting, but that was in Europe and it was for a German professor who had given a lovely, wonderful talk. It was very unusual.

* * *

We have now gone from an individual type of involvement to teamwork. This leads to the integration of a large number of people. This leads to new problems, dominant personalities. How do you put together the thinking and the thoughts and the personalities, and the personal differences?

* * *

Your own professional distinction and distinctiveness will be added to. Personal things... your own stature... your own recognition... and your own sense of accomplishment... how you feel about yourself.

* * *

There aren't many artists who paint for critics; they paint for themselves. Take that with a grain of salt, because you don't live in a closed world. If you're the only appreciation of what you do, it doesn't mean very much.

* * *

Sure, there must be the appreciation of a number of small successes, small illuminations, small rewards, but in no way do they add up to that single spike. Very few people experience that... there's only so many Nobel prizes. But your own personal spike isn't good enough. There has to be recognition.

The above represents the major themes that I culled from my data. The linkages are obvious, and are clearly suggested by the heuristic model with feedback shown in Figure 1.1. The following represents some minor themes.

Recognizing the Problem

There is a constant unconscious and conscious involvement with this frustration, which you put before yourself. It keeps going and going, and then you see the problem. It's like in tennis. You've been practicing all the time, you make a lot of mistakes, and then hit a great shot.

* * *

There was a meeting with a woman at a New Year's Eve party. It was chemical. You have a sudden love affair. It makes no conscious sense whatsoever. You develop a relationship (with the problem). When you see the problem, meet it, you get feelings of acceptance of warmth and love... and it feels great.

* * *

If nothing excites me, I'll go start reading the literature. This can go on for anywhere from a day to several months. Then I'll grab hold of something and say, "This sounds like an interesting problem."

* * *

What I'm trying to convey is that, in the beginning, the excitement is not there. Then you start formulating a problem in your mind, in physical terms, rather than mathematical terms. In images. In mechanisms.

* * *

Oh, that's purely random usually. The problem just sort of appears.

* * *

Something that for one reason or another has struck a chord, and I'm just unsure. I just want to know. How does it do it this way?

* * *

Usually that doesn't take much... some sort of a need had presented itself. Usually it doesn't take much, just give me a little excuse, some reason to go.

Pushing for a Solution

I feel that I've got the starting point for some ideas that should work, then I'll try to push it. It generally does not work... But the road blocks typically are only surmounted after a period of layoff.

* * *

In other words, you sort of have to "prime" your unconscious. You have to force enough in to get your unconscious working. It won't get working unless you give it enough data base.

* * *

He would say to his 3-week-old daughter, perched on his desk, "How the hell do I solve this equation. Come on, tell me, don't sit there like a dummy."

* * *

And basically you're poking and looking for a soft spot, and if it gives a little bit then you push some more. If it's very hard you try to go around it.

* * *

I really didn't have it. I was certainly dancing around. I was sparring: one right thing; one wrong thing. A lot of things were being sparred. I had to think about it. And what happened was I went to bed thinking about it. I had a lousy night's sleep.

* * *

You get very impatient. You really want to take the next step. You want to finally demonstrate it. You want to move fast. You tend to do things rather than think about things. When you are in that state, it is very difficult to sit down and put all the pieces of a puzzle before you and look very carefully.

External Pressures

Distraction factors. If there's too many other things happening: personal life, social life, too many different jobs being input, that seems to slow it down. But too few things seem to slow it up also. There's like an optimum number [for each person].

* * *

The conflict... over what is allowable under your professional circumstances. There are problems you would like to attack but can't, because you don't have the time for them, or you might not get funding, or might not get the pat on the back.

* * *

A young person can't go for a year without producing anything.

* * *

You have to weigh the cost, both financial and in the time [spent].

* * *

[Our]... creative talents are affected in a pragmatic way.

* * *

It was fun. But now we got contracts all over the place, deadlines to meet all the time. I got stuff I should be working on, but we have to have these abstracts to a meeting. There's a deadline. It's painful, really painful.

* * *

It usually depends on the environment, colleagues, people, where I find myself, sources for funding... more pragmatic, tangible kind of things happen.

* * *

Negative emotional experiences come mainly from funding pressures, not the scientific pressure. This I enjoy, but the stress and emphasis is too much on the funding. You can be doing good work, but if you're not getting money to support it, people then consider it as not "real" research work because there's no money attached to it... that frustrates me sometimes.

* * *

I think, truly, that I left the field for more practical reasons than for creative reasons. I had to work on something by myself that didn't require so much money to keep going.

Failure

One individual was "ashamed." Others were not quite as concise.

I feel like a failure... failed if the model doesn't work.

* * *

If I were wrong I'd be really upset.

* * *

I was embarrassed because I was wrong in a little way, only a little.

* * *

Most physicists, I'm convinced, are a hell of a lot smarter than me. I'm just hanging on by my fingernails, for god's sake.

* * *

[When you fail]... a total case of despair and disappointment and sadness, incredible sadness. We once thought we had the world by the tail, but it didn't work... and we got sadder and sadder and sadder and sadder... and it was a very bad moment for all of us. It was as if a pot of gold at the end of the rainbow suddenly turned to brass.

* * *

If we had been smarter, more theoretical... it could have been predicted. We got caught up in our own sense of excitement and didn't look at the nitty-gritty details.

* * *

You feel heavy. You get a great sense of anger, too.

* * *

You don't sleep well.

* * *

Failure is a more personal involvement than success.

* * *

There must be subconscious recognition that... how many failures am I going to be allowed? At some point you must produce.

* * *

Failure has a number of variances. There could be failure because you don't have enough data to put something together, or failure from a complete lack of

understanding. You don't know. Or failure because, this is the worst I suspect, when you finally realize that you should have known it way back when... and that's the worst [failure].

The General Subject of Creativity

...which means to me the ability to shake up what information you have in there and come up with something new and different.

* * *

I think creativity is much different from smart.

* * *

A lot of people are smart—high IQs—but they're not creative.

* * *

I haven't found any objective measure of creativity.

* * *

I think that our educational system teaches people to be stamp collectors. I think we should teach them to be creative from the beginning; anyone can do algebra; they may get some signs wrong.

* * *

You know, I'll tell you one thing, that sort of education is not what the students get at all. So maybe, if they were made aware at a younger age of what really goes into scientific creation, and that indeed it is creation, just like a painting is creation, they would appreciate more the powers that they have to develop, and you would get more creative people trying it.

* * *

There's assimilation, and there's creativity. What we teach them now is assimilation.

* * *

Nobody told me that there were other fields around. My mind is really hiding. I make things happen and then I move on. I'm a producer. I usually produce it by using multiple talents and multiple modes... putting it together.

* * *

Why don't you interview the spouses of the people you are interviewing? They can tell you more about creative feelings than the people you are interviewing. They had to suffer with them.

* * *

There is really not anything great or special about a person who does original research work. I think that the most important thing is their personality; it plays a very strong role in scientific research. It's not how bright or how smart you are, it's

whether or not you really have the right kind of personality to do honest and good research.

* * *

You are going to have to separate the differences between a science approach and invention. Most of science follows a laid-down methodology that is at the root of all science. But the next step comes from your own insight. The ability to take certain observed facts, data, experiences, experimental observation and work at them and try to put them together like a jigsaw puzzle and see the missing pieces... and from your insight develop what is the next step to provide the clue to the interrelationship... to solve the problem.

* * *

Well, in many cases it's sort of a deliberate rational approach, not necessarily involving emotions, many times not involving emotion. But [if you get stuck] you can feel very dejected and have your own scientific Black Fridays like the Black Mondays of the stock market.

* * *

Significant work, significant problems, like anything else, does not move in a straight line.

* * *

In a sense I suspect it's no different from a writer finishing a book, or a painter or sculptor finishing a piece of art, or any other creative activity.

* * *

[Creative] success is really only the beginning of a person. "What will I now do with the success?"

IMPLICATIONS AND APPLICATIONS

Several implications arise after some reflection on the findings. Those that come to mind immediately address the following questions:

1. Is there a unified process associated with the experience of creative behavior of all types?
2. How fundamental to our basic needs are the concepts of illumination and acceptance?
3. What is the significance of the difference between personal and collective validation?
4. Is there a limit on the growth of understanding, technology, and creation?
5. How is the concept of spirituality incorporated into the overview of the heuristic process?
6. What is the role of affect tolerance (Krystal, 1990) in the creative process?

With regard to applications, possibilities exist in the areas of: (a) education, (b) understanding human behavior, (c) psychotherapy, and (d) motivation. I will address the implications first.

It is clear from what we have discussed so far that there may very well be a dominant, preferred or, indeed, unique natural process (Douglas & Moustaka, 1985) at work when a human being is acting in a creative fashion: the heuristic mode, the structure of which is outlined at the end of the last section. Ghiselin (1952) stated,

> The creative process is not only the concern of specialists, however; it is not limited to the arts and to thought, but is as wide as life. Or perhaps it would be more correct to say that invention in the arts and thought is a part of the invention of life, and that this invention is essentially a *single process*. (p. 24; emphasis mine)

There are substantial and exquisite differences between human individuals, families, tribes, and cultures (Milgram, 1990). But it is not difficult to imagine that, because our arms, legs, and genitalia are all similar and function in essentially an identical manner no matter if we're an Eskimo or Aborigine, then our brains might also *process* input in an identical manner. If so, then the concept of a unique creative mode is not as far fetched as one might think.

With regard to the concept of illumination, an interesting view was put forth by May, Angel, and Ellenberger (1958). He viewed it as "the moment when eternity touches time." It occurs when *meaning* is given to events that have occurred in the past or are capable of occurring in the future. In this interpretation meaning (aha!) is dominant. In other views, such terms as *completion, euphoria,* or *orgasm* were used. Whatever the personal feeling, there is clearly the implication that both illumination and acceptance by the relevant community are unipolar positive modes; we rarely, if ever (except perhaps in pathological personalities), have negative feelings when we are illuminated or accepted. Hence, we might expect that there is a drive toward these positive unipolar modes that may be akin to the natural biological drive toward orgasm. We can live without it, but without it we react to our blockages, which are unipolar negative poles and can lead to emotional discomfort and ultimately pathological behavior. We get no *relief* (Reik, 1941), but we can get temporary *release* by "letting off steam," which can often be self-abusive or abusive to others. Lastly, the proposed similarity between the sex drive and the drive toward illumination is consistent with Freud's (1963) controversial view that it is a simple matter to redirect libidinal energies into nonsexual arenas. The payoff is similar. That is, when one is immersed in an "exciting creative act" that is not sexual, one's sex drive might well be diminished.

I would also now like to propose that the collective modes of validation and consciousness offer us more rewards than the personal modes. First, the collective mode contains the unipolar positive mode of acceptance; the personal

mode does not. Next, the collective mode allows for more rewards (positive strokes) from our fellow man; this concept is a means toward establishing a more satisfying life. Indeed, Freud (1950) pointed out that

> the asocial nature of neuroses has its genetic origin in their most fundamental purpose, which is to take flight from an unsatisfying reality into a more pleasurable world of phantasy. The real world, which is avoided in this way by neurotics, is under the sway of human society and of the institutions collectively created by it. To turn away from reality is at the same time to withdraw from the community of man. (p. 74)

There are, of course, other ways to attain the peak experiences, such as the runner's "high." This is certainly a personal validation. Appropriate drugs will provide one with the same feelings of power and euphoria, and so-called mystical experiences. These experiences, too, are forms of personal validation. However, they decouple us from the collective consciousness. Indeed, they often alienate us, separate us from the local and nonlocal community at large, and provide us with few or no strokes from others. They must ultimately fail because of this deficiency. All the drugs, running, and self-indulgence we can imagine will not substitute for our basic need for bonding, which is physical closeness and emotional openness with our fellow man. We *need* to be autonomous, to show *others* what *we* can do, and for *them* to accept *us*.

Jung espoused similar views. As Staude (1981) described it,

> His [Jung's] views of the whole person as a self-actualizing system *interacting* with others in a *cultural* context is a more adequate way of viewing human beings and behavior than is a mechanistic reductionistic one. Jung evaluated the development of a person in terms of the person's balance and wholeness and the person's relation to his *inner* and *outer* worlds. (p. 73)

Staude (1981) continued:

> I believe that Jung's emphasis on the archetypes of the collective unconscious, those archetypal universals of human development, complement and supplement the personal emphasis of psychoanalysis, ego developmental psychology, and humanistic-existential psychology. In my opinion, the recognition that each life is totally singular and unique and that each of us in his or her experience is also realizing the pattern of human life—a pattern realized an infinite number of times before us—is an immensely liberating one, and it leads to a kind of serenity we can see in the old Jung, as reflected in his memoirs. (p. 94)

With regard to the problem of the growth and limitations of human creativity (see, e.g., Medawar, 1984, for a discussion of this problem as it relates to the scientific endeavor), the loops in the heuristic model (Figure 1.1) are essentially

the feedback loops of a conventional systems approach. Positive feedback leads to continuous growth; negative feedback leads to homeostasis. History teaches that our system has positive feedback inherent in it. Hence, the growth of our understanding (we most likely can only asymptotically approach a complete description of objective reality—e.g., Medawar, 1984) and technology appear to be limitless and unstable in a positive way. The more we create, the more our useful creations get fed back into the knowledge and skills component of our immersion phase.

The human mind is apparently always creating. Indeed, the more there is contained in the immersion component, the more creative we become. The mind seems to have more creative energy when there is more knowledge to be immersed in. Our scientific ideas, models, and theories now are more sophisticated than they were in the early 20th century. They are infinitely more detailed and often more elegant. In this sense they are more creative. Our art is more creative now with regard to its expansiveness and ubiquity. The human mind seems to have an almost infinite potential—a potential that is presently only partially tapped.

The next implication of the study focuses on the problem of spirituality (e.g., Hoppe, this volume; Scharfenberg, this volume; TenHouten, this volume). Maslow (1968) and Bolen (1979) share the view that the peak experience, or *satori*, puts the human being into a mode where the person feels "at one with universe." Certainly, in the personal mode, this feeling of oneness, of being part of the entire universal system, is an acceptably valid view. But with the introduction of the collective mode and the appearance of the positive unipolar acceptance mode, another feeling emerges, that of being at one with the human condition. When we are accepted by our peers, we feel that we are part of them, part of the human system. Eastern philosophy (see, e.g., Bolen, 1979) emphasizes that the existence of the *satori* provides evidence for a greater power in the universe, a spiritual harmony, a godlike concept. In that sense illumination and personal validation can be spiritual in nature. However, the acceptance inherent in the collective mode rings of our interaction with our fellow human beings, and the personal mode may also readily be thought of in this manner. The concept of a higher order, a god, need not necessarily be invoked in order to appreciate the extremely good feelings we experience on very special occasions. Rather, we might focus on the joy of interaction, on the teachings of Jesus Christ. Do unto others. Be part of the human condition. Help others as much as you can. The teachings of Christ are profound; the worship of Christ is irrelevant. Freud (1950) concluded that to be religious meant to deny yourself the ability to self-actualize. That is, if we assume the existence of powers higher than ourselves, then we cannot be held completely accountable for our actions. "The infinite and ineffable principle of life" (Bolen, 1979, p. 4) is primarily the existence of the two unipolar positive poles: illumination and acceptance. It is wonderful to be illuminated and to be accepted!

The last implication lies in the area of affect tolerance (Krystal, 1988), one of the three major personal parameters identified in the introduction. (The other two are ideational fluency and intrinsic motivation.) The results of the study identified rejection and failure as critical components of the creative process. The view is consistent with the findings of various researchers. The issues surrounding failure are perhaps best summarized in a review of Epstein's (1990) work by Runco and Albert (1990).

> When first faced with a problem in the proximal environment, an organism attempts to solve the problem with responses that are already part of its existing repertoires. This explains creative behavior's characteristic of continuousness. And it is at the point that behaviors not recently reinforced, because they are not successful in solving the problem, will, over time, drop out of the sequence and be replaced by those stronger and more appropriate behaviors that have previously worked successfully enough under similar conditions to connect with some similar environmental characteristic and be stimulated in the present environment. The organism's history does play a major role in what can be described as the emergence of "new" behavior, as the person-oriented models hold. But equally important is what is implied. Because all of the responses that an organism emits are not successful (and weaken and become extinct), the organism is *failing* a large percentage of the time. This steady stream of failure is a significant characteristic of the continuous nature of behavior, and, we would add, especially applicable to the attempted creativity of humans... It would be helpful to teach all persons that failure is intrinsic to creative behavior, and that continuous effort tailored to the lessons of failure, rather than the emotions of it, is a workable antidote to it. Learning this lesson would help remove, or at least reduce, a sense of helplessness and a passive belief and reliance on inspiration, chance, or blind luck as necessary elements to creativity. (p. 266)

Rejection as a form of failure (Miller, 1990), and failure itself, most commonly produce the negative feelings outlined in Figure 1.1: anger, fear, worthlessness, depression, shame, and so on. To be able to work through these feelings, in a manner where the emotional reaction can be encapsulated or controlled by the meanings and lessons of failure, appears to be a vital component that will allow the individual to stay on track, and to continue along the creative path. In this regard, perhaps a primary educational component should be the *teaching of the affective features of the creative process*. Imagine all the talent wasted by those who are ignorant or unappreciative of the role that feelings play in the process.

Let us now focus on some possible applications of the results of the study. With regard to our educational process, we have always focused primarily on the immersion phase, where assimilation dominates. It is quite clear from the study that in order to be creative, we must be knowledgeable. We certainly don't have to be as knowledgeable as possible (e.g., Watson, 1968), but we must have a clear, uncluttered view of the field and must be skilled in the use of its tools so

that ideational fluency can be optimized. However, because we haven't been able to teach creativity, its presence has been sorely lacking in our educational system. Perhaps one of the reasons for this is that the subject of creativity appears to be intimately connected to our emotional state, to the "right side" of our brains, and the mood of the 20th century is predominantly logical and scientific. (Is this why it has been, relatively speaking, one of our bloodiest centuries?) The acceptance of the role that emotions play in the process could lead to an enhanced educational environment for our young people. They might learn that it's quite acceptable to sometimes live inside the feelings of the unipolar negative pole of the blockages, to feel aggression, frustration, anger, anxiety, fear, worthlessness, alienation, shame and depression. We *all* have some or all of these feelings at one time or another, even our "greatest creative talents." We are apparently *born* with the affects of anger, pleasure, sadness and fear. It is not acceptable, appropriate, or in our best interests to deny their existence and the role they play in the most creative parts of our lives. Our young people would do well to learn to accept and appreciate their feelings, and also to try not to let their normal negative feelings impede their development (affect tolerance). In this way they can learn to trust themselves, to feel good about themselves, and to believe in themselves. It is invaluable for them to learn that being able to express and use their feelings is as important to their creativity as the fundamental need to immerse themselves deeply in an appropriate knowledge base that fits their temperament, intellect, and desires (intrinsic motivation). In this regard we should first continue on our quest to understand human behavior via a two-pronged attack—thoughts and feelings. When we learn to further our understanding of who we are, we can learn to trust ourselves and our intrinsic powers.

Scientists are people. We have the same feelings as clowns, the same thought processes as accountants. We are as special as the next guy on the bus. Medawar (1984) elegantly pointed out that:

> Because a scientific career does not call for rare, high or unusual capabilities, it is accessible to almost all, and a career in science stands out as one of the great opportunities of a liberal and democratic society. Moreover, science itself is various enough to satisfy all temperaments. Among scientists are collectors, classifiers and compulsive tidiers-up; many are detectives by temperament and many are explorers; some are artists and others artisans. There are poet-scientists and philosopher-scientists and even a few mystics... and most people who are in fact scientists could surely have been something else instead. (p. 10)

Finally, one might inquire into the implications of the results in the area of psychotherapy. B. Miller-Shaw (personal communication, May 1987) suggested that her experience as a psychotherapist has led her to view therapy as a multistep process. Her steps include: awareness of a problem or pain, incuba-

tion, insight, self-explanation, decision, action, and integration. In the heuristic structure the awareness lies in the immersion phase, the decision and action phases are the creative synthesis, and the integration is the validation feedback loop. Change will not occur in the person unless the learning experience is integrated into the personality, unless the person *grows,* unless he or she reaches a new level of knowledge. More significantly, the structure may provide us with a reason why insight-oriented therapy sometimes, if not often, works. In this therapeutic modality the key is the insight or peak experience. The attainment of peak experiences (eurekas!) has exceptional results in many cases. Maslow (1968) stated,

> The person in the peak experience feels more integrated (whole) than at other times... more at peace with himself... more efficiently organized... more able to fuse with the world. (p. 104)

This can be interpreted as a feeling of oneness and as being a part of the greater human condition. It is therefore suggestive that blocks to insight by repressed material and strong defenses in psychotherapy may be similar to blocks to creativity in general. The erasure of early negative "tapes" and repressed material might have a more useful application than we imagine. The identification of the above structure with loops also leads one to muse over specific psychopathologies. Loops, of course, can produce knots (Laing, 1970) internally or externally. However, because the loop process can be one of growth, where we often reenter into the immersion phase at a higher level, then the structure might more appropriately be modeled as a helix, a spiral. It is easier to visualize helices enmeshing than closed loops. Helices might be the preferred embodiments by which psychopathology can best be modeled.

Blanck and Blanck (1974), among others, offered an interpretation of Hartmann's work that also encompasses a loop model in the general process of human growth and adaptation.

> Out of his consideration of these regulation factors, Hartmann is forced to propose that there are processes of adaptation in the broader and narrower sense, as well as broader and narrower principles. This seeming confusion is the result of heuristic necessity, of having to refer to postulates not yet proposed because they cannot be discussed simultaneously. Therefore, we have to consider the spiraling situation wherein the infant, born into an expectable environment with apparatuses of his own serving adaptation, enters into a system of reciprocal relations in which his own regulating systems perform adaptive services, not only upon himself and his environment, but also, through his effect on his environment, upon himself again, calling for further adaptive accommodations which introduce new configurations and equilibria. In this circular, interdependent interchange, even the most effective forms of reality adaptation cannot guarantee optimal adaptation. (p. 30)

Kohut (1985) espoused the following view:

> Seen from this, the traditional viewpoint, we will say that the success of Freud's self-analysis was the precondition for his creativity. We may furthermore say not only that the inner freedom obtained by his self-analysis liberated the nameless creative forces which served as the instinctual fuel for his achievements, but that he was in addition, on the strength of his unique endowment, able to turn each personal insight into a suprapersonal scientifically valid psychological discovery (p. 181)

With reference to the problem of motivation, it is important for managers and leaders in business enterprises to fully understand that creativity is far from simply a cognitive process. It involves human processes that have deep feelings, both positive and negative, associated with them. In order to optimize productivity the emotional needs of the workers will probably have to be met. This means learning to appreciate and work with feelings and to be aware that negative feelings are a normal part of the process. It is also important to realize that great "highs" come from both illumination and acceptance, and that the acceptance usually means not only a personal statement that the work is really appreciated, but also an appropriate financial remuneration.

One might also point to similarities rather than differences between individuals as well as between groups to find further justification for all the above considerations. For example, ample similarities exist between religions, cultures, and psychotherapies, so that we might again suggest the existence of a human creative process. As we have said, although all individuals are unique and different, the *processing* of information could very well be the same for all members of the species. Even the constant battle between political philosophies can be thought of within the creative process: rugged individualism (personal consciousness) versus socialism (the collective consciousness). One can see that a proper balance must develop between developing freedom without exploitation and societal control without restricting personal creativity.

CONCLUSIONS

In this chapter I proceeded through three different categories. Firstly, in the introduction we noted several of the models presently in use to describe creative behavior, with a natural emphasis on our own description. In comparing and contrasting my model with other models, it appears that there is sufficient overlap with specific features of several other models (e.g., Ghiselin, 1952; Runco & Albert, 1990; Weisberg, 1986) so that my model is worthy of attention. In particular, the model seems to be appropriately congruent in enough areas to

appear reasonably comprehensive in scope, especially when it focuses on the areas of intrinsic motivation and, in particular, affect tolerance. However, given that one of our guideposts is the suggestion that human beings can be governed by the laws of deterministic chaos, the model might ultimately be thought of as too simplistic and of narrow dimensionality.

Secondly, I described the handling and presentation of the data. It was my purpose here to provide the reader with the richness of the emotional experiences described by the interviewees. The utility of this is obvious, and it should be especially helpful to all students, particularly graduate students, in that they can feel the ultimate human qualities of those people that they might respect and think of as mentors and guides. It might aid students substantially in knowing that the process they are involved in is similar for all practitioners, no matter what stage of development they are in.

Thirdly, I discussed the implications and applications of the study. In essence, the section was also a conclusion. We concluded that there might very well be a unified process associated with all types of creative behavior; that acceptance by our appropriate peer group was fundamental to our basic needs, and hence that collective validation was generally more significant than personal validation; that there was no obvious limit to the growth of understanding, technology and creation; that spirituality in a religious sense was not a necessary feature of the process; and that affect tolerance was a critical parameter in allowing for the development of personal creativity.

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2

Creativity and Bipolar Mood Swings: Why the Association?*

Ruth Richards

There is strong evidence for an association between creativity and a personal or family history of bipolar mood disorders. The link may be multiply determined by cognitive, affective, and behavioral factors. After reviewing the relevant evidence, this chapter examines one form of powerful potential mediator, involving deviant cognitive style. It specifically considers creativity enhancement due to: (a) state-dependent phenomena linked with mild mood elevation, and (b) trait characteristics acquired through the historical experiencing of the range of biplar mood states. Information-processing and motivational qualities are both proposed to be affected.

This chapter first reviews evidence that may help explain a connection between creativity and bipolar mood disorders, and it then proposes both mood-linked *state* and *trait* phenomena that may help explain the association. At a broader level, the discussion is also about the question—as well as popular belief—of whether one needs to "be sick to be creative." Can one lead a peaceful and pleasant life and still have hopes of being innovative? Or does one have to experience abnormal extremes of some sort?

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According to Dryden, in *Absalom and Achitophel:*

"Great wits are sure to madness near allied;
And thin partitions do their bounds divide."

Among eminent creative persons, we shall see that there are actually a large number who have had mood disorders (e.g., Andreasen & Glick, 1988; Goodwin & Jamison, 1990; Richards, 1990). In fact, Aristotle, back in antiquity, asked specifically about depression, wondering why "all" persons "outstanding in philosophy, poetry or the arts are melancholic, and some to such an extent that they are infected by the diseases arising from black bile" (Jamison, 1990, p. 333). He gave examples of the effect, including Socrates and Plato.

Melancholia was also seen as an indicator of genius in the Renaissance, and emulation of "melancholic behavior" even became a fad in 16th-century Europe (Becker, 1978). As part of the 19th-century Romantic movement, Wordsworth too wrote about mood (Jamison, 1990, p. 333):

We Poets in our youth begin in gladness;
But thereof comes in the end despondency and madness.

Is this really the price of creativity?

We know that affective phenomena are an integral part of the full operation of the creative process, no matter what field of endeavor. Affect may serve as the subject or medium of expression, as the motivating force, companion to cognition in identifying problems, in channeling and redirecting inquiry and evaluating the adequacy or elegance of the final creative result (e.g., Barron, 1988; Hoppe & Kyle, 1990; Krystal, this volume; Perkins, 1981; Richards, 1990, 1991; Schuldberg, Shaw, Smith, all in this volume; Shaw, 1989; Sternberg & Lubart, 1991).

But why might an advantage for creativity lie in an affective *disorder!?* And what might this mean for the great many people who happen to be functioning quite well? This chapter will first review the present state of knowledge about creativity and bipolar mood swings, and then go into particular detail about state and trait effects at the affective/cognitive interface, focusing on issues of cognitive style in creativity.

PRELIMINARY DISTINCTIONS

Bipolar Disorders

We shall focus on the special group of people at risk for bipolar mood disorders—actually quite a large segment of society—beginning with the 4–5% of the population apt to develop one of the various bipolar "spectrum" disorders

(e.g., Akiskal & Mallya, 1987), and adding to this their very large group of unaffected relatives. The bipolar disorders are biologically based medical conditions with a significant genetic component (e.g., Goodwin & Jamison, 1990; Wender, Kety, Rosenthal, Schulsinger, Ortmann, & Lunde, 1986), yet they are often misunderstood and their victims stigmatized. People do not tend to talk about their psychiatric family histories; however, a great many people have a bipolar illness running in their family. For such people, this discussion may have some added and immediate relevance.

Results may also have even broader applicability in the population-at-large. This generality is suggested, for instance, by the presence of at least some degree of seasonal mood fluctuation in as much as 92% of the population (Kaspar, Wehr, Bartko, Gasit, & Rosenthal, 1989), or by the presence of damped cyclical mood patterns, which weakly echo those of the more mood-disordered, among many control subjects (Eastwood, Whitton, Kramer, & Peter, 1985).

The five relevant bipolar "spectrum" conditions include: (a) *bipolar disorder type I*—henceforth called "bipolar I" disorder—or, more commonly, manic-depressive illness, with its marked manic mood elevations and severe depressions; (b) *bipolar II* disorder, with milder, and sometimes quite functional, "hypomanic" mood elevations, again with severe depressions (some people with bipolar II disorder think of themselves only as depressive); (c) *bipolar III* disorder, with severe depressions, but in which latent hypomania shows up only after a person has taken antidepressant medication (these persons may also consider themselves depressive); (d) *cyclothymia*, in which both the mood elevations and depressions are milder in character; and (e) *hyperthymia*, marked by milder, hypomanic mood elevation, but in which the depressive pole is completely absent. Included under the latter designation are some of those very cheerful, positive, and always "up" individuals most of us know, who may astound us with their boundless energy and enthusiasm.

Many other clinical features also accompany these mood changes (see American Psychiatric Association, 1987; Goodwin & Jamison, 1990). There can also be wide variations in the frequency and amplitude of mood swings, and people can often function normally, sometimes even for many years, between episodes. But one should not underemphasize the great pain and suffering these conditions also involve, and the high rate, in the untreated, of suicide (Goodwin & Jamison, 1990). Robert Schumann wrote the following during his first episode of what he called "madness" (Jamison & Winter, 1988):

> My heart pounds sickeningly and I turn pale... often I feel as if I were dead... I seem to be losing my mind. I did have my mind but I thought I had lost it. I had actually gone mad. (p. 35)

A patient described the state of depression (Goodwin & Jamison, 1990):

> I doubt, completely, my ability to do anything well; it seems as though my mind has slowed down... works only well enough to torment me with a dreary litany of my

> inadequacies and shortcomings in character, and to haunt me with the total, the desperate hopelessness of it all.... If I can't feel, move, think, or care, then what is the point? (p. 41)

The fact that mood disorders are *highly treatable* with medication (e.g., Andreasen & Glick, 1988; Goodwin & Jamison, 1990) in fact becomes tragic when one hears that two-thirds or more of the mood-disordered never seek or receive help (Jamison, 1989).

Eminent Creativity and Everyday Creativity

It is also helpful to distinguish between *eminent creativity* (based on criteria of widespread social recognition, involving, for instance, symbols of public or professional recognition, national awards, prizes, citations of merit, publication, achievement of best-seller status, highly acclaimed performance—the sort of recognition many people in fact associate with the word *creativity* (Richards, 1981, 1990), and *everyday creativity* (e.g., Richards, Kinney, Benet, & Merzel, 1988a; Richards, 1990). Everyday creative accomplishment depends only on criteria of *originality* and *meaningfulness* to others (after Barron, 1969), and can take place in virtually any type of activity at all, at work or at leisure. Eminent creative work can be viewed as an important special case of everyday creativity—albeit one affecting only a tiny handful of the people who are creative by the everyday definition.

EMINENT CREATIVITY

The systematic study of creativity and psychopathology did not begin until the late 19th century. These and later studies of eminent persons tended to be anecdotal or flawed by a range of design problems, even up through the 1960s. Nonetheless, this evidence, when taken together, consistently pointed in the same direction. There indeed appeared to be elevated rates of psychopathology among eminent creators. The data were most complete for artistic creativity, but there were similar (if less pronounced) findings in the sciences. Mood disorders figured most prominently among these pathologies (Andreasen, 1987; Jamison, 1990; Richards, 1981).

Aristotle and others linked exceptional achievement with depression. But modern research has indicated that depression may only comprise part of the picture. Just as commonly found are mood elevations—both manic and hypomanic (Jamison, Gevner, Hammen, & Padesky, 1980; Richards, 1981, 1990). Consider the remarkably high rates of mood disorders, and bipolar disorder, found in two modern studies of eminent creators. Among Andreasen's (1987) creative writers, a full 80% had a mood disorder, over half of these with a bipolar disorder, compared to 30% in a control sample. In Jamison's (1990)

study of outstanding British artists and writers, 38% had been *treated* for a mood disorder, a similarly high percentage, considering other evidence that one-third or less of affectively ill persons tend to seek help. In addition, 89% of these creators had experienced intense creative episodes sharing many features with clinical hypomania (Jamison, 1989, 1990).

In fact, in both of these studies, the typical mood elevation was the milder, or hypomanic, "high." Such mild states of mood elevation are often (but not always) functional, and they may well have been overlooked in the past by clinicians whose mental set was toward finding "something wrong" (Richards, Kinney, Lunde, Benet, & Merzel, 1988b).

EVERYDAY CREATIVITY

Previous research tells us about the mental health element of eminent creators, and particularly about artistic creators. But there is a question that does not follow at all directly, as some might think: To what degree are mood disorders and creativity related in the population at large? The everyday situation need not be parallel to that of eminent creators; for instance, if most eminent creative writers were older, we would not expect most older people to be creative writers.

This important question led to my work on creativity and affective illness with Dennis Kinney and other colleagues at McLean Hospital and Harvard Medical School. We wondered if a mood–creativity link would extend beyond the specialized fields of the arts and sciences to the variegated activities of everyday life. A general creative capacity, we reasoned, should be capable of emerging in different ways for different people, depending on their particular interests and activities. Indeed, Andreasen's (1987) study of the relatives of creative writers supported this; the relatives—who emerged significantly more creative than controls' relatives—displayed widely varying areas of creativity.

Compensatory Advantage

Andreasen's (1987) finding was consistent with a genetically based hypothesis: creativity reflects a broad-based *compensatory advantage* to the genetic risk for bipolar disorders (Richards, 1993a; Richards et al., 1988b; see also Minkoff, 1983). Bearing in mind that the genetics of bipolar disorders are likely more complicated, one can compare them with sickle-cell anemia, a frequently devastating blood disease with high morbidity and earlier mortality. The sickle cell carrier state, however, involves only a mild anemia, at worst, and at the same time carries a compensatory advantage—resistance to malaria. This advantage helps maintain the sickle cell gene in the population.

Similarly, *creativity might reflect a compensatory advantage to the genetic risk for bipolar disorders*. Creativity would be enhanced within families at risk,

but in such a way that there would be an inverted-U relationship between creativity and the degree of bipolar symptomatology. Creativity would therefore reach its peak, on the average, for persons with intermediate manifestations of bipolar phenomenology (Richards et al., 1988b; see also Richards, 1993b, regarding a related position proposed by Hans Eysenck). We felt that cyclothymes, for instance, might particularly show such an optimal pattern.

One may recall that everyday creative accomplishment, in our view, needed to meet only the requirements of *originality* and *adaptation to reality* (or meaningfulness to others (after Barron, 1969), two widely employed criteria for creativity. We equated everyday creativity, so-defined, with that broad and adaptive capacity which helps us adjust to new conditions and environments, and which is fundamental to our very survival—what Dobzhansky (1962) called "phenotypic plasticity."

Among other implications, everyday creativity, by this definition, need not require extreme disability or suffering; indeed, creativity may occur in the relative absence of these. One may argue that the very persistence of the most painful and debilitating bipolar mood disorders down through the generations—and the terrible suffering these have created—are a partial result of a positive, adaptive evolutionary advantage in the milder, and more plentiful, variants of the disorders, those forms that show only partial expression (e.g., Richards, 1981, 1990; Tooby & DeVore, 1987).

To examine this possibility scientifically, we needed to be able to assess the creativity of everyday activities and accomplishments as diverse as (in the case of some of our subjects): performing ingenious home repairs, developing innovative child care approaches, designing and making clothes for one's children, inventing tools for auto repair work, managing and expanding a small business, and designing and carrying out dangerous wartime resistance activities.

Lifetime Creativity Scales

Existing measures of real-life creative accomplishment were at that time either constrained to special areas of endeavor, or required that the accomplishments had received some form of social recognition, for instance, awards, citations, performances, or publication. Our first step was to develop and validate (on over 500 personally interviewed subjects) our *Lifetime Creativity Scales* (Richards et al., 1988a), broad-based measures of the quality and quantity of real-life everyday accomplishment at work and leisure. We were thus able to do the first broad-based study of real-life creativity and psychopathology, using subjects chosen only by diagnostic criteria.

Our key measure for our genetic hypotheses was *Peak Creativity,* a "quality" measure that assessed peak originality over the adult lifetime at work or at leisure, considering as data a subject's various accomplishments in "major enterprises" in any life sphere. This measure was able to address the maximum

reflection of underlying creative potential, as realized in real-life activity, while minimizing the personal or environmental handicaps (e.g., a bad year, illness, times of financial strife and limitation) that can inhibit potential achievement.

First Study of Everyday Creativity and Bipolar Disorders

With this measure, we compared manic-depressives, cyclothymes, and other first-degree normal relatives to both normal and ill controls lacking a personal or family history of mood disorders (Richards et al., 1988b). Diagnosis and creativity were assessed by raters who were "blind" to the other variable, as well as to other irrelevant information. Hence, the chance of rater bias was minimal.

Our combined "at risk" subjects (manic-depressives, cyclothymes, plus first-degree normal relatives) did in fact show higher Peak Creativity than controls. As predicted, it was not the manic-depressives who excelled; rather, the cyclothymes were particularly high. There was also a compelling surprise: The creativity of the psychiatrically *normal* relatives was similarly elevated. Nor was normalcy the explanation, because the normal control subjects (who lacked a family history of bipolar disorders) were not so distinguished.

We speculated about subtle subclinical effects, but also about whether some of these normals were actually *hyperthymic*, or chronically hypomanic in such a functional productive way that it was never viewed as a problem (Richards et al., 1988b). Whatever the explanation, it appeared that everyday creativity might be much more strongly linked with psychological health than was eminent creativity.

Creativity and Other Diagnostic Categories Involving Mild Mood Elevation

Results may generalize to certain other psychiatric conditions involving states of mild mood elevation. Indeed, the cyclothymes in our study were diagnosed using the second edition of the Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 1968), and subjects may well have included persons who would now be designated bipolar II. Akiskal and Akiskal (1988) found higher artistic creativity among bipolar II and III than bipolar I, schizoaffective, or "pure" depressive patients. In a preliminary study of job creativity (Richards, Kinney, Daniels, & Linkins, 1992), we too found bipolar II subjects significantly more creative than bipolar I subjects. In this context, it is worth noting again the evident predominance of bipolar II over I subjects in both Andreasen's (1987) and Jamison's (1989, 1990) research on eminent creators.

Additional information comes from nonclinical studies of college populations. Eckblad and Chapman (1986), using their Hypomanic Personality Scale, compared students scoring above $1^2/_3$ standard deviations against control

subjects. They first found the presence of ongoing hypomanic personality traits a strong predictor for clinical hypomanic episodes—which occurred in over 3/4 of their experimental group—with the remainder displaying either shorter mood fluctuations or ongoing hyperthymia. These college students, compared to controls, also felt themselves to be more unique, individual, creative, and apt to succeed than other students. In addition, 68% of the students had a hobby involving an artistic or fantasy activity, compared to only 28% of the controls, Schuldberg (1990) too looked at hypomanic personality traits among college students, using the same instrument, and found these traits linked with paper-and-pencil measures of creativity, and with measures of creative attitudes.

Creativity and Depression

In view of growing evidence, we eventually altered our inverted-U hypothesis to indicate that an intermediate degree of mood *elevation* (sometimes even in mild or subclinical form) could be more important to creativity than the depressive lows (Richards & Kinney, 1989, 1990). One may then wonder if depression in itself is a major factor in creativity when the underlying bipolar risk is not present. Akiskal and Akiskal (1988) found, as mentioned, greater artistic creativity in bipolar II and III subjects than in "pure" depressives. Looking at accomplishment defined more broadly, Coryell et al. (1989) found that the first-degree relatives of bipolar I and II subjects excelled in educational or occupational achievement compared to the relatives of pure unipolar depressives.

In a small preliminary study, Richards et al. (1992) compared the peak creativity of depressive subjects *with* and *without* a family history of bipolar disorder. (The former might well include potential bipolar III subjects—those who could become hypomanic on antidepressants.) We reasoned that possible subclinical effects of mood elevation during "normal" periods in these depressives might be similar to those in our "normal" creative relatives of bipolars. In fact, our first group, those subjects *with* the bipolar family history, did emerge as significantly more creative. One may certainly wonder if those of Andreasen's (1987) eminent writers or Jamison's (1989, 1990) eminent artists and writers who were "pure" depressives also fell in this category—not to mention the creative "melancholics" noted by Aristotle.

EXTRACREATIVITY FACTORS, AND EMINENT VERSUS EVERYDAY CREATIVITY

Before considering potential mechanisms linking mood states and creativity, resolution is needed about the apparently stronger link with pathology for eminent creativity than for everyday creativity. The explanation may be complex.

There are many potential direct and indirect connections between creativity and psychopathology (see Richards, 1981, 1990, for reviews, a typology, and examples). For homogeneous groups such as Andreasen's (1987) eminent creative writers, in which a full 80% were mood-disordered, one might indeed postulate some factors intrinsic to the field itself (i.e., to the nature of creative writing). Interestingly, Jamison (1989, 1990), who identified severe mood swings or elated states in many of her eminent novelists, poets, playwrights, and artists, found none of these among the biographers, a group whose work she feels may be less associated with "creative fire."

However, one should also note potential "extracreativity" factors that might help explain the eminent part of eminent creativity—that is to say, factors in bipolar illness that could raise the odds of eminent recognition when creative talent is already present. Richards and Kinney (1989; Richards, 1990) proposed, among these, the driven, obsessional, and persistent work orientation often associated with bipolar disorders, a sense of "standing apart" from others that could facilitate risk taking and the challenge of accepted norms, a need for external validation, based on an uncontrolled and fluctuating sense of oneself, and an ability to think in broad and sometimes grandiose terms. In this last regard, a heightened sense of moral and social awareness has also been reported. Goodwin and Jamison (1990) note such an experience during a manic episode of one patient:

> I had an exaggerated feeling of self importance. All the problems of the universe came crowding into my mind, demanding instant discussion and solution—mental telepathy, hypnotism, wireless telegraphy, Christian science, women's rights, and all the problems of medical science, religion and politics. (p. 26)

In any case, we see that high levels of noneminent everyday creativity may perhaps appear among a much broader and healthier segment of the population—and one with a rather different psychological profile—than may be found among eminent creators, or at least creators in the arts. One should nonetheless note that there are multiple routes to creativity of any sort (Richards, 1981), including ones that are relatively more healthy. However, with everyday creativity, in particular, one is not required to "be sick to be creative."

CREATIVITY AND FEATURES OF ELEVATED MOOD STATES

We next consider data linking features of elevated mood states to creativity, and then look more deeply at potential mechanisms. The ultimate argument, in the next section, states that one may need the presence of both the mood elevations and depressions (at least their presence at low subclinical levels) for the optimal

functioning of a "bipolar" creative advantage; this advantage may actually occur in a complex combination of ways. However, we begin here with mood elevation.

Previously, several potential advantages of mild hypomania to creativity have been suggested, including an "expanded (cognitive) capability, heightened emotional awareness, and energizing potential" (Richards, 1981, p. 303; see also Bowden, this volume; Jamison et al., 1980; Schuldberg, 1990, and this volume). The third edition of the *Diagnostic and Statistical Manual of Mental Disorders* (American Psychiatric Association, 1980) actually gave one criterion for clinical hypomania as "sharpened and unusually creative thinking."

Of interest are the notations a bipolar II patient made for herself in 1978, years before she even knew she had a bipolar disorder (Richards, 1992). During her mood elevations, she explained, she thought she'd been having variants of "Maslow's peak experiences." She had recorded how, over a period of 3 weeks, she had been:

> sleeping only "4–6 hours" and was "not tired," but rather was "energized," "very focused," able to "center," with "greater self-control," and "discipline," "intensity heightened," a "high state of interest," and sometimes "bouts of laughter." She "*needed* to listen intensely to music." She wrote that she "preferred turning inward" but was "frustrated by having no artistic medium as an outlet for creative energy." (p. 5)

Current diagnostic criteria. Current criteria for hypomania from the third revised edition of the *Diagnostic and Statistical Manual of Mental Disorders* (American Psychiatric Association, 1987) include: (a) a distinct period of abnormally elevated, expansive, or irritable mood; (b) three features (or four, if irritable) from: inflated self-esteem or grandiosity, decreased sleep need, talkativeness, flight of ideas or racing thoughts, distractability, increased goal-directed activity or psychomotor agitation, and excessive pleasurable activities with painful consequences (e.g., buying sprees, sexual indiscretions, and other impulsive acts); and, for hypomania, rather than mania, (c) absence of marked impairment in vocational or social functioning and of risk of self-harm. One should again keep in mind that some hypomanic states are more functional, and more enjoyable than others.

EMINENT CREATORS—PREFERRED CREATIVE MOOD STATE

Andreasen's (1987) writers, actually, were reported to have most often preferred a normal mood state for creating. Because of their strong history of mood disorders, one might question if certain subjects were sometimes referring to an adaptive mood elevation or even an ongoing hyperthymia.

Jamison (1990) looked at this "state" question in detail, finding that 89% of her artists and writers experienced intense creative episodes which she found shared many features with clinical hypomania. There were a range of cognitive, affective, and behavioral characteristics which involved, for instance, energy, confidence, and speed of mental association. (These are discussed further later.)

EVERYDAY CREATORS—PREFERRED CREATIVE MOOD STATE

Jamison et al. (1980) asked patients about their experience of hypomania, finding that it led to greater feelings of creativity, productivity, sensitivity/alertness, outgoingness and sexual intensity. Unfortunately, normal mood states and others weren't compared.

Nonetheless, patient reports are quite compelling. Below are brief anecdotal notations presented by Goodwin and Jamison (1990) on the effects of mood elevation from three bipolar patients showing emotional, cognitive, and motivational aspects of the experience:

> First and foremost comes a general sense of intense well-being. I know of course that this sense is illusory and transient. (Custance, in Goodwin & Jamison, 1990, p. 25)

> The memory is complete. One idea calls up a host of related ideas without effort. The man cannot but consider every question... in all its aspects simultaneously, and he sees the right answer at once. (Goodwin & Jamison, 1990, p. 26)

> I would write books on psychiatric theory too, and on theology. I would write novels. I had the libretto of an opera in mind. Nothing was beyond me. My creative impulse had found full outlet and I had enough now to write to last me for the rest of my life. (Coate, in Goodwin & Jamison, 1990, p. 29)

Richards and Kinney (1990) requested specifically that bipolar and unipolar patients identify their most creative mood state. Bipolars, when compared to unipolars *lacking* a bipolar family history, showed clear general preference for mood elevation and, specifically, for *mild elevation.* Still, there was some variation, including bipolars who opted for normalcy, and two who even preferred creating during periods of severe depression.

Richards and Kinney (1990) also looked formally at 23 of Jamison's (1989) cognitive, affective, and behavioral features—the features that characterized intense creative episodes for the eminent artists and writers above—but, in our case, comparing instead groups of noneminent bipolar patients, divided into those who preferred *normal, mildly elevated,* and *very elevated* mood states.

The resulting profiles for persons preferring mood *elevation* versus *normalcy*

for creating was different enough that these groups almost seem to have different creative personalities. On the other hand, features between groups which preferred mild versus marked mood elevation differed little. (Recall that these are all bipolar patients, whatever their mood preference. Also note that bipolar I and II subjects were distributed similarly across preference groups. Unfortunately, there were insufficient data to include pure unipolar depressives, and in any case, reference is made only to clusters of variables because of limited sample size.)

First, there was very little difference between groups preferring elevated mood states for creation, whether mood was mildly or extremely elevated. Many of Jamison's cognitive, affective, and behavioral features, found during eminent creators' productive states, described creative "highs" in these everyday bipolar subjects as well. Included were features that together indicated a kind of spontaneous exuberance (e.g., expansiveness, impulsivity, and euphoria), and cognitive quickness (rapid thinking, associative speed, ideational fluency).

At the same time, the bipolar subjects stating a preference for normalcy for creation differed markedly from their mood elevated counterparts—in that the features above were not particularly pertinent, nor indeed, were well over half of Jamison's (1989) list of features. Those features which did show up were, though, also quite relevant to the subjects who had chosen a mood elevated preferred creative state. Such widely experienced features included a more modulated form of positive affect (e.g., sense of well-being, confidence, enthusiasm), along with intensity of feelings.

One may speculate as to whether or not such features are not perhaps more *trait* than *state* characteristics that may facilitate creativity for any persons with bipolar disorders. Indeed, if one were to include nonbipolar controls, one might even find such features characteristic of high creative states in general.

MOODS AND CREATIVITY: MECHANISMS INVOLVING COGNITIVE STYLE

Next we will consider ways in which mood may affect cognitive style, with consequences for creativity. This may be considered as one phenomenon among probable others, more as an example than as any inclusive explanation for creative effects. We begin with issues of mood and cognition for the population at large, and then move on to special considerations for persons at risk for bipolar disorders. Again, there are both *state* and *trait* issues to consider. We begin with Simonton's (1988) chance-configuration theory of genius, as one reference point for mental attributes that may facilitate exceptional creativity. This characterization of mental organization should apply equal well to distinguished creativity at the everyday and eminent levels.

SOME STRUCTURAL AND DYNAMIC QUALITIES OF EXCEPTIONAL CREATIVITY

Simonton (1988) associated genius-level thought with semirandom selections within an extremely broad range of mental alternatives, as is outlined in his *chance-configuration* theory. In many ways, normal and genius-level thought can be said to involve similar cognitive strategies (see also Gardner, 1988; Perkins, 1981; Weisberg, 1986). But what distinguishes the genius in Simonton's (1988) model is both the quantity and quality of the possible associations, based on the intricate structure of underlying mental connections. The chance-permutation process involves samplings throughout richly interconnected networks involving widely ranging information and concepts, rather than along rigid, impoverished, and narrowly delineated pathways. These configurations also direct the search in a semirandom rather than blindly random and therefore inefficient way.

This *structural* aspect of mental organization will change rather slowly. A *dynamic* aspect (see also Matthysse, 1991; Richards, 1993a) may also be distinguished, one which can change more rapidly. According to Simonton (1989), the genius also operates at a *higher* level of mental entropy, such that thoughts can flow quite freely among the rich associative structures. In a certain sense, one might say that these float above the landscape, rather than becoming trapped within particular pathways or configurations (mental ruts and valleys). Interesting, related patterns emerged from a neural net computer simulation of mania (Hoffman, 1987) in which increases in a "thermal" scaling factor produce increased "wandering" in the vicinity of a single memory or actual jumps from one memory—or energy minimum—to another. (Highest values give complete destabilization.)

The ultimate goal implied by Simonton's (1988) model is movement toward increasingly sophisticated levels of mental organization—which actually, one might say, eventually involves lower entropy, at least locally in the mental "vicinity" of these ultimate insights and fixed solutions. However, one can see that this resolution or homeostasis is not the immediate goal, but a longer term one because a more energy-efficient solution (in the short run) could readily be achieved. This might therefore be termed a *delayed-gratification principle* in the intellectual/emotional sphere.

This preference derives from a distinctive cognitive style. The genius will readily tolerate, if not embrace, a state of considerable disorganization (high mental entropy), toward the satisfactions of new explorations and discoveries of ultimately greater value and elegance (Barron, 1963; Krystal, this volume; Simonton, 1988). This dynamic quality of exceptional thinkers appears linked to features including preference for complexity and tolerance for ambiguity (e.g., Barron, 1963, 1969), related to the cognitive style of integrative complexity (Barron, 1963, 1969; Richards, 1993a; Simonton, 1984). This stylistic

preference for a complex integration of material is an important associate of creative thought across different fields of endeavor.

Potential Facilitators of Creativity

Based on the above, one might predict that phenomena that further increase: (a) the number of available elements or classes, (b) the richness and sophistication of their structural intercombinations, or (c) the flexibility of their dynamic patterns of access and use (at least, if central cognitive control is retained and not abandoned for a psychotic process) should raise the odds for the emergence of creative thoughts. It appears that mood, and mood *swings*, might do just that—and not just for geniuses, or for persons at risk for bipolar disorders either, but for everyone.

STATE EFFECTS: MOOD ELEVATION AND COGNITIVE STYLE

Mood, Overinclusion, and Creativity

Mild mood elevation does in fact facilitate creativity generally, among the population at large. One mechanism, furthermore, involves increased availability of information. Isen and Daubman (1984) and Isen, Johnson, Mertz, and Robinson (1985) showed that positive affect (mild mood elevation), across several means of mood induction, increased the unusualness of word association, as well as the inclusiveness of categorization. Isen et al. (1985) speculated that positive affect allows subjects to see relatedness and interconnections among numerous mental elements in a more integrated fashion.

Unusualness of association and overinclusion have also both previously been associated with creativity in different contexts (see Andreasen & Powers, 1974, 1975; Richards, 1981). Isen, Daubman, and Nowicki (1987) and others (e.g., Greene & Noice, 1988) have directly shown that positive affect stimulates creative problem solving.

Mania, Overinclusion, and Creativity

Things become even more interesting when one notes that both behavioral and conceptual overinclusion (involving the number of elements included in a category, and the range of classification rules employed) is characteristically found in manics (e.g., Andreasen & Powers, 1975; see also Jamison, 1990;

Richards, 1981, for reviews). Overinclusion variables are typically measured using the Object Sorting Test (Goldstein & Scheerer, 1941).

Classification rules can include use of vague and distantly related bases for grouping, and some developmentally primitive forms. Some of these show resemblance to the "complexive thinking" described by Vygotsky (1934, 1962) in the thought of young children. But it also shows similarity to high creative thought (see also Arieti, 1976; Richards, 1981). Andreasen and Canter (1974) compared creative writers directly with manics, as well as schizophrenics, on overinclusion variables, finding particular similarities on all variables between manics and writers, with schizophrenics much lower. Andreasen and Powers (1975) said of both manics and creatives:

> they tend to show considerable overinclusive thinking... Both writers and manics tend to sort in large groups, change dimensions while in the process of sorting, arbitrarily change starting points, or use vague distantly related concepts as categorizing principles. (p. 72)

However, writers were also higher on measures reflecting abstract, cohesive, and nonidiosyncratic quality of thought, by contrast with manics, showing the ability to adapt cognitions for creative ends.

Mania and "Combinatory" and "Intrusive" Thinking

Further refinement on manic thought processes was provided by Holzman et al. (Holzman, Shenton, & Solovay, 1985; Holzman, Solovay, & Shenton, 1986). They used post hoc factor analysis with 22 subscales of Johnston and Holzman's (1979; Solovay et al., 1986) Thought Disorder Index, and found two forms of thinking that were distinctive of mania by contrast with schizophrenia; the first in particular suggests use of broad and varied bases for categorization. These are: *combinatory thinking* (marked by incongruous or fabulized combination and playful confabulation), and *irrelevant intrusions* (looseness, flippancy). Combinatory thinking involved the "tendency to merge precepts, ideas, or images in an incongruous fashion" (Shenton et al., 1989). It is quite distinct from the thinking of schizophrenics, as Holzman et al. (1986) pointed out:

> Manic thought disorder manifests itself as loosely tied together ideas that are excessively and immoderately combined and elaborated. Often, there is a playful, mirthful, and breezy quality to their production. Intrusions of incongruous ideas into social discourse is one consequence of this propensity. Schizophrenic thought disorder shows very little, if any, of the exuberant, jocular, frivolous elaborations of the manic patient. (p. 369)

Thought disorder is assessed using response to projective materials such as the Rorschach Ink Blots—that is, response to ambiguous stimuli that facilitate

"thought slippage." Here are examples of ink-blot response of the manic type that would be considered thought disordered (Holzman et al., 1986; Shenton et al., 1989). The potentially creative quality is also apparent—at least for one who had intentionally sought such juxtapositions.

"It looks like a mastodon wearing shoes."	(incongruity)
"A beetle crying."	(incongruity)
"Because it's black, dark, darkness, lovemaking."	(looseness)
"Two crows with afros, and they're pushing two hearts together."	(fabulized combination)
"An evil witch doing a square dance... She had her dress like this and she was do-si-do-ing."	(playful confabulation)

Flexible choice of conceptual style. Many authors, such as Freud (1908/1958), Koestler (1964), Kris (1952), and Kubie (1958), have linked creativity with primitive or regressive forms of thinking. In addition, Arieti (1974, 1976) and Vygotsky (1934, 1960) compared conceptual process with that of schizophrenics. Andreasen and Powers (1975), Richards (1981), and Schuldberg (this volume) take additional looks at this phenomenon. Indeed, creative thought may, at times, approximate the pathological. However, with creators, one is concerned with cognitive *style,* with a cognitive *preference,* based on ongoing personality trends. Successful creators are able to exercise flexible *choice* between conceptual *styles* of varied developmental origin, and thus turn their products to adaptive ends (Richards, 1981). This is consistent with the progressive and functional qualities of such successful creators, including their elevated ego strength (Barron, 1969; Kris, 1951; Richards, 1981; Schuldberg, 1990).

Regarding adaptive use of more regressive material, one may consider in more detail the primitive thought which is linked with schizophrenia, as described by Arieti (1974, 1976). One should meanwhile bear in mind that (a) according to Arieti (1974), manic productions could depart as well from conventional logic because of the pressured quality of the disorder; and (b) there was, at that time, a general tendency to misdiagnose psychotically manic individuals as schizophrenic (Pope & Lipinski, 1978).

Arieti (1976) distinguished two types of thinking: *paleological* and *Aristotelian,* and related these generally to Sigmund Freud's primary and secondary processes, with features including displacement, condensation, symbolic representation, use of allusion, analogy, and lack of time sense. Paleologic thought can also occur in dreams, ancient myths, primitive cultures, and in the thought of young children (Arieti, 1974, 1976). Secondary process, related to regulation of ego-events and conscious processes, utilize characteristics including judgment, intellect, logic, and reality testing (Freud, 1949). These are often associated with mature adult thought.

Arieti (1974) identified three aspects of paleologic thought in schizophrenia: (a) identification based on similarity, (b) increased use of meaning based on denotation, not connotation, and (c) concretization and perceptualization of the concept. A beautiful schizophrenic woman, for instance, when asked who she was, replied, "A flower." The poet too may use paleologic thought in the service of simile or metaphor, but is able to combine both paleologic and Aristotelian processes toward this end. Arieti (1974, 1976) noted how, in Blake's "The Sick Rose" ("O Rose, thou art sick!..."), one finds rose and sick woman fused, but these also maintain their individuality through at least one secondary level of meaning ("beautiful life is destroyed by illness").

Such a combination of primitive and advanced processes may well comprise the critical difference between Andreasen and Powers's (1974, 1975) creative writers and their manics. When one considers the high rates of mood disorders among Andreasen's (1987) creative writers, one sees a quite reasonable chance that Andreasen and Powers's (1974, 1975) creative writers were themselves densely mood disordered and quite frequently bipolar (see also Richards, 1981). Thus, these eminent writers' adaptive performance compared to patients may have had less to do with a personal history of mood disorders than with modulating factors that, in their presence, may have made creativity possible, including (a) a functional versus floridly manic state, (b) availability of advanced intellectual function and ego controls, (c) and additional advantages, for instance, a higher educational level in the group of writers.

Manifestations of "Thought Disorder" in "Normal" Relatives of Bipolars

Bipolar disorders fall along a spectrum (Akiskal & Mallya, 1987), and some states can indeed be quite functional. How then does one explain enhancement of creativity in, for instance, a cyclothyme? And what about the normal relatives (or the evident "unipolar" depressives) with a family history of bipolar disorders? Doesn't an explanation based on a manic thought disorder fall apart at this point?

Very interestingly, there is some evidence for familial patterns of thinking. Looking at schizophrenia, for instance, McConaghy (1959) found that the use of deviant categorizing principles on the Object Sorting Test characterized not only the patients, but their *parents* as well, when contrasted with parental controls. Shenton et al. (1989), using Johnston and Holzman's (1979) Thought Disorder Index, showed for manics, as well as for schizoaffectives, and schizophrenics, that thought disorder may be found *in the first-degree relatives of parents, including relatives who are not themselves clinically ill.*

Of further interest is McConaghy and Clancy's (1968) finding of deviant categorization among both a regular nonclinical sample of college students in a psychology course and their parents. The high-scoring students indeed appeared to be adequately functioning, causing the researchers to give their dimension the

more neutral name of "allusive thinking." But there was one further twist relevant to creativity. Although high- and low-scoring students were comparable overall on an achievement measure in psychology, the high "allusive thinkers" showed more *variation,* including some outright failures and some special citations of merit!

Hence, so-called thought disorder in "normals" may exist, and be a very subtle form of "dysfunction" (if it is truly that). Isen et al. (1987) indicated that only a slight increase in positive affect is sufficient to enhance creative problem solving. Such a minimal alteration could produce a low-grade thought disorder in individuals whom we tend to call psychiatrically normal, without lending any appearance of pathology. Richards (1981) noted the potential for subtle subclinical phenomenology in normal relatives of persons with major psychiatric disorders, and Richards et al. (1988b) noted the potential in "normal" relatives of bipolars for an undiagnosed *hyperthymic* state. Such subtle states may, indeed, be optimal for creativity, providing an enriched thought process while maintaining the full potential for the necessary ego controls.

TRAIT EFFECTS: MOOD ALTERNATION AND COGNITIVE STYLE

From the foregoing, one might think that the most creative and mood-disordered individuals should be *hyperthymic,* that is, people who appear "happy all the time." Such persons perhaps exist and have not come to clinical—or to creativity researchers'—attention (Richards et al., 1988a). However, we would suggest, as have others as well (e.g., Andreasen & Glick, 1988; Jamison, 1990, in press; Schuldberg, this volume), that the full range of a bipolar emotional experience may be important in understanding effects on creativity. Effects may again be complex. Richards (1990) uses her typology of potential associations between psychopathology and creativity (Richards, 1981) to summarize a range of current positions on this issue.

Some creativity-enhancing effects may be specific to a particular mood, such as depression, as in use of depressive experience as material for creative expression (e.g., Andreasen & Glick, 1988; Jamison, 1990; Richards, 1981). Some may involve straightforward carryover of learned patterns and sensitivities from one mood state into another, and some the patterns resulting from experience which *combines* extreme mood *fluctuations.* The last two possibilities are considered briefly next.

"Carryover" Effects

The existence of "carryover" effects seems likely. Jamison et al.'s (1980) bipolar patients reported ongoing and *lasting* effects of their mood swings on creativity,

productivity, and overall sensitivity. Consistent with this, Eckblad and Chapman (1986) found, when they removed the episodic items from their Hypomanic Personality Scale, that the remaining personality or style items were able to predict very well by themselves the presence of an intermittent history of hypomanic episodes. That is, the episodic mood elevations seemed clearly connected to something more ongoing.

Unlike the bipolar subjects, Jamison et al.'s (1980) unipolar depressed patients did not report lasting effects of mood swings on creativity and productivity. However, they did feel that sensitivity was influenced. Hence, depression by itself may contribute at least to a heightened awareness.

There are many further possibilities in bipolar individuals for carryover of habits or behaviors, including ongoing effects on cognitive style, as developed further below. A further motivational possibility involves an increased confidence and willingness to keep going, to keep on trying—a pattern which can become reinforced in turn by the success it engenders. Because bipolar illness can often be deadly (Goodwin & Jamison, 1990), it can be particularly important when some patients are able to overcome the moment and say to themselves what a subject of Eckblad and Chapman's (1986) could say, despite repeated depressions: "I always know I'll feel better tomorrow" (p. 220).

Affective Integration and Increased Creative Courage

In Simonton's (1988) chance-configuration model of genius, the richly interconnected mental material that the creator may flexibly access should include, not only cognitive, but affective, content. The creative use of such material involves not only its *availability* through its complex web of interconnections, but the *motivation* to access such material in the first place.

Individuals at risk for bipolar mood disorders (including persons with frank bipolar disorders and those relatives with more subtle or subclinical features) may show both types of advantage—of content availability and of motivation for access—as one result of the experience of alternating *bipolar* mood swings. It is also suggested that nonbipolar individuals (a) may sometimes show this advantage, and (b) may further develop this potential should they wish to do so.

Forces working against affective integration. There are forces that work toward congruence rather than incongruence and variability in the mental flow of affective material. First are propensities for *mood congruent* recall and, to a less clear extent, for *state-dependent* retrieval (e.g., Blaney, 1986; Bower, 1981; Isen, 1984, 1985). Furthermore, if one is feeling low, the tendency is to abolish this low state. This may include a more passive tendency toward temporary "decay" (Blaney, 1986), and also a more active tendency toward *mood repair,* or to "chase the blues away" (Isen, 1984, 1985). Mood-congruent recall is weaker for negative than positive material (Isen, 1985), such that an active defensive, distancing, or distracting maneuver may well be successful. Isen (1985) pointed

out that all negative affects need not be handled in the same way. But taking sadness, for instance, one result may be impoverished schemas of mood-relevant material, involving less plentiful, less interconnected, and less readily cued material (Isen, 1985; Isen et al., 1987).

Things are somewhat different with positive affect, for the tendency is toward *mood maintenance;* the goal is to preserve the pleasant state in the interests of self-regulation (Isen, 1985). This tends to inhibit the creation of rich mental associations that "cross affective lines," and tends to keep one in the "happy" more than the "sad" camp.

There is certainly irony here, because a positive mood tends to *decrease* the motivation to take risks (Isen, Hygren, & Ashby, 1988). Recall that mood elevation can enhance creative thinking, including novelty in associations, categorization, and problem-solving capability (e.g., Greene & Noice, 1988; Isen & Daubman, 1984; Isen et al., 1985, 1987). Yet at the same time, one's desire to fearlessly use this creativity becomes diminished by the increasing urge to play it safe. It almost seems as if there is a plot against "rocking the boat"—a negative feedback mechanism to limit the practice of creativity.

Individual differences in affective integration. Clearly, these patterns are not equally valid for all individuals. A poet, a playwright, an actor or actress, must switch mood states as readily as a scene may change. These individuals have somehow created a different and more flexible mental organization—with an openness to experience, including affective experience, characteristic of highly creative people (e.g., Barron, 1988; Richards, 1993a; Rogers, 1961; Smith & Carlsson, 1990).

An actor, for instance, described to me how he prepared emotionally for a scene in which he felt both guilty and responsible, remembering back to a time at his grandmother's, when he was a young boy, and his little sister had fallen off a bed. He wouldn't face his emotions directly, but would ease into them through sensory experience:

> You start with something peripheral—the room, the smell, it's grandmother's house, and it always had a smell—bread or whatever. If you don't push, that smell will lead to something else—and something else. But you do it gently—and it all starts connecting. Use the senses, the color of the room, a little chain reaction—you get into that—and (then) you speak the lines.

The above phenomenon is proposed as one important route to affective openness—the multisensory, multicoded representation of experiences, with attention to their many facets. When a person becomes overwhelmed by hopelessness in a depressive disorder, depressive affect can come to completely dominate one's associations (e.g., "I got that wrong," "I'm no good," "I can't do anything," "it's hopeless"), and this may become so dominant that even the initial stimulus is lost (e.g., Matthysse, 1991). Cognitive therapy, in fact,

operates by providing an intellectual *interrupt* (in computer language) for such a negative affect loop (see Beck, Rush, Shaw, & Emens, 1979; Isen, 1984).

For high creative flexibility, one would want access to mental material that could be relatively *mood incongruent* and *state independent.* Numerous and varied mental routes may exist to and from stimuli with dominant negative emotional content. Some creative individuals, for instance, actors and actresses or playwrights, may even become highly skilled at sneaking up along these mental byroads so as to enter quickly into entirely new mental regions and open up whole new mood-incongruent affective *schemas* (i.e., data structures representing concepts stored in memory—Rumelhart, 1984).

It is further suggested that persons at risk for bipolar disorder (a) not only tend toward a greater richness of association to many stimuli, as discussed above, but may also (b) have some unusually strong mental connections between very disparate affects, as described further below. Thus, in addition to the intellectual interrupt of cognitive therapy, which allows escape from affective traps, there may be an affective interrupt as well.

Factors in bipolar disorders that may favor affective integration. Depressed individuals, because they cannot turn so readily from their negative moods, may potentially end up with as well-elaborated, interconnected, and as readily cued negative as positive schemas (Blaney, 1986; Isen, 1984, 1985; Isen et al., 1987). It is proposed here, in addition, that individuals at risk for *bipolar* disorders (and perhaps persons, in this case, with more noticeable symptom pictures) could develop plentiful connections, not only within, but *between,* negative and positively coded affective schemata—through mechanisms including sequential anticipation, contiguity, and some sense (however illusory) of causal control. We will focus in particular on the last possibility.

Symptoms of mania and depression can comingle. The classic psychoanalytic position (Eaton & Peterson, 1969; Goodwin & Jamison, 1990) holds that mania is a flight from depression. Hypomania too can involve a certain degree of escape or avoidance. Mania is not a blissfully happy state that stands in contrast to an unhappy one, depression. Mania has its definite down side—albeit one of different pace and flavor than that of a unipolar depression. Said one patient, "I have felt infinitely worse, more dangerously depressed, when manic than when in the midst of my worst depressions. In fact, the most awful I have ever felt in my entire life" (p. 27).

The excitability of mania represents a more ongoing state of mood elevation, but affect may nonetheless range from euphoric to highly irritable, with possible underlying coexistence of positive and negative feeling states. Kraepelin, in an early classic description, characterized delirious mania as: "very changing, sometimes anxiously despairing (thoughts of death), timid and lachrymose, distracted, sometimes unrestrainedly merry, erotic or ecstatic, sometimes irritable or unsympathetic and indifferent" (Goodwin & Jamison, 1990, p. 25).

Thus indeed originated the term *raving maniac*. As Kotin and Goodwin concluded: "if mania is a defense against depression, it is often an inadequate defense, since depressive symptoms remain prominent during the manic phase" (in Goodwin & Jamison, 1990, p. 284).

John Custance, a manic depressive writer, described his mental associations during one of his hospitalizations when manic (and also depressive):

> the mere sight of these seagulls sets up immediately and virtually simultaneously in my mind the following trains of thoughts (and he mentions nine sometimes elaborate memories followed by): The Mental Hospital where I spent nearly a year during my worst attack of suicidal depression... the gulls terrified me for two reasons: firstly because I thought myself as a sort of super-gull who had been gulled into selling his soul; and secondly because I thought I was responsible for all the death and the evil in the world and that the spirits of all the lost seamen since the world began were in those gulls calling for vengeance on me. It is interesting to note that both in manic and in depressive periods of sufficient intensity animistic conceptions of this kind impel themselves forcibly upon me; I cannot avoid seeing spirits in everything. (in Jamison, 1990, p. 253)

Consequent associations may greatly multiply the quantitative number of connections between affectively based schemata as well as dramatically enhancing the qualitative variety of material that may become intimately bound. Diverse affects and mood congruent information may cross party lines, as it were, and mingle with material from which it would otherwise be kept separate, through the more normative principles of negative *mood repair* and positive *mood maintenance*.

Whether or not a manic defense succeeds in reality, the coexistence or rapid alternation of extreme mood states may forge directional links between these states, as well as between whatever mood-associated material they can access. Especially if the flight from depression should succeed (or appear to do so), the more tightly and *directionally* linked may the negative and positive material appear. The gratification that may come from *mastery* of a negative affect is important here, and should be distinguished from the negative affect itself (Krystal, 1981). There is also a message here for the future: that *this* is the route to improvement. The solution is in action, not inaction; it is in confrontation. Risk taking becomes more the rule. The person on a bipolar "high" knows he or she cannot preserve the mood state anyway.

This conviction can become part of one's self-concept and can modify cognitive style, at least during mood states which prime the appropriate cognitive structures (Blaney, 1986). For such bipolar individuals, the active stance may become psychically more cost effective (see Rubenson & Runco, in press); it may emerge as particularly powerful in overall high-functioning people. Thus, whereas many non-bipolar people may attempt to limit depression

by keeping it at bay, the manic may cope (and sometimes when not manic as well—via a "carryover" effect) through frantic and almost incessant activity.

Other situations which may enhance affective integration and creative courage. One might wonder if a certain response to the experience of hardship—a more creative, coping response—may sometimes interact with and further engender the integration of diverse affects and experiences. There are a surprising number of eminent creators who—if not mentally ill—have suffered some difficulty or deprivation, including parental illness, troubled childhoods, poverty, traumatic loss, and physical disability (e.g., Andreasen, 1987; Goertzel & Goertzel, 1962; Jamison, 1990; Richards, 1981, 1990; Sandblom, 1989; Simonton, 1984). These are people who have still emerged mentally flexible, and open to experience, which includes their own inner thoughts and feelings. How then might this occur?

Consider, for instance, resolution of the "incomplete information processing" of traumatic experience in Horowitz's model for treating posttraumatic stress disorder (see Peterson, Prout, & Schwarz, 1991). Effective treatment can eventuate in an integrated experience that no longer needs to be walled off from the rest of one's personality, or which can erupt in intolerable intrusions. In some cases, we propose, where trauma is not totally devastating, and in the presence of other strengths, that certain mental and emotional barriers may ultimately become even more permeable than they might have been otherwise, allowing more free-flowing creativity.

Similar to the proposal for bipolar individuals, true trauma recovery may necessitate conscious coprocessing of diverse affects and cognitions that would otherwise have been fiercely avoided, with lasting results including diverse mental connections and an empowerment borne of this mastery. Paradoxically, then, we propose that the major divisions of consciousness resulting from severe trauma, in certain instances may—through a courageous processing of one's experience—ultimately serve to soften the "normal" fragmentation of consciousness due to the principles of mood maintenance and mood repair, and—in some areas, at least—permit an enhanced mental openness and creative flexibility in the recovered individual. Such creative resilience would, indeed, be a very worthy and hope-producing goal in the treatment of trauma.

There are clearly other responses to trauma, however, and a great many people can be vanquished by hardship (e.g., Gardner, 1990; Herzberg, 1990). Some individuals, however, who emerge personally resilient (Garmezy & Rutter, 1983; Rolf et al., 1990) and productively creative (e.g., Flach, 1988, 1990; Gut, 1989; Richards, 1990). In view of this, Richards (1993a) suggests some slower, gentler, and more stepwise procedures, with a much lower rate of attrition, through which children might acquire greater affective integration and creative risk-taking potential.

which are not confined to persons at risk for bipolar disorders. Indeed, they are mind-expanding phenomena from which we may all learn.

CONCLUSION

Everyday creativity is broadly applicable to work and play, indeed to virtually any human activity. Furthermore, by its very definition (as a central adaptive capacity), everyday creativity should be health producing. Even if its origins are in illness, the results of everyday creativity should tend toward health (see Richards, 1990).

There is support from many directions for a personal or familial connection between creativity and bipolar mood disorders. However, for everyday creativity, the connection within a given person does not necessarily require the presence of disease, impairment, or suffering. Indeed, the normal relatives of bipolar individuals are among those showing a creative advantage. The underlying phenomena may be subclinical in nature and subtle indeed (e.g., Richards et al., 1988b), or at least have these aspects.

A range of cognitive, affective, and behavioral factors have been linked with mood elevation and creativity for everyday and eminent creators alike. We noted some of these possibilities, but then focused on factors related to cognitive style, in part because of their explanatory power, and in part by way of example.

Mood elevation may increase one's mental capacity for unusual associations, overinclusion, and for creative problem solving in general. This creative capacity also fits with patterns of thinking in bipolar thought disorder (even showing up in bipolars' normal relatives), and with patterns of thinking in creative (though not necessarily bipolar) individuals (e.g., Richards, 1981, 1990; Shenton et al., 1989). These are phenomena that are not specific to bipolar disorders—but their emergence may be facilitated by it.

The presence of *mood swings* may lead to higher creative capacity through effects on affective integration and on motivation for creative risk taking (among a range of other possible effects). These effects may result from forced temporal ties between affectively disparate experience, and from use of more active manic-type modes to compensate for negative affective experience. Thus there are effects on both ability and motivation. This pattern departs dramatically from the normative patterns of negative *mood repair* and positive *mood maintenance*.

The overall result is an active, courageous, and affectively integrated cognitive style—and this may affect as much as 4%–5% of the population, that is, those apt to develop a bipolar spectrum disorder (Akiskal & Mallya, 1987), along with their many unaffected relatives. It is also a pattern to which not only persons at risk for bipolar disorders are privy.

Although there is much more to be learned, it appears that risk for bipolar disorders may (when taken with other strengths) help engender changes in cognitive style that could increase creativity. This may happen both through effects on creative *ability* and *motivation*. In the future, study of bipolar disorders should reveal much more about this complex illness and its link to creativity, as well as provide new insights into the creative process in general.

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3

Bipolar Disorder and Creativity

Charles L. Bowden

Bipolar disorder, a common, severe, recurrent condition, is unusual among psychiatric disorders in being associated with increased creativity and work productivity. The most striking examples of creativity, linked to the milder manic states of the disorder, have been documented in the lives of writers and musicians. However, enhanced creativity in more ordinary business life and enhanced work productivity appear to be common features of bipolar disorder. A small number of experimental studies provide further support for the association of manic symptomatology with creativity. These studies also indicate that the thinking processes observed in mania differ from those characteristic of schizophrenia. The role of maintenance treatment to prevent relapses in bipolar disordered patients is an ethically complex one. Factors that must be considered are the maladaptive consequences of the illness, the efficacy of available treatments, the risk–benefit ratio of the treatments, and the autonomy and active consent of the patient.

Bipolar disorder may be unique among psychiatric disorders in that, in some instances, it confers advantages on persons who have it. These advantages largely show up in areas of creativity and work performances. The purpose of this chapter is to review the evidence for these advantages, place these in perspective against the impairments and problems that also characterize its effects, and consider the related scientific and ethical issues concerning treatment of the condition.

CLINICAL FEATURES OF BIPOLAR DISORDER

A brief review of the clinical characteristics of bipolar disorder will help to place in context what we know of its linkage to creativity. Bipolar disorder, also referred to as manic depressive illness, has been known throughout time. Mania and depression are the only psychiatric disorders written about by Hippocrates, over 2,000 years ago. The illness is characterized by recurrent episodes of both depression and mania. When depressed, persons tend to be uninterested in usual pleasures, slowed in thinking, socially withdrawn, and fatigued, and they sleep excessively. When manic, speech and thinking are accelerated, time spent asleep is diminished, energy and physical activity increased, and appetite for pleasurable activities enhanced. Judgment is usually impaired, with consequences such as overspending, impulsive sexuality, and infractions of the law. Mood is invariably disturbed, although in a complex manner. The person may be elated and grandiose, or irritable, argumentative, anxious, and dysphoric. Frequently there are admixtures of both the elated and irritable features. Both depressed and manic episodes may last from hours to many months. The average duration of untreated depressions is around 8 to 12 months, with manic episodes between 2 to 8 months (Keller et al., 1983). Persons with milder manic symptoms are referred to as *hypomanic*. Many of these persons do not see the hypomanic periods as distressing, although family members and coworkers are frequently aggrieved by their behavior. These patients are likely to seek treatment when depressed.

In its most characteristic form the illness begins in the late teenage or early adult years, with recurrences and in many cases actual worsening of symptoms over the remainder of the life span. There is a strong heritable component to this form of bipolar disorder, usually traceable through either the maternal or paternal relatives. Additionally, there is some evidence of assortative mating, with one bipolar patient being somewhat more likely to marry another bipolar patient. One indication of the strength of hereditary factors is that if one monozygotic twin has bipolar disorder, the likelihood of bipolar disorder in the other is over 70%, even if the two were separated at birth, thus excluding factors of common rearing (Bertelsen, Harvald, & Hauge, 1977).

SECONDARY CONSEQUENCES OF BIPOLAR DISORDER

In addition to the distress and direct effects of the symptomatology of the disease, bipolar disorder is associated with many untoward consequences. The risk of suicide in untreated bipolar disorder, including bipolar II disorder, is seven- to eightfold that of the overall population. Bankruptcies, moves, and divorces are all significantly increased in bipolar disorder (Brodie & Leff, 1971). Whereas bipolar disorder patients generally indicated that they would remarry

their spouse, the spouses asked separately generally said that they would not remarry the ill partner. Data such as these strongly indicate the inability of the bipolar disordered persons to see themselves as others see them, and the tendency when manic to underestimate the negative consequences of their behavior on social relationships.

ARTISTIC CREATIVITY IN BIPOLAR DISORDER

The contributions of Jamison (1989) in investigating the evidence of bipolar disorder in the lives of writers, musicians, and politicians are particularly noteworthy. Jamison (1989) often meticulously traced out to direct sources the evidence that she has published. The number of persons in the arts who have had bipolar disorder and personally written about their experience is remarkably high. The examples described here are only a fraction of those available.

Randall Jarrell was one of the finest poets of the 20th century, and a noted literary critic. A substantial percentage of his poetry has a melancholic, past-oriented, reflective tone. As with many artistic productions, we rarely know the mood state of the person during the time of composition. Indeed, it is possible that a given composition may have been worked on during more than one mood state. The poem "A Prayer at Morning" conveys the insomnia, the inability to experience pleasure, and the sense of hopelessness that so often characterizes bipolar depression.

> Cold, slow, silent, but returning, after so many hours.
> The sight of something outside me, the day is breaking.
> May salt, this one day, be sharp upon my tongue.
> May I sleep, this one night, without waking. (p. 490)

By contrast, many other of Jarrell's poems are playful, exuberant, exquisitely sensitive to sensate pleasures, and sexually suggestive. The language is rich to overflowing with alliteration and assonance. It is as if the poems were constructed by two different persons with opposite temperaments. These excerpts from "A Man Meets a Woman in the Street" are illustrative:

> I walk behind a woman. Her hair's coarse gold.
> Is spun from the sunlight that it rides upon. Women are paid to knit from sweet champagne
> Her second skin: It winds and unwinds, winds
> Up her long legs, delectable haunches,
> As she sways in sunlight, up the gazing aisle...
> For a moment I'm younger, the century is younger.
> The living Strauss, his moustache just getting gray,
> Is shouting to the players: "Louder!

Louder! I can still hear Madame Schumann-Heink—"
But I've pretended long enough: I walk faster
And come close, touch with the tip of my finger
The nape of her neck, just where the gold
Hair stops, and the champagne-colored dress begins.
My finger touches her as the Gingko's shadow
Touches her. (p. 351)

With all of this sexually suggestive content, Jarrell then surprises us in the last lines:

Because, after all, it is my wife
In a new dress from Bergdorf's, walking toward the park.... (p. 76)

Jarrell was psychiatrically ill much of the last year of his life, which ended in suicide. Just before his psychiatric hospitalization, his wife described that "He was granted a few magic weeks of Lisztian virtuosity when nothing in his lectures or readings was veiled to him any longer. Everything his heart desired seemed possible to him.... Poems flew at him... until just words beat at his head like many wings."

Many other writers' and musicians' productivity appears closely tied to their mood state. Schumann composed over 25 pieces in each of two years that he was hypomanic. By contrast during two of the years that he was depressed, he composed two and no pieces, respectively. Hugo Wolf composed over 200 songs between 1888 and 1891 and an additional 30 between 1895 and 1897. At his most frenzied productivity, he composed two and three songs daily, and composed 50 during a 3½-month period.

Wolf was enraptured and grandiose with his compositions: He wrote, "Erstes Liebeslied eines Madchen is by far the best thing I have done up to now... it would lacerate the nervous system of a block of marble." The next day he added: "I retract the opinion that Erstes is my best thing, for what I wrote this morning, Fussreise, is a million times better" (Schonberg, 1970).

Most of Wolf's songs are delightful, often romantic, and deservedly constitute a staple of the vocal repertoire. A few of his works hint at a manic, shrill, hostile, insistent state of mind, such as "Verschling' der abgrund" in the *Italienisches Liederbuch.*

Wolf was extremely difficult to deal with, often angry, pedantic, quick to criticize friends and persons whom it was imprudent to alienate. In critiquing Brahm's "Fourth Symphony," he wrote, "He has, to be sure, never been able to raise himself above the level of mediocrity, but such nullity, emptiness and hypocrisy as prevail in the E minor Symphony have come to light in none of his other works. The art of composing without ideas has decidedly found its most worthy representative in Brahms."

Wolf deteriorated to a psychotic manic state, proclaiming that he had been named director of the Vienna Opera. Following his release after his first commitment to the asylum, he tried to drown himself. He was recommitted and spent the last four years of his life in the asylum. Wolf's medical history is complicated by his having contracted syphilis at age 17. Given that a wide range of insults to brain function, including infectious states such as neurosyphilis, can cause or precipitate secondary bipolar disorder, the origins of his disorder may have been nongenetic or, possibly, the organic disturbance may have worsened an already present manic depressive condition.

Hector Berlioz described his bipolar illness in vivid terms:

> What can I say that will give some idea of the action of this abominable disease? There are... two kinds of spleen; one active, mocking, passionate, malignant; the other morose, and wholly passive, when one's only wish is for silence and solitude and the oblivion and sleep. For anyone possessed by this latter kind, nothing has meaning, the destruction of a world would hardly move him. (Schonberg, 1970)

His productivity, social relationships, and the form of his works were influenced by his illness. His often played "Symphony Fantastique" is illustrative of his illness in two ways. The content of the Fifth movement of the piece is macabre, intrusive, with rapidly changing tempos and an intense, driving quality. There is little else like it among the classical repertoire of frequently played pieces. The fact that this is often brought out for performance around Halloween is indicative of its emotional tone. The process by which Berlioz wrote "Symphony Fantastique" also suggests a manic state. The first four movements appear to constitute a whole. Indeed, critics have viewed the March au supplice, which closes the fourth movement as one of the most final pieces in music. Yet, Berlioz added the bizarre music and story of the fifth movement to complete the piece.

Berlioz's temper was unforgettable. His behavior at the opera is described by the dramatist Legouve (Schonberg 1970): "One of my neighbors rises from his seat and bending towards the orchestra shouts in a voice of thunder: 'You don't want two flutes there, you brutes! You want two piccolos! Two piccolos, do you hear?'" Berlioz's grandiose thinking extended to his music. He described his ideal orchestra as including 467 instrumentalists, plus a chorus of 360. In addition to the 242 strings there were to be 30 harps, 30 pianos, and 12 cymbals. Berlioz's moodiness was also intense. Describing his mood when trying to write an article, he said, "I felt simply overcome by despair. There was a guitar standing against the table. With one kick I smashed it in the center.... On my chimney two pistols were looking at me with their round eyes. I stared at them for long time.... I tore my hair and wept with furious indignation" (Schonberg, 1970).

CREATIVITY OUTSIDE THE ARTS

One reason students of creativity in bipolar disorder have favored authors, artists, and musicians is that they leave a record that often informs about their illness and its linkage to creativity. However, for every John Berryman, Robert Lowell, or Sylvia Plath, there are many more persons with bipolar disorder who lead their lives as teachers, in business, in governmental service, or as scientists. Below I review the evidence that some elements of creativity and accomplishments prevail in these persons.

Richards (1990) studied what she calls *everyday creativity,* which she defined as entailing originality and meaningfulness of the activities to others, but not requiring public recognition. She found, as did Schuldberg (1990), that hypomania, rather than mania, is positively related to such creativity (Richards, 1990; Richards & Kinney, 1990; Schuldberg, 1990). She and Kinney postulated that subclinical factors such as confidence, sociability, energy, and ease of thinking provide a compensatory advantage in persons at risk for bipolar disorder and may raise creative potential (Richards & Kinney, 1990). The genetic diathesis toward bipolar disorder may result in more rapid thinking, impulsivity, and restlessness which in turn incline the person toward greater creativity (Jamison, 1989). Possibly higher creativity among normal first degree relatives of manic depressive subjects than among the manic depressive subjects suggests that the advantages of greater creativity may disproportionately accrue to those with the mildest symptom characteristics, and relatively better functioning among the spectrum of bipolar patients and persons at risk for bipolar disorder (Richards, Kinney, Lunde, Benet, & Merzel, 1988). Akiskal and Akiskal (1988) also found greater artistic creativity among patients diagnosed as bipolar II and III rather than those diagnosed as bipolar I or schizoaffective.

Cropley (1990) viewed such creativity as the net result of a variety of characteristics, particularly openness, playfulness, flexibility, and humor. These are also characteristics that many persons would use to describe positive mental health. There are no experimental data to support such views, and descriptions of bipolar patients suggest a different set of characteristics, ones that do not often include openness and flexibility. Flach (1990) suggested that the resilience to overcome difficulties is an essential characteristic of this type of creativity.

Comments by John A. Mulherren, Jr., a Wall Street stock trader with a bipolar disorder, are also relevant. Mulherren believes that in his unmedicated state he is more stimulated, more creative, stronger, virtually indefatigable, quicker mentally, more focused, or what he calls "one hundred fifty percent normal—everything works. I'd never give it [illness episodes] up." Psychiatrists frequently encounter bipolar II patients with similar self-described enhanced productivity and mental acuity during hypomanic periods. Although it is not often possible to confirm such reports or to assess actual changes in productivity over time, such statements are often indirectly supported by relatives' com-

ments, earnings, and levels of responsibility achieved. Andreasen (1987) provided relevant supporting evidence: The first degree relatives of the writers who met bipolar disorder criteria were significantly more likely to have graduated from college, or to be in managerial, supervisory positions, than were the relatives of controls. This held true both for women and men.

Churchill is a pertinent example from the political arena. He wrote principally about his melancholic periods, but also is described by various sources as having an inordinately high capacity for work. Jamison, having reviewed much of this evidence, thought it likely that he had a cyclothymic temperament (Goodwin & Jamison, 1990). Churchill's physician quoted him: "black depression settled on me.... I don't like to stand by the side of a ship and look down into the water. A second's action would end everything" (Moran, 1966).

EXPERIMENTAL STUDIES

In contrast to the rich biographical material available about persons with bipolar disorders, there is little extant experimental or quantitative work. Andreasen compared a group of writers at the University of Iowa writers' workshop with controls matched on age, sex, and education. Using diagnostic criteria (not whether the person had actually been diagnosed or treated) she made a diagnosis of bipolar disorder in 43% of the writers, compared with 10% of the controls. Bipolar II disorder was more than twice as common as bipolar I disorder in the writers. Affective illnesses were also more frequently present in first degree relatives of the writers than of the controls. Twenty percent of the first degree relatives of the writers met criteria for creativity, versus 8% of the relatives of controls. The high percentage of bipolar disorder in controls suggests that an unusually low threshold for establishing the diagnosis was used.

Jamison (1989) reported that 38% of a group of English artists and writers had received treatment for affective illnesses. Poets had the highest frequency of treatment with medications, 33%, with 17% having specifically been treated for mania. Fully half of the poets were either treated with drugs or hospitalized for mood disorders. Almost all of those with bipolar disorder described creative periods, with 89% indicating that reduced need for sleep was a precursor to their creative periods.

Richards (1990) found evidence of greater creativity in persons with milder forms of bipolar disorder. These are patients who would probably be diagnosed as cyclothymic. She also reported higher creativity in normal first degree relatives than in the bipolar probands, evidence which she also took as supporting the possibility that a less than complete expression of bipolar symptomatology is more likely to be compatible with creativity.

Psychometric tests show similar findings, but also tend to support a differentiation in thinking processes seen in mania from those characteristic of

schizophrenia. Manics but not schizophrenics were characterized by incongruous condensations, flippancy, fabulized combinations, and playful confabulation. An example of a response scored as playful confabulation was "An evil witch doing a square dance. She had her dress like this and she was do-si-doing." Solovay, Shenton, and Holzman (1987) found that scores were three standard deviations higher than in the schizophrenics and essentially seen only in the manics. Shenton, Solovay, and Holzman (1987) found an inability to preserve conceptual boundaries in the bipolar patients. Interpretation in bipolar patients was superior to that of the normal controls. The manic responses were characterized by inability to preserve conceptual boundaries, or as the authors stated, "loosely strung together and elaborately combined." An example of the associative looseness is the response: "Because its black, dark, darkness, lovemaking." Manics did not differ from normals on confusion or idiosyncratic verbalizations. In the aggregate, these studies indicate that a form of thinking disturbance is common in mania, but that it differs substantially from the thought disorders most commonly present in schizophrenia. Furthermore, the formal characteristics of the manic thought appear consistent with the empirical descriptions and personal statements of persons with bipolar disorder in relationship to creative activities (Andreasen & Powers, 1974).

MECHANISMS OF CREATIVITY

Drawing on the subjective reports of persons with bipolar disorder, careful observations of others, and the few experimental studies, I now turn to some of the characteristics that are associated with creativity in bipolar disorder, and more importantly, may reflect causal relationships with that creativity.

Manic states are characterized by an *increased range and speed of associated concepts*. This has been studied formally with striking differences from the patterns observed in control subjects (Shenton et al., 1987). Because one aspect of intelligence and creativity entails the degree of organized complexity of thought, this is a highly plausible factor in the creativity of the bipolar person. This dimension is closely linked to what Koestler (1964) referred to as *bisociation*, which he viewed as fundamental to creativity both in the sciences and the arts. He wrote:

> The bisociative act connects previously unconnected matrices of experience; it makes us 'understand what it is to be awake, to be living on several planes at once.'... At a certain level of problem solving even a healthy kind of illogicality, of disregarding apparent contradictions, makes its appearance... the search for the right type of matrix to bear on the problem, becomes more intuitive, more remote from the normal routine of thinking, and extra-conscious processes play an increasingly important part.

A second characteristic is *perseverance.* This is often described in intrusive, insistent terms. The individual, in a single minded way, seems bent on imposing his will or view onto others. William James, who had severe depression, wrote that the psychopathic temperament (i.e., mentally imbalanced, irrepressibly curious, eccentric, grandiose) often brings with it ardor and excitability of character... when a superior intellect and a psychopathic temperament coalesce... in the same individual, we have the best possible condition for the kind of effective genius that gets into biographical dictionaries. Such men do not remain mere critics and understanders with their intellect. Their ideas possess them, they inflict them, for better or worse, upon their companions or their age (James, 1958).

A related characteristic is *the increased energy* of the manic person. With 18 or 20 hours per day spent in motorically and intellectually charged activity, there is simply a greater time period during which efforts might be brought to fruition. Here one must add a caveat that applies in some degree to all of the characteristics summarized here. A moderate increase in a behavior may be adaptive and underpin various types of creativity (to wit the intense outpouring of songs mentioned earlier for Schumann and Wolf) but more extreme energy outpouring is likely to be associated with lack of task completion, agitation, and inability to maintain focus. A manic patient who stayed awake the entire night baking pies for which she had no use retrospectively acknowledged that "not a one even tasted good."

Reduced sleep may be a particularly important factor in creativity. In one sense it is inherently related to increased activity. Additionally it is a harbinger and likely precipitant of manic episodes. I have had some patients with bipolar disorder who have learned this and described deliberate efforts to reduce sleep to elevate mood and thinking or to move themselves from a depressed state. This triggering phenomenon has frequently been described, in part because it is so dramatic.

Manic thought is *overly focused on the self,* in an intensely contemplative way. It is thus plausible that recognition of normally nonreporting physiological and psychological internal states might lead to novel observations. The corollary to this in the external world is the increased acuity to sounds, colors, and behavioral nuances (eg., Jarrell's earlier poem). This enhanced range of perceptions would potentially serve to increase intellectual alignment for creative activity.

Manic sensations are often focused on *heightened sexual interests* and behaviors. Although it would be difficult to argue that sexual behaviors are creative in other than a procreative sense, the ability to relate the sexual to the nonsexual dimensions of my life may yield associational material not ordinarily present because of inhibition, constraining social mores, and the like. The earlier quoted poem by Jarrell is illustrative.

Given the higher socioeconomic status of bipolar persons, and the evidence for superior educational and vocational achievement, one may speculate that overall increased intelligence is fundamental to the increased creativity in bipolar disorder. However, there is no evidence of increased I.Q. in bipolar patients, and the notion of intelligence is a complex one, with a more useful conceptualization of it entailing discrete capabilities along several, rather than one dimension.

ETHICAL CONSIDERATIONS

Bipolar disorder is a serious illness. Yet we see evidence that in its milder form, a complex picture often emerges, with concurrently adaptive and maladaptive behaviors. It is clear that many persons with hypomania do not view themselves as ill or in need of psychiatric treatment. To what degree is treatment then indicated? This overall question requires analysis along several lines.

First, how maladaptive is the disorder? Aggregate data indicate that suicide rates and many of the disruptive events associated with bipolar disorder are as high in bipolar II patients as in bipolar I patients. Goodwin and Jamison (1990) estimated that of the 36 American poets of the 20th century represented in the *New Oxford Book of American Poetry,* over 20% had manic depressive illness. Five of the eight whose illnesses were best documented committed suicide (Goodwin & Jamison, 1990). Additionally, because the disorder is generally a chronic, recurrent one, over time repeated episodes are likely to impair the patients' job competitiveness, social relationships, finances, and self-confidence. Finally, there is some evidence that failure to treat early, milder forms of bipolar disorder may, in a fashion developed in the kindling model, result in more frequent, more severe, and more treatment refractory forms of the disorder. The notion of kindling is that initial episodes of an illness may be in response to psychological and environmental stressors; but with repeated episodes some aspects of the biological systems linked to the disturbed behavior become permanently altered. A consequence of these alterations is the precipitation of illness episodes by the disturbed biological systems, independent of environmental factors. Therefore a strong case can be made for treatment on the basis of functional impairment and illness course.

HOW EFFECTIVE ARE AVAILABLE TREATMENTS?

Unfortunately, studies of the past decade describe a less favorable acute and maintenance phase response to lithium than did studies of the late 60's (Harrow, Goldberg, Grossman, & Meltzer, 1990). In part this appears to reflect an increased number of bipolar patients with secondary mania, rapid cycling, and mixed or dysphoric forms, all of which are associated with less favorable

response to lithium. Thus the strongest case for treatment is for the patient with classical elated-type mania with an early onset and a positive family history of mood disorder. Fortunately, alternative therapies, particularly with valproate and carbamazepine, hold substantial promise of utility in many forms of bipolar disorder. Additional studies are needed to establish more firmly their primary indications and limitations.

WHAT IS THE RISK-BENEFIT RATIO?

In particular, for present purposes, what effect do available treatments have on creativity or human functions that may underpin creativity? For many patients lithium is well tolerated and does not interfere with cognitive processes. However, there is abundant evidence that disturbance of cognition is a frequent side effect of lithium (Bech, Thomsen, Prytz, Vendsborg, Zilstorff, & Rafaelsen, 1979; Christodoulou, Siafadas, & Rinieris, 1977). Memory problems were the single most important reason for noncompliance in studies reviewed by Goodwin and Jamison (1990). Several studies document lithium's detrimental effect on long-term memory, memory retrieval, and speed of information processing (Glue, Nutt, Cowen, & Broadbent, 1987; Judd, Hubbard, Janowsky, Huey, & Takahashi, 1977).

Unfortunately, studies of the psychological effects of lithium have largely been conducted in normal volunteers, and may not be entirely generalizable to persons with bipolar illnesses. The studies have relatively consistently described reduced social involvement and lack of initiative from lithium (White, Bohart, Whipple, & Boyd, 1979). Such reports are consistent with the subjective reasons that patients give for discontinuing lithium. The double-blind study of lithium dosage reduction by Kropf and Muller-Oerlinghausen (1985) found that patients receiving higher dosages of lithium had reduced scores on initiative, assertiveness, and sociability. No controlled studies of the effects of lithium on productivity have been published. Two studies of artists, writers, and businessmen indicated that about three-quarters reported no change or improvement in productivity while taking lithium whereas about one quarter reported reduced productivity (Marshall, Neumann, & Robinson, 1970; Schou, 1979). These studies indicate that increased study of cognition in relationship to drug treatments for bipolar disorder is needed, and that careful attention to such adverse effects, especially in maintenance phase treatment, is important.

HOW TO ESTABLISH THE DECISION TO TREAT?

The decision to treat the patient who has a bipolar disorder is, of course, influenced by many factors other than the effects of drug treatments on cognition. The material reviewed in this chapter indicates that this factor is an

important one, as the data show that adherence to treatment with lithium is strongly linked to the patient's subjective sense that cognition is impaired by the drug. Further studies in patients on this question, especially in relationship to dimensions of cognition that may underpin creative, productive activity, would help in several ways. In addition, alternative treatments for bipolar disorder are desirable, and may be provided by both carbamazepine and valproate. The possible use of lower doses of lithium warrants further study, although the limited data are not encouraging (Gelenberg et al., 1989).

Psychiatrists have two major treatment issues to deal with in relationship to creativity and role function. The first is the question of implementing maintenance treatment. Unlike the clear indication for acute episode treatment, maintenance phase treatment obligates the patient to active treatment between episodes. In light of the substantial recent evidence that compliance with lithium during maintenance treatment is poor in about 40% of patients, and that effective prophylaxis occurs in only about two-thirds of those who are adhering to adequate regimens, questions of the effects of lithium and other prophylactic drugs on functional capabilities assume greater importance. What are the likely effects of repeated episodes of illness on function, including aspects of creativity, in the absence of treatment? What will the long-term effects of the drug be, both directly on behaviors linked to creativity and productivity, and indirectly through reducing the severity or frequency of recurrent episodes of mania, depression, or both? There is empirical evidence of behavioral kindling in bipolar disorder, wherein repeated illness episodes result in a gradual change from milder, more environmentally triggered episodes to more severe autonomous episodes. Although additional information in these areas is likely to become available, difficulties in prospective study of these questions mean that decisions will perforce be made on less than optimal information. Therefore serious consideration of the preferences of the patient is necessary, even when these are at variance with the preferences of the clinician. One reason for this is the clear evidence that many patients do not take lithium as prescribed, especially during maintenance phase treatment.

The second treatment issue extends from the first. For the patient taking maintenance therapy, active, continued inquiry into subtle dimensions of work and social productivity is needed. The patient needs to be informed of these issues and encouraged to assess them in an ongoing way. This collaborative approach with the patient is likely to result in both improved long-term function and diminished adverse effects. An additional reason for this collaborative, educational approach is that today's information is certain to be modified by new, additionally useful information over the many years that the patient will experience his or her illness.

A useful dictum in the management of chronic, recurrent disorders is that the patient learns to love his illness. For the patient with bipolar disorder, this can often include a direct recognition of some of the adaptive, beneficial con-

sequences of the condition, as well as the indirect lessons such as patience and the development of alternative means to achieve a goal that characterize all chronic illnesses.

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4

Giddiness and Horror in the Creative Process*

David Schuldberg

Productive and original processes are sometimes accompanied by moments of giddiness *that include feelings of manic or hypomanic euphoria and excitement. Methods such as brainstorming, which encourage inductive thinking through the generation and combination of schemata, may capitalize on this acceleration of motivation and cognition. The rules or antirules employed by these methods are strikingly similar to psychotic thought processes. This proximity to psychosis, as well as other aspects of giddiness, can lead to a number of different fears, referred to as* horror. *The childlike grandiosity and the destructive rulebreaking implied by new and original elements and combinations strike a note of shame and taboo and raise horrors involving merger and loss of boundaries or of going too far and finding abandonment or alienation. The grandiosity involved in giddiness may also raise specifically Oedipal fears of retribution. The contradictory affects are discussed in relation to processes and pitfalls involved in creative productivity. The*

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intermingling of these experiences accounts for some of the complex emotions associated with the creative process; mixed affective states play a key role in creativity.

Extreme, ambivalent, or bipolar emotions appear to have an important role in the creative process. Both *intellectual* ambivalence (Bleuler, 1950)—evident in inappropriate shifting between contradictory ideas—and *affective* ambivalence are present in psychopathology and in the processes of generating new solutions to problems. Two opposing, prototypic affects occur as naturally alternating responses to perceptual, cognitive, and existential situations and dilemmas that creative activity seeks to resolve. The two emotions, one positive and one negative, are referred to as *giddiness* and *horror* in this chapter, although a variety of names are mentioned. Cognitive and motivational processes accessed in a moment of creative work co-occur and are intertwined with this pair of contradictory and powerful affects experienced sequentially, cyclically, or simultaneously. Brainstorming and related creativity enhancement techniques (see Davis, 1973, 1986; Stein, 1975, for examples) supply samples of methods for encouraging the generation of creative products. Methods for using existing materials to develop new ones are termed *induction,* defined as reasoning from parts to wholes, from the particular to the general, or from the individual case to universals. This chapter is also concerned with the proximity of creative cognitive and affective processes to psychopathological ones.

GIDDINESS AND COGNITION

Giddiness refers to the emotional acceleration and pleasure involved in the playful, excited, or driven phases of creative work. The poet Anne Sexton describes the relationship between giddiness and poetics in a letter where she provides a dramatized account of her "rhyming": "*Me.* I know it's silly. And I keep laughing. I can't seem to feel anything but silly. I keep talking LANGUAGE" (quoted in Middlebrook, 1991, p. 225). Giddiness includes manic and hypomanic symptoms, affects that can be stimuli, facilitators, or consequences of successful creative work (Andreasen & Canter, 1974; Andreasen & Glick, 1988; Jamison, 1989, 1990; Richards, 1991; Richards, Kinney, Lunde, Benet, & Merzel, 1988). The relationship of giddiness to "inappropriate" or "silly" behavior is also a component of the complex of similarities between schizophrenic symptomatology and artistic productions; these may share a "hebephrenic" silliness and disregard for social convention.

At times, the generation and recombination of ideas is experienced as playful, sometimes as *serious* play (see Haley, 1963), and is accompanied by positive emotions of pleasure and excitement. A "light" or playful atmosphere is also important for the accurate assessment of creative potential (Guilford, 1971); such an atmosphere is sought in various brainstorming techniques.

Another form of giddiness is the experience of rapture or "being transported"; these affects touch on the exalted, mystical, and religious aspects of creative activity. Rapturous experience can accompany either focused attention on inner experience or outwardly directed perception associated with feelings of openness to or oneness with others or nature. When one is alone, the sense of being swept away is similar to spiritual or religious ecstasy; this can include feelings of volitional, cognitive, or motivational "passivity," as well as the openness, mutual responsiveness, and connectedness to the environment described for some "peak experiences" (Maslow, 1970).

In an interpersonal context giddiness may be experienced as being carried along or swept away by the dynamics of relationship. Two or more people can provide mutually stimulating interaction and a social context for a building of creative efforts and a leapfrogging of imagination. Improvisation is fostered in such a group setting, and competitiveness may be involved as a spur to seeking greater heights. In both the solitary and the social environment, being transported or carried away includes a sense of sensitivity and responsiveness. If these experiences are compared with psychopathological descriptions of loss of ego boundaries, weakened psychological defenses, a diminished stimulus barrier, and the personalized experience of cosmic or religious themes and dramas, it is clear how a parallel can be drawn between ecstatic states and madness. However, it is important not to engage in easy romanticizing of rapture, extreme creativity, and especially of madness.

AFFECT AND COGNITION IN INDUCTION

Both giddiness and—as will be clear soon—horror provide examples for viewing the essential unity of cognition and affect in creative productivity (Shaw, 1989). Descriptions of the stages of the creative process generally include one phase involving the generation of new ideas, derived from either internal (intrapsychic) or external (environmental) sources. These generative processes have been referred to by a variety of names and include the categories of divergent thinking (Guilford, 1967). New ideas can also be generated by means of the novel recombination of existing or previously created units. This chapter is mainly limited to a discussion of the generative and combinatory phases of the creative process, with less attention to the editing, consolidation, and "selective retention" (Campbell, 1960) of new ideas, or the communication of a more polished finished product based on them.

Brainstorming and other techniques for stimulating creativity can focus on either generation or recombination of units. Generation is encouraged by several of the rules of brainstorming welcoming unrestrained ideational production, "free wheeling," and quantity, or rules suggesting setting aside the normal customs governing—for example—the uses of a familiar object. Recombination is encouraged in the rule that combination and improvement are sought.

One method for combining existing ideas in new ways is to begin with a series of cognitive, perceptual, or affective *superimpositions* (see Rothenberg, 1979). Some techniques for encouraging induction provide "rules" of correspondence to guide such combinations and the building up of complex propositional terms based on previously derived units. These processes of superimposition are not strictly speaking "deductive," primarily because of the ad hoc, temporary, unsystematic, and improvisational nature of the rules of combination and aggregation they employ. They do not provide for the rational combination of elements, nor for straightforward conclusions from a set of premises. Rather, they are temporary and possibly indeterminate, and they encourage improvisation, *bricollage,* and a playful attitude toward more formal methods of combination or deduction. They inherently include suggestions for breaking set and bypassing usual cognitive modes.

In this encouraging of combinations there is a conscious implementation of integrative as well as sometimes destructive rules or "rules of thumb." These injunctions sometimes contradict everyday modes of thinking and can lead to the generation of new basic units for future recombination. As an example of this "generativity through recombination," cognitive integration can occur in the perception of an already built-up combination as a gestalt, or in subsuming it under a new concept.

If these sometimes loosely constructed rules of thumb are applied prescriptively, they represent an important attempt at implementing *antirules,* methods for circumventing existing interpretive schemas. At their best, such principles yield a valuable critique of the world as it has been understood, and represent "negative dialectics" evident in some artistic products. It is in this sense that they are antirules and may also be destructive. One paradoxical rule for attempting creative problem solving provides a limit-case example of an antirule: In "reverse" brainstorming (see Davis, 1986) the subject is encouraged to think of how to make a situation worse, encourage results opposite to those desired, or to ask "What can we do to be less creative." This is strikingly similar to paradoxical methods in some strategic psychotherapeutic interventions.

BRAINSTORMING AND PSYCHOSIS

Inductive processes of recombination and going beyond the information given used in brainstorming are similar to manifestations of cognitive psychopathology described in the psychological testing and descriptive psychiatric literature (Anthony, 1987; Barron, 1965; Bleuler, 1950; Hasenfus & Magaro, 1976; Harrow & Quinlan, 1985; Keefe & Magara, 1980; Prentky, 1980; Rapaport, 1946; Schuldberg, 1990; Schuldberg, French, Stone, & Heberle, 1988). The similarities are also related to the experiences of giddiness and horror.

Techniques for "crazy," "playful," or "unusual" combinations represent cases of the antirules described above and may initially be associated with the affective experiences of giddiness. Techniques for facilitating the process of induction use a variety of principles. Some methods encourage *juxtaposition,* where unrelated ideas are superimposed or put side by side. This corresponds closely to the primary process mechanism of condensation and to contamination in the psychological test literature, and is also related to Rothenberg's (1979, 1988) concept of "homeospatial thinking." Other techniques encourage *breaking down conceptual boundaries,* mimicking the "fluid conceptual boundaries" of psychotic thought (Blatt & Wild, 1976; Quinlan & Harrow, 1974). This produces results similar to contamination of responses and the weak linkages in loose associations and conversational derailment. For example, the creativity induction technique of "forced relationships" encourages making conceptual connections of stimuli by using *unusual attributes of the concept,* using unusual associates to form new schemata that may form new components for further recombination. Attention to unusual aspects of an object that are possibly less abstract than its more primary associates is also related to concreteness (Goldstein, 1944) and literalness (Hertler, Chapman, & Chapman, 1978; see later). New creative works may also result from the *intermingling of themes and sets* (Harrow & Quinlan, 1985); cognitive, perceptual, and even *experiential* intermingling parallel the affective intermingling of giddiness and horror.

The use of *generative series or sequences,* when pathological, involves loss of the regulative links or the overall set governing a train of thought, or loss of coherence in a conversation. Such smooth sequential *flow* (Csikszentmihalyi, 1977) is also encouraged in the free wheeling of brainstorming. Anne Sexton's description quoted earlier draws the connection between giddiness and such linguistic productions.

Creative thinking may also result from the use of *alternative rule systems* for combination. Some early attempts to explain schizophrenic thought processes focused on possible deficits in syllogistic reasoning (Von Domarus, 1944). Although it is no longer believed that flawed deductions form the basis of formal thought disorder (Chapman & Chapman, 1966), such "paleologic" (Arieti, 1974) can provide a strategy for novel recombinations and conclusions.

The preceding examples have emphasized parallels between inductive thinking and behavioral correlates of "positive" symptoms of psychopathology, most characteristic of some types of schizophrenia and of mania. "Negative symptoms" (Strauss, Carpenter, & Bartko, 1974) as well may be used creatively. For example, a *concrete set* is utilized productively in the techniques of "attribute listing" and "attribute shifting." In attribute listing, the participants enumerate the functional characteristics of an object, seeking novel approaches in a more basic understanding of the problem itself. Attribute shifting involves moving one's attentional focus (Singer, 1978) from one set of an object's properties to another, less commonly considered, set. This requires *dis*attending (Cromwell &

Dokecki, 1968) from more primary associates and allows productive use of aspects of "concrete" and "literal" thinking (Goldstein, 1944; Hertler et al., 1978). Strikingly, this concreteness can lead to new and possibly abstract concepts, results similar to those of the brainstorming technique of attempting to see a problem with a "fresh eye." Such products can have a poetic or strikingly hyperrealistic quality, suggesting how deficit symptomatology can have helpful and healthy aspects. In fact, one of the remarkable mysteries of the creative process is that concreteness and what Rapaport (1946) called a pathological loss of distance from the object (see Schuldberg & Boster, 1985) can lead toward integration and sometimes a startling synthesis. The shift from literalness to abstraction or to vivid artistry lies at the heart of the inductive process.

Cognition and affect are inextricably interrelated, and both can become more differentiated and integrated during generativity and consolidation (Cowan, 1978). The melding of concepts and the interplay of elated and depressed affect (see Shaw, 1989) provide additional connections between the clinical phenomenologies of cognitive, affective, and interpersonal symptoms in schizophrenia, bipolar affective disorder, and the personalized and self-referential aspects of paranoid states. The superimposition and then the dialectical interplay of contradictory thoughts or ambivalent feelings and the intertwining of cognitions and emotions play a central role in creative transformations. Richards (1991, this volume) discusses how the experience and reconciliation of contradictory moods is involved in the creative process. Descriptions of temporally related cognitions and affects and their juxtapositions naturally lead to questions regarding the primacy of cognition or affect, and in this chapter I argue for comparable and complementary roles for both.

Thus far, this chapter has concentrated on the affect of giddiness as a concomitant and integral component of inductive cognitive processes. How, then, does horror enter the picture?

DISTURBING ASPECTS OF CREATIVE PROCESSES

Horror is a second powerful, primal emotion involved in the cognitive and existential situation of creating. "Horror" comprises a variety of negative emotions, including "fear," "anxiety," "angst," "shame," "embarrassment," and "dread." It encompasses a number of clinical aspects of depression, both cognitive and affective, including both introjective (self-critical) and anaclitic (loss-related) elements of depressive experience (Blatt et al., 1982). For the sake of presentation, this section begins by discussing several routes that can lead to horror. For the moment, horror is best explained with reference to different trajectories that lead to it. Thus, it may initially seem that giddiness necessarily *precedes* horror, a reaction to the "giddy" period of induction. However, horror may be the primary emotion and represent a preceding phase in creativity. More

important than temporal sequence is another core issue: Giddiness and horror can be transmuted into each other, and can occur simultaneously in mixed affective states.

Recoil. First of all, horror can arise in recoiling from giddiness, also sometimes experienced by a creator of an outrageous work of art who "recoils in shock." Aspects of giddiness have inherently disturbing elements or may become disturbing after continued experience and an eventual sense of excess.

Loss of boundaries. Many of the creative activities, described above, along with comparable or equivalent psychotic phenomena, involve experiences of fluidity in conceptual and perceptual boundaries that allow previously distinct percepts or concepts to overlap, become similar, merge, and intermingle. This has potentially nightmarish components of feared loss of personal boundaries, of the physical or psychological self, of the experiential outlines of external objects, and of boundaries between roles within the family or within society (as seen in the incest taboo).

Loss of guideposts. When old rules no longer apply, one may not know how to leave the new territory once it has been entered. This implies a fear of becoming lost and is related to "the horror" in Conrad's *Heart of Darkness.*

Fear of Madness. Because the antirules that may be employed in induction have a psychotic flavor, it can become difficult to remain assured that the creative process is not leading deeper into some form of madness. When madness is sensed as a possibility, there is a question whether there are *any* rules. The creative individual may wonder where or whether the inductive process will end, and whether the experience will be overwhelming. He or she may experience the flow (or flight) of creative ideas as independent, ego-dystonic, external, and feel "driven crazy."

Fear of set breaking. The phenomena of horror provide further insight into the relationship between cognition and affect in creativity. While set-breaking and recombination have thus far been discussed primarily in terms of generative rules and cognitive processes, these methods for creating new elements and novel combinations, especially when they involve breaking old sets, also have affective, interpersonal, and social implications. Use of antirules can imply a repudiation of societal norms; indeed, the antisocial aspects of creative activities and individuals have been noted elsewhere (e.g., MacKinnon, 1965). Set breaking can create an alienating sense of interpersonal distance, aloneness, and a sense of strangeness that is sought in some creativity enhancement techniques. The implications of this strangeness for object relationships will be discussed below.

Fear of a failed or poor-quality product. Another aspect of horror arises from perceptions of the imperfection or possible imperfection of the product. The creative individual may also be afraid that the muse will disappear, and that he or she will falter in inspiration. It is here that one sees introjective depression's threats to the creative process, and the themes that may lead artists to destroy

their own work. Fears of loss of inspiration are also related to fears of loss of the imagined product; seeing any actual finished work provides the opportunity for a variety of regrets over its flaws.

Perception of the infinite. Horror can also be experienced in a direct and primary way as a perceptual or phenomenological given. This occurs in unmediated and often startlingly valuable apprehensions of infinite and cosmic themes, as well as related realizations of human finitude and death. Although this is one way that the experience of horror provides material and themes for creative work, it can also come to block the creative process and contribute to existential neurosis or clinical depression. If used successfully, horror can provide a tragic apprehension of human and universal themes and raw material for a communicated creative product. An example of this fear, as well as several other aspects of horror (notably fears of being overwhelmed, of set breaking, and loss of guideposts), was provided by Aldous Huxley, speaking of his experiences with mescaline:

> Confronted by a chair which looked like the Last Judgment—or, to be more accurate, by a Last Judgment which, after a long time and with considerable difficulty, I recognized as a chair—I found myself all at once on the brink of panic. This, I suddenly felt, was going too far.... The fear... was of being overwhelmed, of disintegrating under a pressure of reality greater than a mind... could possibly bear. (Huxley, 1954–1956, p. 55)

Thus, fear and horror may represent appropriate and even realistic reactions to a hopefully transitory apprehension of cosmic, existential, or tragic themes. Seeking and learning from experiences of horror is related to the death instinct's function as a motivation for human activities. In addition, horror has its own restitutive component, and recoiling can set in motion processes of mourning, restitution, working through, and counteraction (S.J. Blatt, personal communication, September 1988) that propel the creative process forward.

Horror at aggression in creativity. The antisocial aspects of induction also raise the questions of whether "anything gets broken" or "anyone gets hurt" when a rule is broken. This notion is present in the iconoclasm implied by new thoughts and experiences. Thus, the breaking of a rule, the use of an antirule, the process of critique, or the statement of something new and original all implicate aggressiveness, interpersonal conflict, and hostility. Both the content and the formal characteristics of primary process thought, including morbid and violent elements, and horror over where it will end or possible psychotic escalation and loss of control over violent phantasies, can arise during the destruction or rejection of old ideas. In addition, when new ideas are coined or assembled, they may initially appear ugly, bizarre, or disquieting. The person may experience such moments of creative freedom as self-aggrandizing, licentious, unpleasant, or aggressive. References to appropriate assertiveness and other such partially sanitized terms do not capture these actual experiences of

destructiveness. Nevertheless, when brainstorming or creative work groups attempt to encourage and liberate productive expression and activity, the distinctions between *aggressiveness* and *assertiveness,* as well as among various types of *power,* may be very helpful to the participants.

Despite such delineations of new ways to behave appropriately, creative set breaking sometimes does include a desire to destroy. Related urges toward *self*-destruction and suicide represent some of the most disturbing aspects of the connection between creativity and psychopathology in creative and eminent individuals (Rothenberg, 1990).

Horror of aloneness: Pre-Oedipal threats to interpersonal relatedness. One affective reaction to giddiness is shame at one's own grandiosity. To give way to play and then to produce and communicate a new idea implies a willingness to believe in the idea's quality, a commitment to one's own value, and a readiness to flaunt the fact that one has produced something of worth. This implies the generally healthy grandiosity described by Kohut (1984).

However, the childlike belief in the powers of the self and accompanying feelings of giddiness can lead quickly to a variety of horrific fantasies. Strongly stating one's own individuality and the value of one's original products represents a challenge to one's possible oneness and merger with others, raising the specter of impending separation and loneliness. This is a specifically *pre*-Oedipal aspect of horror; the recoiling from grandiose self-expression and the fear of separation are related to loss of the object, not to possible retribution for surpassing the other as described below. One may fear that, because of some excess, one will be regarded by the other with a look that is not only not mirroring, but also implies that one is an alien.

Losing others is also involved in primal terrors of becoming lost in an unknown land or away from one's home culture. This is included in the earlier descriptions of fear of madness and the loss of guideposts, but here horror involves a complete loss of connection to others and of social or cultural embededness, resulting in being cut off from others and left alone, shamed, totally isolated, and individual. This occurs when the world is seen in a new way, however briefly, when the rules of a cognitive or perceptual frame, including those of an existing artistic style or genre, are broken. This can also imply a breaking of the societal and personal mores for behaving with others.

In normal times such rules promise a comforting framework for remaining relationally connected to others. During moments of giddiness and horror, however, the perceiver may wonder, "Am I alone?" Thus, there are times during the creative process when maintaining interpersonal connectedness is especially important. Such needs are sometimes subsumed under discussions of the role of a real and supportive muse, personal caretaker, or patron in the life of the creative individual. Concerns about the hostility involved in the creative process may also be neutralized or ameliorated in the accepting, nurturing, or receptive atmosphere that can foster the initial phases of brainstorming. To be effective,

creativity-enhancing techniques require an encouraging and accepting social environment: Criticism is ruled out. Unfortunately, many didactic and other processes in both academia and business, although intended to be productive, foster an environment of hostility toward collaborators that may ultimately hinder creativity. Competition must be managed very carefully in these settings.

Oedipal aspects of Horror. As noted above, pre-Oedipal shame and alienation can result if attempts at individual and grandiose self-expression are not mirrored by the other. In a developmentally more advanced facet of horror and creativity, a statement of new ideas can lead to fears of rebuke and a painful sensitivity to criticism, as well as to excessive self-criticism. Such Oedipal feelings attached to experiences of real or imagined harsh criticism are found in Adler's inferiority complex resulting from people's experiences as small children in a world of bigger adults. It is also classically and more literally present in the young male child's possible imagined ridicule as an ineffectual mate for his mother. Oedipal aspects of horror involve concerns over the consequences of unashamed display, fears that one will be caught out with pretensions exposed, even before one has an inkling of possibly appearing ridiculous. As noted above, such concerns over going too far are also connected to more basic fears of rejection, abandonment, loss of others, and of being cut off or ostracized from one's group and society.

The process could go either way, to "Heaven or Hell". In the midst of intense cognitive and affective experiences, a seemingly minor shift in interpretation can produce a rapid transition from giddiness to horror. By itself, realization of this possibility and of the potential unity of the affects can lead to feelings of horror. Intense and rich psychological material can be experienced in multiple ways, with the phenomena of giddiness and horror very close together. Realizing that the productivity of genius can be indistinguishable from madness, that there is an essential unity of disparate affects, that pioneering and innovation can result in loneliness and the destruction of the familiar, or that inductive cognition and affect can go either way, may all represent core dialectical experiences of the creative process.

COGNITION AND AFFECT IN HORROR

It was noted earlier that giddiness can result from creative activities, including the packaged procedures of brainstorming. Horror is not addressed as directly in these interventions, but the relevance and importance of this second emotion are nonetheless clear. Attempts at minimizing horror are included in the nonjudgmental, accepting, and supportive atmosphere to be established for optimal encouragement and even the accurate assessment of a person's creativity. The possibility of horror is also addressed indirectly by group methods themselves; these muster social support for the stimulation and encouragement of new ideas, and the participants in a creative problem-solving group can lean on each other,

avoiding aloneness and some of the anaclitic aspects of depression as they simultaneously push against the limits of the conventional wisdom. People can use each other's presence to remain earthbound in a positive sense, connected to the interpersonal social world and avoiding disconnection. Although the experience of being grounded can lend a secure base to the inductive process, it can also limit the generation of new ideas. For example, creative production can be stifled through group norms mandating only moderate creativity (a conceptual slow-down); norms may also be directed at maintaining politeness, encouraging a modicum of both social and cognitive conventionality, and allowing only limited questioning of the frame, structure, or corporate culture of the work group itself.

GIDDINESS AND HORROR IN EMOTIONAL ADMIXTURES

It is difficult to elaborate on the positive aspects of horror, and it is certainly easier to seek and recommend giddiness. However, a balanced treatment of negative affects—even extreme negative affects—is important for further theoretical considerations of the inductive process. Giddiness and horror can be experienced in rapid alternation and can go hand in hand, as, for example, in the infectiously rising laughter of the toddler that turns unaccountably and smoothly to panicked crying.

These emotions may well represent the affective components of a dialectical process of expanding and differentiating cognitive and affective creative experience. More specifically, the *simultaneous* experience of giddiness and horror appears to correspond to a synthetic and transitional moment in the inductive process, a moment of flux that may be exalted, painful, or include both emotions. Such emotional admixtures appear to represent an important affective stimulus, component, and consequence in the creative process. Richards (1991, this volume) also noted the importance of this experience of different emotions, perhaps exemplified in the co-occurrence of features of depression and mania in bipolar disorders. Thus it may be the *bipolar* nature, rather than the specific *affective contents,* of bipolar affective disorder that are most relevant to the dynamics of creativity.

Personal access to simultaneous, contradictory emotions can provide an important and even necessary component of creative work. The experience of emotional admixtures or contrasts may provide impetus for a dialectical transition or transformation and an apprehension of the unity of opposites, providing the opportunity for an inductive leap. Intense emotional combinations, alternations, cyclings, and ambivalences, as well as intense cognitive and affective oscillation and behavioral vacillation, may also occur in the early phases of a new love relationship. In falling in love, the shifting between exaltation or sense of promise on the one hand and fear and dread on the other surely represent a nearly universally understood creative moment in human experience.

This chapter has emphasized experiences that are most likely to occur during attempts to summon the muse and begin creative problem solving, times when emotional admixtures and cognitive complexity may be sought deliberately, as opposed to when they are spontaneous and come unbidden. Once begun, the interaction and simultaneous experience of giddiness and horror can *drive* the ongoing work of induction, and it is possible that each emotion actually summons its opposite, resulting in a series of creative transformations (Rothenberg, 1979, 1988) or the dissolving of a previously insoluble personal, technical, or aesthetic problem.

Such a "vanishing of the problem" (Wittgenstein, 1961) highlights a connection between creative induction in art and in psychotherapy. Aspects of set breaking are inherent in most forms of psychotherapy, whether they are described as: the reorganization of mental structures and dispositions of mental energy; transformation of internalized object representations and external relationships; restructuring of cognitive and interpersonal schemata; disproving of pathogenic or irrational cognitions; changing of self-statements, attributions, and evaluative sets; or modification of response repertoires and environmental contingencies and the role of signals controlling behavior. Each of these formulations of the process of psychotherapeutic change contains elements of perceiving, thinking about, feeling toward, or behaving in relation to the world in new ways. Therapeutic set breaking is described in more abstract and theoretical terms by Haley (1963) and Watzlawick, Beavin, and Jackson (1967). Experiential paradoxes in the therapeutic situation (Haley, 1963) may in turn include and produce affective and cognitive paradoxes.

This leads to the question, alluded to throughout this chapter, of the extent to which both psychotherapy and creative thinking represent *dialectical* processes of attaining knowledge. Rothenberg (1979, 1988) saw the Janusian process at work in both, and acknowledged the possible role of other and dialectical processes in therapeutic change. However, he suggested that the Janusian process is essentially *not* dialectical (Rothenberg, 1979, pp. 255–259), viewing the creative collapsing and superimposition of different views as nonsequential and not necessarily resulting in synthesis or resolution. In contrast, this chapter has argued that the cognitive and affective superimpositions that form the basis and preconditions for some inductive processes are essentially dialectical in nature because of their synthetic and transformative aspects.

CONCLUSIONS

In this chapter I argued for the central role of affective ambivalences in the creative process. Two intense primary affects, giddiness and horror, were described as experienced sequentially or simultaneously in a dialectical interplay over the course of a creative encounter. A question that remains is whether these affects are merely emotional concomitants of the process of creative

alchemy, or whether these affects and their union are inherently inductive. The experience of contradictory, primal, and existentially rooted affect appears to represent one facet of a kind of philosopher's stone that can aid in the dissolution of everyday views of the human condition and turn ordinary experience into something extraordinary. These affective and cognitive processes allow momentary development of the fresh eye of the child and the assertion of one's novel perceptions and combinations with confidence and commitment.

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5

Creativity and its Discontents*

Mark A. Runco

Friedrich Nietzsche claimed, "That which does not kill me makes me stronger," and the creativity literature suggests that there may be something to this claim. Under certain circumstances, disturbance and tension can facilitate creative effort. This chapter reviews the research on tension and related concepts, including asynchrony, marginality, resilience, and problem gaps, and suggests that the various kinds of tension can best be explained in terms of cognitive disequilibrium. It also suggests that a matrix is necessary to understand the various causes and effects of tension. Tension may be intrapersonal (e.g., between a particular situation and an individual's understanding of it, or between two modes of thought) or interpersonal (e.g., between one individual and others in his or her field, or between parents or teachers and their child or student). The effects include the sensitivity to problems and gaps that initiates efforts and the motivation to sustain creative efforts. The most controversial aspects of this theory are that some kind of tension must precede the intrinsic motivation that characterizes creative effort, and that evaluation and appraisal are necessary for this tension. Individual differences in reactions to tension are explained in terms of developmental histories and in terms of subjective interpretations of the situation which leads to tension.

For some time now, I have had the feeling that something very important is being overlooked in creativity research. I am referring to an adequate appreciation of

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the interplay between the cognitive and affective components of creativity. This oversight may reflect the interest in being scientific about the creative process, given that emphasis is typically placed on those facets that can be objectively investigated. The components that are more subjective are often deemphasized.

One of the resulting problems is a failure to understand innovation and discovery in science. Too rarely are the preferences and affective proclivities of the scientist recognized. The scientific method relies on replication in part to minimize the potential impact of personal preferences; but even with empirical work, theories can be biased by an individual's feelings.[1] This may explain why Cyril Burt published results from bogus data.[2]

Gould (1991) seemed to recognize this problem when he wrote:

> we must remember—and an intellectual's most persistent and nagging responsibility lies in making this simple point over and over again, however noxious and bothersome we render ourselves thereby—that truth and desire, fact and comfort, have no necessary, or even preferred, correlation (so rejoice when they do coincide). (p. 57)

This is from Gould's essay on the desire of some people for "creation myths" and explanations about human origins. Gould set the record straight about several particularly irksome phylogenic creation myths—and there probably are ontogenic creation myths which need a similar purge—but my reason for quoting Gould is because of his view of the only infrequent correlation of "fact and comfort." Comfort, of course, represents an affective aspect of the scientific process.

Admittedly, there can be great benefit when an individual follows such feeling or affective intuition. Consider Skinner's (1956) proposal, in his "Case Study in the Scientific Method," for scientists to "drop everything" if they find something new which interests them.[3] Consider also Bronowski's (1958/1977) notion that

> the man who proposes a theory makes a choice—an imaginative choice which outstrips the facts. The creative activity of sciences lies here, in the process of induction... To the man who makes a theory, it may seem as inevitable as the ending of *Othello* must have seemed to Shakespeare. But the theory is inevitable only to him; it is his choice, as a mind and as a person, among the alternatives which are open to everyone. (1977, pp. 10–11)

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[1] The Matthew effect (Simonton, 1988) may also be explained in that readers become comfortable with an author and stop evaluating the quality of the author's work.

[2] Burt's unethical science can also be explained in terms of his heavy investments in the nativistic literature (cf. Rubenson & Runco, 1992).

[3] Runco (1993) explored this Skinnerian suggestion, and the apparent contradiction between it and operant theory. Gruber (1978, p. 140) discussed the advantages and problems of "deviations" and "the danger that the individual may too easily go off on a tangent."

Bronowski's view interests me in part because his recognition of the individual's choice of material is consistent with my view of *intrapersonal evaluations* (Runco & Chand, 1994; Runco & Smith, 1992). These evaluations will be discussed below, but for now I merely wish to note Bronowski's recognition of the emotional bases—the inevitable choices—of science. Clearly, emotions play a role in many scientific endeavors. In fact, all creative acts may be dependent on affective tendencies and reactions. Affect and comfort can mislead scientists—and presumably other creators—but they can also guide and motivate them to persist in their efforts.

The benefits of affect and the interplay between the affective and cognitive facets of creativity can both be understood by examining the research specifically on *tension*. As I see it, this concept is a critical one for the understanding of the motivation for creativity. This chapter reviews that argument, drawing from the theories of creativity which describe tension as motivation. Tension must be an important concept, given that it is found in so many theories, including those which offer explanations of marginality, asynchrony, resilience, disequilibrium, problem gaps, and so on. Later I attempt to integrate the various views of tension. I also present the controversial argument that there is a cognitive precursor to the affective involvement in a creative endeavor. Put differently, I believe that intrinsic motivation follows from cognitive involvement in a task, rather than the other way around (cf. Schuldberg, 1994; Zajonc, 1980). Although both affect and cognition are involved in creative acts, I argue that the latter in fact causes the former. Before the details of that position are given, developmental and cognitive theories of tension in creativity are reviewed.

DEVELOPMENTAL VIEWS

Developmental examples of tension are especially interesting because they help explain how certain individuals learn to interpret seemingly unpleasant tensions as challenging and motivating. And ironically, there is a bit of theoretical tension reflected in descriptions of the circumstances which may be necessary for the development of creative potential. Put most simply, the development of creative potential may require certain coincidences (Albert & Runco, 1987; Feldman, 1986) *and* certain asynchronies (Gardner & Wolf, 1988).

One type of coincidence is between the individual and a domain. It is, for example, virtually impossible that creative talent in the domain of photography would be able to develop without the technologies necessary for its performance. Hence the potential photographer's interests and skills must be synchronized with the technology, as well as with a cultural appreciation for this kind of art. As Albert and Runco (1987) described this, what is needed is "a high degree of 'goodness of fit' between persons and career requisites" (p. 73).

Albert and Runco (1987) also suggested that a lack of fit during development can lead to tension. They cited a great deal of work showing how the early parent–child relationships of eminent physical and biological scientists tend to be "aloof," "not very intense," or at least "not close" (p. 77). This may be important for creativity because it can allow a child to develop autonomy, a trait which is crucial for independent and creative thought (Albert & Runco, 1989). Yet surely there is an optimal level of autonomy in parent–child relationships. Too much and the child may lack the feelings of security that allow him or her to explore and learn; too little and there are no opportunities to develop self-confidence. Some distance may also facilitate ego development. This is how Albert (1971) explained the surprisingly high rates of parental loss in the exceptionally gifted population. Albert also looked to identification, or lack thereof, and modeling, with children benefitting from the diversity of models in the extended family (after the parental loss).

Albert (1991) used the term *incongruence* to describe conflict between parents which may influence their child's development. He concluded that "often gifted children develop and succeed in spite of their parents" (p. 87). He also used the term *wobble* to describe families:

> The creative person-to-be comes from a family that is anything but harmonious—one which has built into its relationships, its organization of roles, and its levels of communication a good deal of tension if not disturbance, what I term a "wobble." But along with these characteristics, there is a commitment to achievement as opposed to just "having fun," a special focus of interest and aspirations upon the indexed child, and a great deal of family effort to see that these aspirations are met. (Albert, 1978, pp. 203–204)

Others have reported "steeling" or toughening effects of difficult experiences. Valliant (1977), for example, concluded that "the human ego grows in adversity as well as in prosperity" (p. 336), and Rutter (1985) described how "unpleasant and potentially hazardous events may toughen an individual" (p. 600). Ochse (1990) wrote that "creators typically suffered some deprivation and distress in childhood" (p. 81), and VanTassal-Baska (1989) added that "adversity appears to teach certain lessons about perseverance and achievement" (from Subotnik, Kassan, Summers, & Wasser, 1993, p. 107).

Self-reports suggest that competition within families (e.g., between siblings) or pressure to stand out at school contribute to perceived tension, at least for gifted students (Subotnik et al., 1993, pp. 111, 113). The effects of birth order and family size should be carefully considered, given the extensive literature on family background and creativity (Albert, 1980; Gaynor & Runco, 1992) and the common assumption about sibling rivalry (Cassidy, 1992). Gaynor and Runco (1992) looked specifically to parental expectations, the prediction being that expectations—which are influenced by birth order and age intervals

between siblings—may underlie certain intrafamilial tensions. Academic pressures may be as critical. Roe (1963) described conflicts arising from "a difference between the value structure of the home and the value structures which underlie much of our education" (p. 132), for example, and the conflict between a child's "wild" or "silly" ideas and the expectations of the teacher (p. 134).

Some of the best evidence of the value of tension was given by Goertzel and Goertzel (1962). They examined the biographical and autobiographical works of 400 eminent individuals, and they found that the majority had "in their childhood experienced trauma, deprivations, frustrations and conflicts of the kind commonly thought to predispose one to mental illness or delinquency" (p. xii). Goertzel and Goertzel (1962, chap. 6) reported that, of the 400 eminent individuals, "only fifty-eight can be said to have experienced what is the stereotyped picture of the supportive, warm, relatively untroubled home.... The comfortable and contented do not ordinarily become creative" (p. 131). The Goertzels even reported how certain groups differed. All actors in their sample, for instance, were raised in "troubled homes," as were most novelists (89%), composers and musicians (86%), explorers and athletes (67%), and psychologists, philosophers and religious leaders (61%). Only 20% of the inventors experienced familial conflict. Some individuals seemed to work to compensate for physical handicaps; others experienced situations wherein "responsibility hastened the maturity of the child or enriched his life by making new experiences possible for him" (p. 214). There was also anxiety about parents, alcoholism in families, school difficulties, and so on. (Of the 400, one of the most interesting was Charles Lindberg, who apparently was "subject to terrific nightmares about falling off a roof or precipice" [p. 222].)

In much the same vein, MacKinnon (1960/1983, p. 369) reported that "persons of the most extraordinary effectiveness had life histories marked by severe frustrations, deprivations, and traumatic experiences." He further described how in "samples of highly creative subjects... some endured the most brutal treatment at the hands of sadistic fathers" (p. 375). MacKinnon (1962) listed a variety of sources of tension, including "ambiguities in identification with parents," "some estrangement of the family from its immediate neighborhood," and "cultural dislocation." (The last of these is given more attention later.) MacKinnon's explanation for the benefit of tension was that "the creative individual has the capacity to tolerate the tension created in him by the strong opposing values, and in his life and work he effects some reconciliation of them" (p. 377). Incidentally, MacKinnon brought up the interesting possibility of a sampling bias in the creativity research, noting that many "ineffective" or atypical persons "have been motivated by their distress to reveal themselves" (p. 367).

Csikszentmihalyi (1988) took a different view of the impact of early experience on creativity. He suggested that

> the impressions artists work with come from many sources. One that is very prevalent among contemporary painters contains memories of childhood. Whether the viewer realizes it or not, and often also unbeknown to the artist, the images that form the core of a great number of modern works represent the rage or the ecstasy of childhood which the artist tries to recapture in order to integrate it into current experience.... Such works occasionally achieve a magical synthesis of past and present, an abolition of objective time, a healing through the reactivation of former pain which can now be tolerated by the mature person. We might call such an achievement "abreactive originality," borrowing a term from psychoanalysis to describe the successful release of psychic tension through the symbolic reordering of repressed traumatic experiences. (p. 219)

Csikszentmihalyi (1988) defined *cathartic originality* as occurring when artwork reflects current discomforts. Most important in Csikszentmihalyi's theory may be the idea that childhood tensions are repressed, and have an effect only when the individual matures and can better cope.

The notion of cathartic originality was recently supported by Lindauer's (1992) findings of stylistic changes of aging artists. Lindauer discussed how artwork might compensate for physical, sensory, and emotional handicaps, and other problems which arise as one ages. He also noted how artists may change their style as a "result of personal conflicts in late life" (p. 219), and he pointed out that

> in literature... authors are said to change when they are about to accommodate to life's new demands.... Wordsworth, for example, was unable to shift from the spontaneousness of his youth... to philosophical and contemplative reactions more appropriate to later life.... Shakespeare, on the other hand, met aging's new requirements by shifting from works of history and comedy to tragedy. (p. 219)

This suggests an adaptation, which is a fairly common way of describing creative problem solving (Cohen, 1989; Gardner & Moran, 1990; Richards, 1990, Valliant & Valliant, 1990).

Csikszentmihalyi's (1988) theory is also largely consistent with the report of Albert and Elliot (1973) on the association between creative potential and adolescents' "handling of conflict." Albert and Elliot suggested that

> preadolescent creative children are less likely to use repressive defense in recognizing a personal conflict, and, along with this, appear to have greater cognitive facility with and access to cognitive resources at different levels of consciousness than less creative people. (p. 177)

Dudek and Verreault (1989), Kubie (1958), Rothenberg (1990), and Russ (1988) each described how the creative process can benefit from access to preconscious material. Moreover, research on primary process suggests that the ability to

tolerate discomfort (including the negative affect of primary process) is related to creativity (MacKinnon, 1960/1983; Rothenberg, 1990; Russ, in press).

Other sequelae of tension include confidence and a "trust in disorder" (Barron, 1963). Barron noted that:

> the creative artist and scientist appear, when one reads biographical accounts, to have experienced an unusual amount of grief and ordeal in life and to have shouldered burdens of pain that most commonly disable the individual... the creative individual is one who has learned to prefer irregularities and apparent disorder and to trust himself to make a new order. (p. 157)

Barron also noted "the motive is thus generated for searching out other situations which would seem to defy rational construction, with some degree of confidence that after much deprivation, tension, and pain a superior form of pleasure will be attained" (p. 157). Of considerable significance in this quotation is the recognition of the active role played by the individual. The "searching out" Barron described is entirely compatible with the theory that creative individuals actively pursue appropriate intellectual investments (Rubenson & Runco, 1992).

Barron (1963) also tied the deprivation to tension and affect (i.e., preference and pleasure). As a matter of fact, it seems to me that the distinction between *privation* and *deprivation* is useful for the present discussion. In Rutter's (1982) view, *privation* describes situations in which a child is unable to form an attachment to a particular or primary caregiver. *Deprivation* describes situations where a child forms a bond with a primary caregiver, but the caregiver is lost at some point early in the child's development. This is a relevant distinction because of the effects: Simplifying some, privation is predictive of a cognitive deficiency (e.g., mental retardation), but deprivation is predictive of an affective problem (e.g., insecurity). Most of the conflicts covered in this chapter—and especially parental loss, noted above—characterize situations of deprivation, so it makes sense that the effects are affective (i.e., intrinsically motivated behavior, in the case of a creative individual). It would be difficult for an individual who has experienced privation to perform creatively, given the cognitive requirements.

DISEQUILIBRIUM

The well-known theory of Piaget (1976) is especially applicable to the topic of developmental tension. Indeed, it was Piaget's theory that suggested to me that certain cognitive operations must precede (and can therefore explain) intrinsic motivation. In the Piagetian view, individuals experience disequilibrium when they encounter something they do not understand. The tension in disequilibration is between what an individual knows (and holds in cognitive structures) and what the individual experiences. Assimilation is possible, whereby new informa-

tion is forced into existing structures, but at some point the structures must accommodate that information, via differentiation and integration. Why assimilate and accommodate? Why put forth the effort? To maintain equilibrium and an understanding of one's experiences. It is in this sense that cognition precedes intrinsic motivation.

Clearly, equilibrium is not the sole objective of creative activity. As Barron (1964) pointed out, it may be that novelty is what individuals seek, rather than homeostatis. Equilibration may also reflect simple exploration, some sort of *deviation amplification* (Gruber, 1988), or even a *contrarian* effort (Rubenson, 1991). Creative individuals may have particular and idiosyncratic goals, incentives, and strategies,[4] or they may have largely conventional goals for their work but use different standards when judging success. If Barron (1964) is correct about novelty, creative individuals may attempt to do something which is unique within their profession, while a less creative individual may simply aim for uniqueness relative to his or her place of employment or own past performances.

Importantly, Piagetian theory is not always directed to disequilibria between cognitive structures and new information (that is, the environment), nor is it limited to change during childhood. Instead, disequilibria result from a variety of situations, some of which are not at all tied to information supplied by the environment. Piaget (1981) referred to a tension between knowledge and possibility in his description of self-regulation and *reflective abstraction* (at least he did so in the Foreword to Gruber's [1981] *Darwin on man),* and here he was describing how epistemologies can develop during adulthood. Still, his focus was on creation is a very literal sense—that is, as the production of something new. The creativity I have been discussing involves more than just novelty or newness; it also requires some elegance, "effective surprise" (Bruner, 1973), or some sort of "holy cow" (Gruber, 1988).

The utility of the concept of equilibration has been recognized by many theorists (Hunt & Paraskevopoulos, 1980; Runco & Gaynor, 1993; Stein, 1988). Stein, for example, suggested that, "at the start of the creative process the individual experiences a state of disequilibrium. His psychological condition is marked by disturbed homeostasis—tension arising from a lack of emotional satisfaction with the existing state of affairs" (p. 53). Stein tied disequilibrium to the sensitivity of certain individuals. Hunt and Paraskevopoulos (1980) suggested that

> development approaches its maximal rate when the infant, toddler, or young child regularly encounters situations which offer information that is sufficiently discre-

[4] Idiosyncratic goals are mentioned in many biographies (e.g., Cassidy, 1992), but a noteworthy example was uncovered by Spurgeon (1991) in his study of productive writers. John Creasey, author of 560 books, told Spurgeon that his work was a kind of revenge, having been told as a boy that he could write, but then having "everyone in the family ridiculing the idea" (p. 1). The 10 individuals in Spurgeon's informal study published more than 3,300 titles.

> pant from that he has already mastered to be of interest, and perhaps even surprising... problems which offer sufficient interest yet remain within his coping capacity. (p. 286)

They referred to "the problem of the match," implying that careful planning by parents, teachers, and other caretakers is required for appropriate "levels of discrepancy." The possibility of optimizing matches specifically for creativity was described by Runco and Gaynor (1993).

OTHER TENSIONS

Although the disposition for originality is undoubtedly overdetermined and not simply the result of any one experience, the message of the review above is that some kind of development tension may be a necessary precondition for later tolerance. Other kinds of tension may also contribute, such as cultural or professional marginality (Gardner & Wolf, 1988; Lasswell, 1959; Simonton, 1988) or tension with the field in which the individual works.

With regard to culture, Lasswell (1959, p. 213) pointed out that

> A well known occasion of innovation is when peoples of diverse cultures intermingle, as when the Roman Empire expanded its domain. Biologists speak of "hybrid vigor"; and presumably some innovations that occur must be attributed to whatever increase of basic capability results therefrom. More directly obvious is the effect of intermingling upon maps of knowledge.

Campbell (1960) added that

> persons who have been uprooted from traditional cultures, or who have been thoroughly exposed to two or more cultures, seem to have the advantage in the range of hypotheses they are apt to consider, and through this means, in the frequency of creative innovation. (p. 391)

Perhaps conflict within the family or culture prepares the individual for conflict with the field (Albert & Elliot, 1973; Cassidy, 1992; Gardner & Wolf, 1988; MacKinnon, 1962/1983). Gardner and Wolf took this view and described how

> both Picasso and Freud felt distinctly marginal for much of their lives. When Picasso was still very young, he left his native Spain. While he became attached to his adopted homeland of France, he always maintained extremely strong (if ambivalent) ties to Spain and was distraught by the rise of fascism there. Picasso saw himself as a Spaniard among Frenchmen, as an uneducated painter among writers and other intellectuals.... As a Jew living in Vienna, Freud always felt vulnerable; and as a maverick physician, he felt estranged from the medical profession.... Presumably, these feelings of marginality served to motivate our two creative heroes to "prove themselves." (p. 106)

Similarly, in his case study of Werner Heisenberg, Cassidy (1992) claimed that

> Heisenberg's extreme youth [age 25] at the time of his most significant work [indeterminacy] indicated an important characteristic that impinged on this and all his early research: his nearly insatiable drive for academic success and for distinction as the best at everything he did. *Not surprisingly, much of this desire can be traced to his family heritage.* (p. 106, emphasis added)

Gardner and Wolf (1988) listed other asynchronies in addition to cultural, including "unusual blends of intelligence" (e.g., Picasso being strongly visual and spatial, but "unexceptional" in all other areas, and Freud strong in personal and verbal intelligences) and being out of place in one's community. Gardner and Wolf were well aware of the dangers of relying on two cases, but noted that various other artists and asynchronies have been reported. They described "the homosexuality of many artists; the clashes of Mozart and of Beethoven with members of their families; Einstein's and Churchill's early difficulties in school; the childhoods of sickness and loneliness that seem almost de riguer for writers in the Romantic era" (p. 113).

Conflicts and differences of opinion between an individual and the field in which he or she is operating are bound to occur; in fact, they are quite common. This may be especially true because judgments given by individuals tend to differ from those given by significant others. Artists frequently disagree with critics, for example, just as scientists describing their research or theory often disagree with peer reviews. Simonton (1988) and Runco and Smith (1992) uncovered empirical evidence of these discrepancies, the latter pointing to attentional differences and "divergent perspectives." We might look again at Heisenberg, and his battles with Schrodinger (Cassidy, 1992), but the point is simply that such differences of opinion may lead to productive tension.

Tension may also be involved in career changes, such as when Piaget brought biological concepts to the field of development. It might also reflect problems with the traditions of a field. Sawyer (1992) discussed tension as a stimulus of improvisation in jazz, and he found "tension between tradition and innovation" (p. 259) and tension between technical skill and innovation. One of the musicians in his sample reported, "sometimes you get technically good with the chords, and you start to feel constrained; if you reach that point, it would be freeing, to free your ears to play a note that normally wouldn't belong there" (p. 260). Tension between tradition and innovation is also implied by Kuhn's (1963) well-known explanation of paradigm shifts and scientific progress.

Tension may reflect a lack of fit between the individual (and his or her preferred thinking styles) and the kind of information that is necessary within a domain. Again quoting Albert and Runco (1987),

> it is not difficult to understand why each mode of knowing and systematizing—art and science—would appeal to different people.... The cognitive, perceptual, and emotional processes, as well as the nature of personal involvement, required in the

> arts and sciences are different and require different dispositions and talents for eminent performance. (pp. 84–85)

Distinctions, more subtle than between art and science, could of course be made. Runco and Chand (1994) and Wallace (1991), for example, described differences within the domain of writing (e.g., between detective fiction and existential fiction, or even nonfiction).

Examples of conflict between modes of thought are easy to find. All of us are sometimes logical and sometimes, well, not so logical. Creativity may require integrated modes of thought (Hoppe & Kyle, 1990; Koestler, 1964; Runco & Chand, 1994; Runco & Vega, 1990). For instance, elsewhere I have suggested that creative ideas, solutions, and insights require some divergent thinking *and* some evaluative and valuative thinking. Kuhn (1963) and Hudson (1970) discussed similar requirements, both using the terms *divergence* and *convergence*. Kuhn (1963) wrote:

> something like "convergent thinking" is just as essential to scientific advance as is divergent. Since those two modes of thought are inevitably in conflict, it will follow that the ability to support a tension that can occasionally become almost unbearable is one of the prime requisites for the very best sort of scientific research. (p. 342)

In a sense, the conflict between convergence and divergence is actually a tension between experience and possibility. This was alluded to by Piaget (1981), as noted above, and in the 1930s by Vygotsky. Vygotsky described what is essentially a benefit of conflict between realistic and imaginative cognitions (see Ayman-Nolley, 1992; Smolucha, 1992). The kind of benefit is very clear in Soth's (1986) study of Van Gogh. Soth argued that Van Gogh was inspired while "looking through the iron bars of his cell in the hospital at St.-Remy." Apparently, Van Gogh had a good view of the Alpilles mountains, and "from that base in observed reality, Van Gogh's imagination took hold. But it was fed by sources in both nature and art" (p. 303). One can imagine the artist using his experience, but modifying the images to fit aesthetic sensibilities (see Kay, 1991). This may occur in a dialectical fashion, with the final artwork some sort of synthesis. For Van Gogh, it would be a thesis given by the Alpilles, the antithesis of his imagination, and a synthesis in *Starry Night.* This dialectical process is clearly suggested by the paintings before *Starry Night* (see Soth, 1986). It was also suggested to Piaget (1981) by the development of Darwin's theory of evolution. Piaget called it a *double dialectic,* describing interactions which are "external (subject x object) and internal (relations among ideas or hypotheses)" (p. vii).

Festinger (1962) described how *cognitive dissonance* can occur when "a person knows various things which are not psychologically consistent with one another" (p. 93). This may be significant because Festinger's ideas about (and evidence for) "dissonance-reducing changes" are entirely consistent with the

theory that individuals are motivated when there is tension between different sources of information. Perhaps the various methods used by Festinger could be used to test hypotheses about tension—between individuals, between theories, between knowledge and possibility, and so on.

Barron (1964) recognized dialectical tension when he wrote that

> individuals who distinguish themselves in artistic, scientific, and entrepreneurial creation exemplify vividly in their persons the incessant dialectic between intragration and diffusion, convergence and divergence, thesis and antithesis.... I have attempted... to understand the specifics of this essential tension.... I have come to the following most general conclusion: in the sequence of related acts which taken together as a process result in the creation of something new, there occur consistently a rhythmic alteration and occasionally a genuine resolution of

Barron (1964) also suggested that "of all the common psychological antinomies, the most basic is that arising from the distinction between self and not-self" (p. 81). Along the same lines, Schuldberg (1994) suggested that

> personal, contradictory emotions... provide an important and even essential component of creative work. The experience of emotional admixtures or contrasts may provide impetus for a dialectical transition or transformation and an apprehension of the unity of opposites, providing the opportunity for an inductive leap.

Unlike the interactions described by Kuhn (1963) and Runco and Chand (1994), Schuldberg's emphasis was on admixtures of emotions which are ostensibly free of cognition per se. This idea of affect being independent of cognition is one of the controversies in psychology (Lazarus, 1991; Zajonc, 1980). In fact, the issue apparently goes well back into the history of psychology as a science (see Reisenzein & Schonpflug, 1992).

Russ (1993, chap. 7) emphasized the *anticipation* some individuals feel when they are challenged by a problem. She described how

> the tension, and perhaps, pleasurable anticipation of the challenge that comes when recognizing a problem, or sensing ambiguity in a situation, helps the creative individual see a problem where others have not. The affective experience serves as a cue. The pleasure that comes when the solution is found... helps the creator know when to stop, or which of the myriad of ideas and configurations is correct.... What is right "feels" right.

This idea of cues is entirely consistent with theories of *gaps* implied by undefined problems (Torrance, 1974; Wertheimer, 1945). Additionally, Russ's description of "what feels right" is compatible with Stein's (1988) theory, mentioned above, that certain individuals are sensitive to creative opportunities and disequilibria. Just as important, Russ's view suggests that individuals may

appreciate tension because they know it will eventually lead to the pleasure of a creative insight. This is another way of explaining the "searching out of tension" that Barron (1963) described, and it supports my position that *the lesson learned from childhood disequilibria may be that tension can lead to insight and pleasure.* The intriguing thing is that, if this is true, intrinsic motivation may not be intrinsic at all (cf. Dickerson, 1989; Runco, 1993).

That tension initiates the creative process is very important because so many others have looked to intrinsic motivation as the prerequisite of creative performance. MacKinnon (1962) and other early students of creativity identified the intrinsic motivation of creative individuals, for example, and Amabile (1990) and Hennessey (1989) reported a variety of experimental comparisons of intrinsic and extrinsic motivations and incentives. Okuda, Runco, and Berger (1991) suggested that "discovered problems" lead to creative solutions more often than "presented problems" in part because they are personally defined and therefore intrinsically motivating. The same argument applies to "real-world problems," for they too tend to elicit unusually creative solutions, and they are presumably more meaningful and personally motivating than the more artificial problems found on many creative thinking tests.

The problem arises when intrinsic motivation is taken as the explanation for creative performance, the assumption being that an individual only uses his or her skills (cognitive and otherwise) when motivated to do so. Although superficially logical, creative performance probably works the other way around. Realistically, *an individual is only motivated if they have the skills to recognize that there is a gap or problem worth their time.* This is the controversial position I mentioned in the introduction to the chapter. Though controversial, it is consistent with the developmental work described above (e.g., Albert & Runco, 1987; Goertzel & Goertzel, 1962; Piaget, 1976, 1981), and with the reports of Khandwalla (1993) and Lazaras (1991a, 1991b). Khandwalla found an association between blocks to ideation and the subsequent problem-solving efforts, and Lazarus defined *appraisals,* which are necessary because "only the recognition that we have something to gain or lose, that is, the outcome of a transaction is relevant to goals and well-being, generates emotion" (Lazarus, 1991a, p. 334). Recognition can only occur *after* an appraisal, and in that sense cognition must precede affect. Put simply, "we don't become emotional about unimportant things" (Lazarus, 1991b, p. 819). Nor are we creative about problems and issues we do not understand. This suggests that both the initial sensitivity and recognition *and* the motivation to persist are tied to tension and developmental disequilibria.

OVERVIEW AND CONCLUDING REMARKS

In the early part of this chapter I claimed that something was missing from the research on creativity, namely an "adequate appreciation of the interplay between the cognitive and affective components of creativity." Here I will

acknowledge that "interplay" may not be the best descriptor. This is because cognition and affect may be inextricable. Their separation may reflect our attempts to describe internal states, and in this sense it is merely a scientific convenience. If cognition and affect are inextricable, or even one and the same, an interplay makes no sense.

The Freudian view is useful on this point, for as I interpret it, the idea is that cognitive processes and affect each have their own logic. Affect is *not* alogical. It is easy to view affective processes as alogical, but it is probably more reasonable to view them as having their own logic. It is somewhat like Elkind's (1979, chap. 13) description of children as *cognitive aliens* because they think differently from adults, only here I am referring to intrapersonal processes and suggesting that one's logical self has difficulty understanding one's affective self. The latter may have a logic of its own, but we typically rely on conventional logic or rationality when trying to examine it.[5] This may be why Lazarus (1991a, 1991b) emphasized *unconscious* appraisals. In his words, "the emotions experienced or displayed seem to make little or no sense, because the intentional premises are hidden" (p. 363). Piaget (1981) described something similar with the term *implicit schemas*. These are "schemas already playing a role in certain acquired structures, but unconsciously" (p. viii).

The irony here is that the lack of understanding between selves may cause psychic tension and disequilibration. Just as intrinsic motivation may result from tension between divergent and convergent processes (Hudson, 1970; Kuhn, 1963; Runco & Chand, 1994), it may also result from tension between one's logical and one's affective selves (Dervin, 1983). As a matter of fact, this is a useful explanation of intrinsic motivation. An individual may *know* (logically) that there is a problem, and further *know* about a potential solution, but at the same time *feel* that something is missing or that more elegant and satisfying solutions are feasible.

A notable portion of the research cited in this chapter was developmental, the argument being that early experience can contribute to an individual's tolerance and use of tension. Developmental theories contribute to our understanding of creativity in that they explain why an individual reacts in a particular manner. Recall here Barron's (1963) view that an individual can learn "to prefer irregularities and apparent disorder and to trust himself to make a new order." Granted, other situations (some not literally developmental) may involve interpersonal tension and may contribute to creativity. For example, Simonton (1987) suggested that the best mentors for creative students are "neither too similar (for that would encourage straightforward imitation) nor dissimilar (for that would offer little in the way of relevant guidelines for creativity)" (p. 146), and Rubenson and Runco (1992) suggested that there is an optimal mix of individuals within working groups which leads to creative productivity. John-

[5] This gives psychologists an uncertainty principle of their own, at least to the extent that attempts to understand affect are logically or objectively guided.

Steiner (1992) described interpersonal tension specifically in creativity research:

> the productive tension between social connectedness and individual immersion in one's task is a recurrent theme in the study of creativity. Its role is highlighted by Vygotskian theory in which the interaction between interpersonal and intrapersonal processes are clearly delineated.... Our current debate concerning creativity requires, I believe, an interdisciplinary orientation in our thought community, a dialogue among individuals who work in a variety of domains. (p. 107)

One more example of interpersonal tension must be mentioned. It comes from the *Wall Street Journal,* where Brown (1991) argued that "sexual tension" within certain businesses can stimulate creative productivity. Perhaps that is best viewed as a "direction for future research."

The various kinds of disequilibria are surely not entirely unrelated. Again, I emphasized the developmental research in part because it may explain why certain individuals go through life being emotionally sensitive, alert to cues and gaps, confident when faced with tension, and capable of tolerating conflicting cognitions or emotions. But there are various contributing factors. Bamberger (1982) recognized this idea of overdetermined behavior when she wrote that

> the tensions and incongruences between formal and figural strategies of [musical] representation and the struggle to redefine the entities and relations associated with them, mirror those that characterize other aspects of this tangled web—that is, personal, interpersonal, and even maturational factors. (p. 71)

Apparently a large matrix would be necessary to describe the various causes and effects of disequilibria. The matrix would have a dimension with interpersonal tension on one pole and intrapersonal tension on the other. A second dimension would reflect modes of thought (logical, emotional, evaluative, divergent, and so on), with subcategories for degrees of consciousness and kinds of information. The effects dimension would include the sensitivity to problems and gaps that initiate efforts and, for the long run, sustain creative efforts (i.e., motivation to solve a problem or complete a project).

A "pros and cons" or benefits and detriments dimension may also be needed for describing the effects. Consider Rutter's (1985) suggestion that

> coping successfully with stress situations can be strengthening: throughout life, it is normal to have to meet challenges and overcome difficulties. The promotion of resilience does not lie in an avoidance of stress, but rather in encountering stress at a time and in such a way that allows self-confidence and social competence to increase through mastery and appropriate responsibility. (p. 608)

Shaw (1994) added that

> creativity... has deep feelings, both positive and negative, associated with it. In order to optimize productivity the emotional needs of the workers will have to be met. This means learning to appreciate and work with feelings and to be aware that *negative feelings are a normal part of the process.*

Pros and cons must be included in the matrix because *tension is not entirely desirable*. More is not necessarily better. On the contrary, there are undoubtedly optimal levels of tension. Some may be helpful, for some individuals, but anxiety might result if the optima are surpassed.

Roe (1963) listed various problems that can be severe enough to inhibit creative work. She described academic conflicts, as well as conflicts during adulthood, such as "the conflict between career and family which is common with any person deeply ego-involved with his profession or vocation" (p. 137). Smith and Carlsson (1983) and Toplyn and Maguire (1991) offered experimental support for the view that there is an optimal level of tension, beyond which anxiety inhibits creativity.

There probably are individual differences in tolerance levels—another possible result of individual developmental histories—but everyone must have some limit. This is an obvious point, but one worth emphasizing. It suggests that we modify Nietzsche's aphorism such that it reads, "that which does not kill me *can* make me stronger." It also suggests that parents and teachers should not maximize tension for creativity, but rather should optimize it. Recall here the view of Hunt and Paraskevopoulos (1980) that there are optimally challenging expectations (also see Rathunde & Csikszentmihalyi, 1991; Runco & Gaynor, 1993). Parents should also keep in mind that an individual's reaction to tension—or any challenge, for that matter—is quite subjective. It is a matter of interpretation. Reactions to tension are not, then, determined solely by the magnitude of tension. They may even be a matter of timing. As Rutter (1985) pointed out, a child's cognitive capacity will determine how tension is appraised.

The tension described in the present chapter may be experienced as unpleasant, even if it has potential benefits. In this sense, creativity is much like stress: They both may result from tension-provoking situations, and both are dependent on one's interpretations (Runco, 1990-1991; Rutter, 1985). Neither resides in the environment, waiting to be found. Situations which may elicit stress can appear to be pleasant, like a promotion in one's career or a holiday, or seemingly negative, like an argument with an intimate friend. Similarly, situations that may elicit creative effort can appear to be strictly problematic rather than challenges or opportunities.

The term *adaptation* is often used when describing the resolution of disequilibration (e.g., Piaget, 1981). Not coincidentally, many theorists have defined creativity specifically in terms of adaptation (Cohen, 1989; Burke,

Christer, & Devlin, 1989; Kris, 1952; Richards, 1990), dialectical processes (Dervin, 1983; Rothenberg, 1990), resilience (Flach, 1990), or coping (Richards, 1990; Russ, 1993; Rutter, 1985; Smith & Van der Meer, 1990). Flach, for example, suggested that "the recurring need for disruption and reintegration forms the basis of the view I have called the *resilience hypothesis*" (p. 162). Much like Barron (1963), Flach argued that individuals

> must be strongly motivated to express talents creatively, considering the obstacles that must often be overcome and the discipline that must be exercised with regularity. Such motivation often represents a way to resolve internal conflicts or a protection against the disorganizing and immobilizing potential of such conflicts. (1990, p. 159)

From a slightly different angle, Rutter (1985) argued that "resilience is characterised by some sort of action with a definite aim in mind and some sort of strategy of how to achieve the chosen objective" (p. 607). He also listed "self-esteem and self-confidence... a belief in one's own self-efficacy and ability to deal with change and adaptation... [and] a repertoire of social problem solving approaches" (p. 607).

Smith and Van der Meer (1990) called creativity "a high-level defense, or if one prefers not to stretch the concept too far, a coping strategy" (p. 25). There are other useful defenses and strategies, such as "emotionally distancing one's self from an unalterably bad situation" (p. 607), but creativity may be the only one which both allows adaptation or successful coping *and* leads directly to original results. This of course does not imply that creativity is exclusively an adaptive function or a coping strategy. As Valliant and Valliant (1990) pointed out, "creativity is most surely a form of play, a means of having fun and not just a means of resolving conflict" (p. 615). Support for the connection between play and creativity is quite extensive (Ayman-Nolley, 1992; Pelligrini, 1992; Smolucha, 1992; Sutton-Smith, 1992).

I have already noted the controversial point about giving cognition precedence over affect. Some theorists give affect the primary position (e.g., Schuldberg, 1994) or even argue that the two are independent (Zajonc, 1980). When any interdependence is acknowledged, the issue becomes one of direction of effect, and it is possible that *tension results from creativity* rather than the other way around. In Rothenberg's (1990) words,

> creative operations derive from healthy functions, [but] they generate mental conflict and tension. In addition to the mental strain induced by these translogical modes of thinking anxiety is generated because these modes also function to unearth unconscious material during the course of the creative process. (p. 187)

(The translogical modes of thought include janusian and homiospatial thinking, as well as creativity.) In line with this view are the *psychotic costs* which may

result from creative ideation (Rubenson & Runco, 1992). There is also a reasonable possibility of bidirectional effects, with tension both a cause and an effect of creativity. Either way, I must concur with Goertzel and Goertzel (1962) about not advocating "mistreatment of children as a way of stimulating creativity" (p. viii).

One last potential controversy should be mentioned. This involves the need for tension and asynchrony *or* coincidences and matches (Albert & Runco, 1987; Feldman, 1986; Hunt & Paraskevopoulos, 1980). I do not want to make too much of this rift, simply because it turns out to be a superficial one. There are some coincidences which may be necessary for creative performance—like an alignment of one's talent with domains that are valued at a given time by a given culture—but these do not preclude asynchronies—like those within a family, culture, field, or mode of thought.

At this point I should reiterate my confession from the first paragraph of this chapter, namely, that I have "the feeling that something was being missed." This deserves to be repeated because it sums up the argument of the chapter.[6] The focus of the present chapter is affect, and the feeling I described is based on information and logic (though imperfect my own may be) concerning what I consider to be an omission or gap in the creativity research. I attempted to review that information and logic in the present chapter. Some readers may take issue with my claims; in fact I hope they do. If they do, we might have a controversy—and tension to stimulate additional research on creativity and affect.

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[6] It is also a self-referencing sentence, which implies that it contains some of tension of its own (Hofstadter, 1982). Most self-referencing sentences answer themselves (e.g., "Is this a rhetorical question, or is this a rhetorical question?"). My sentence merely contains an element (i.e., feeling) of its referent (affect in creativity).

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Part II

Intrinsic Motivation

6

Situational Affect: Proactive and Reactive Creativity

Thomas E. Heinzen

The chapter asserts that attribution biases account for the historical tendency to consider creativity as an exclusively proactive, personality dependent phenomenon and presents historical, empirical, and evolutionary evidence in support of reactive, situationally driven creativity. The evidence includes sociological studies of hunger and starvation, observations from the history of medical innovations, perspectives from the history of public administration, a review of operationalizations of the constructs of frustration and creativity, and a biological account of the evolutionary development of the ear. The article proposes a systematic distinction between proactive and reactive creativity. Although the internal creative process experienced by creator(s) includes both positive and negative affect, affective characteristics of the external situation shape specific features of the creative process and the eventual product. Positive situational affect tends to produce a proactive creative response in individuals, which is characterized by a predictable network of variables such as complex cognitions, intrinsic motivation, and abundant resources. Negative situational affect tends to produce a reactive creative response, which is characterized by a contrasting network of variables such as simple and rigid cognitions, extrinsic motivation, and scarce resources.

Historically, creative invention has taken place under unusual and sometimes appalling circumstances: extreme nationalism (Kroeber, 1944), political turmoil (Simonton, 1975), conflict (Naschold et al., 1985; Merritt, 1985), and even

starvation (Sorokin, 1985). These historical accounts represent some of the most unpleasant, unfortunate, and undesirable circumstances many of us could ever imagine—circumstances laden with negative affect. Empirical research, however, seems to contradict these real-world observations that negative affect may be associated with creativity. Most empirical research indicates that creativity is positively associated with positive affect and negatively associated with variables characterized by negative affect. The network of empirical research which suggests this contradiction with real-world observations includes findings that creativity is positively correlated with positive affect (Isen, Daubman, & Nowicki, 1987), intrinsic motivation (Amabile, 1983), and rich cognitive networks (Isen, Shalker, Clark, & Karp, 1978), and negatively correlated with frustration experienced as negative affect (Heinzen, 1990), authoritarianism (Gough, 1979), and cognitive rigidity (Torrance, 1962).

Of course, it is possible to simultaneously experience intense positive affect about the first three illustrations: pride about national accomplishments in spite of its sometimes merciless and authoritarian structure, revolutionary fervor despite the accompanying insecurity and loss associated with political turmoil, and a visionary idealism that justifies conflict and aggression. But it is much more difficult to imagine how anyone can experience positive affect regarding mass starvation—especially if you are the one who is starving. This discrepancy between observations of real-world creativity and laboratory-based empirical research suggests several alternatives regarding the role of affect in creativity: (a) The laboratory environment is incapable of capturing this real world phenomenon (i.e., affect measured in the laboratory and affect observed in the real-world events represent distinct constructs), (b) empirically based variables have not been operationalized in a way that corresponds to this real-world phenomenon (both affect and creativity suffer from imprecise and conflicting operational definitions), (c) creativity is a more complex construct (i.e., there are kinds of creativity), (d) affect is also a complex construct and can influence creativity in different ways (i.e., there are multiple sources of affect), and (e) both positive and negative affect are related to different aspects of creativity. This chapter asserts that all five explanations account for this discrepancy and that different kinds of situational affect lead to predictable kinds of creativity.

SOURCES OF AFFECT: SITUATIONAL AFFECT

Amabile's (1983) review identified three ways in which creativity has been measured: personality, product, and process. Each approach represents a potential source of affect that may variously influence creativity. Affect in the personality implies a stable, traitlike affect that corresponds to traditional approaches to understanding creativity. By contrast, affect in the product best corresponds to situational affect, the focus of the present article. Situational

affect is partly determined by whether the goal is desirable or undesirable, promoting either positive or negative affect. Affect within the creative process focuses on the internal experience of the creator during moments of invention. The three sources of affect interact to produce various characteristics of the final creative product.

Shaw (1989) described how both positive and negative affect are incorporated into the basic elements of the internal creative process as reported by scientists and engineers. But what about affect coming from the external environment—one aspect of the social psychology of creativity? Obviously, situations don't experience affect—but the do "carry" affect as illustrated by the tendency to approach or avoid either pleasant or unpleasant circumstances. According to Shaw, a creative person may experience both positive and negative affect—concurrently and at different points in the creative process. A second and not incompatible possibility is that the entire creative process is overlaid with various degrees of both positive (intrinsically motivating, attractive, self-initiating) or negative (extrinsically motivating, repellent, crisis driven) situational affect. The internal creative process typically generates both positive and negative affect as the individual creator proceeds through a heuristic approach to problem solving; the external characteristics of the situation represent an alternative source of affect and one that helps shape the internal creative process and the characteristics of the eventual product. Both positive and negative external affect can produce creativity, but one tends to produce a creative product characterized by elaborate, ongoing productivity while the other tends to produce a creative product characterized by minimal, short-term, coping responses.

Folk wisdom asserts that "necessity is the mother of invention"—that the motivating effects of starvation, for example, are sufficient to overcome both physiological distress and negative affect. One proposition of this essay is that necessity alone (characterized by negative affect) is insufficient for creativity—an absolute minimum of interaction with some other appropriate factor is required to "produce" new and effective responses. In the extreme case of starvation, the raw materials for nourishment have to exist in order to generate novel solutions to the problem of hunger! Later, I will note how Wong's (1979) frustration–exploration hypothesis implies that goal blocking can lead to alternative kinds of creativity that have nothing to do with hunger. But when applied to the immediate problem of hunger, a minimal amount of internal positive affect is probably experienced as a problem is solved: Starvation is averted once again. In economic terms, demand in the absence of any kind of supply will not produce anything that meets specific need. On the other hand, supply appears to be a sufficient requirement for creativity, because, as we shall note from evolutionary illustrations, enough supply (redundancy) can create its own demand by creating a new function for itself. The optimal affective conditions for human creativity seem to be when the internal supply of positive affect confronts the external demands of an appealing situation. For example, a

desperate but enjoyable circumstance such as when a capable individual confronts an intrinsically motivating problem should produce relatively high levels of proactive creativity. However, the bias in creativity research has been to attribute the causes of creativity almost exclusively to the "supply" of creativity in the human personality, without acknowledging the "demands" of situations and circumstances. But both supply and demand for creativity exist outside human personality.

A second proposition of this essay is that the varying situational mix of necessity and abundance shapes the creative product—that there are *kinds of creativity,* and that they vary in a systematic way according to the supply and demand characteristics of situations. When the mixture is strongly flavored by necessity, it produces *reactive creativity* and is accompanied by a predictable network of characteristics. On the other hand, when the mixture is dominated by abundant resources, the effect is *proactive creativity,* accompanied by a contrasting but equally predictable network of characteristics. Reactive creativity discovers that tree bark can help keep you alive; proactive creativity invents variations on tortes. Reactive creativity is a function of frustrating, demanding situations; proactive creativity springs from supplies whose abundance leads it to look for new ways to spend itself. Real-world creativity is usually a function of their interaction.

Unfortunately, the human propensity to take credit for good events and to send the blame for bad events elsewhere has biased our thinking about creativity. Creativity has a "good" reputation. Therefore, we humans tend to take credit for it. Before we can understand the relationship between situational affect and creativity, we need to attempt to strip away our attributional biases—to look at creativity as a scientific phenomenon worthy of our understanding rather than as an adjective with which we describe ourselves and our organizations. If we believe that creativity is more than just an exercise in the social psychology of impression management, we need to attend to our own attributional biases and develop a valid social psychology of creativity.

ATTRIBUTION BIASES IN CREATIVITY RESEARCH: AN ARGUMENT FOR THE SOCIAL PSYCHOLOGY OF CREATIVITY

One of the contributions that social psychology has made to our understanding of human perceptions, judgments, and behavior has been the systematic identification of a network of attribution biases (Fiske & Taylor, 1984). Attributions are causal judgments, and one particularly virulent strain of biased causal judgment is known as the fundamental attribution error. Like its near cousin, the actor–observer bias, the fundamental attribution error leads us to assume that the cause of observed behavior lies in persons rather than situations. Con-

sequently, we tend to blame (or credit) individual persons and personalities even when situational factors clearly play an important causative role.

When we apply the attribution bias to our understanding of the phenomenon known as creativity, we would expect to see researchers (whose scientific standing does not exempt them from attribution biases) assign the cause of creativity to persons and personalities rather than to situations and circumstances. And in fact creativity research has tended to focus on creative styles, inspirational persons, and clusters of creative personality traits.

The efforts of scientists, chiefly psychologists, to describe, predict, and understand creativity began with psychoanalytic theorizing and humanistic affirmations, progressed to more mundane but empirical studies of the creative personality, and now increasingly focuses on social factors that either inhibit, facilitate, or otherwise interact with individual difference variables in the production of novel yet effective responses to specific problems and purposes (Albert, 1983). The early research emphasis was on the individual—the personality characteristics associated with highly creative persons and the processes by which an individual generated creative ideas. A more recent research emphasis examines how situational variables influence creative production.

Freud (1933) proposed that creativity was the expression of sexual energy in a socially acceptable form. Alternatively, Jung (1959) proposed that creativity was a basic human motive, part of the tendency to self-actualize—a theme developed by humanistic psychology, in which creativity became associated with the apex of human evolution and achievement. While such notions retain a strong intuitive appeal, they were not intended to be, nor did they lend themselves to, experimental verification. The rise of empiricism led to systematic inquiry into the nature of creative individuals.

The notion that creativity is somewhat immune from situational influences has been an implicit belief since the earliest systematic inquiries into the topic. Accordingly, the object of study has tended to be the creative personality and the style of thinking characteristic of creative individuals rather than creative products and how situational factors might facilitate or inhibit creative productions. The individual creator represents an early and enduring research object for those interested in creativity. Galton (1869) initiated such empirical inquiry when he proposed a genetic basis for the enduring notion of genius. Similarly, Cox (1926) published *Early Mental Traits of Three Hundred Geniuses*. Both researchers grouped creators and leaders together under the term genius and sought to identify distinguishing characteristics. Modern impetus for personality research regarding creativity probably stems from Guilford's (1950, p. 444) address to the American Psychological Association in which he urged the study of the creative personality and "those patterns of traits that are characteristics of creative persons." Twenty-five years after Guilford's address, while researchers in other areas were just acknowledging the critical importance of individual

differences in the construction of nomothetic theories (Underwood, 1975), creativity research began moving toward an interactive model in which both individual difference and situational variables became the topic of investigation. Certainly anecdotes such as Einstein's (1949) well-known but disparaging remarks regarding the effect of graduate training on his scientific curiosity spurred the recognition that external factors influence creativity. "The hitch in all this was... the fact that one had to cram all this stuff into one's mind for the examinations, whether one liked it or not. This coercion had such a deterring effect upon me that, after I had passed the final examination, I found the consideration of any scientific problem distasteful for an entire year" (p. 17).

Relatively recent social cognition research tempers our belief in the individual with the possibility that researchers, like other observers, may have committed an attribution error (Ross, 1977) in attributing much of the causal variance in creativity to the individual while ignoring the influence of the situation. Even if attribution biases have not subtly directed the course of creativity research, the notion that different traits may be formed in different cultures suggests that the psychology of creativity extends beyond the domain of personality measurement to the environmental factors that "breed" common characteristics within a particular subculture (Anastasi, 1970).

Although several conceptual models of human behavior propose that the best predictor of human behavior results from an interaction between situations and individual difference variables (e.g., Ekehammer, 1974; Snyder & Ickes, 1985), this approach has only recently been applied to the topic of creativity. However, both Mumford and Gustafson (1988) and Amabile (1983) proposed models that specify how situational components interact with individual difference variables to influence creative productivity. Both models indicate that one way in which situations influence creative output is through motivation. Situational variables that tend to undermine intrinsic motivation have been the focus of Amabile's research, which conceives of task motivation as a necessary but not sufficient component of creativity. These situational approaches have opened up new areas of research accompanied by the possibility of understanding and manipulating the environment in order to facilitate creative productions. For example, recent studies have evaluated the effects of authoritarian peer pressure (Eisenman, 1982), competition (Amabile, 1982), and situations creating positive affect (Isen et al., 1987), on various indicators of creativity.

The pattern of creativity research appears to be shifting away from psychoanalytic theorizing and personality assumptions towards empirical investigation of the effects of specific situational variables on particular components of creativity. This has given rise to the emergence of a new paradigm (Amabile, 1983), which develops the social psychology of creativity and guides research strategies while offering a pragmatic approach to facilitating creative productions.

How far can we push this social psychology of creativity? Can creativity take

place without any human intervention at all? The twin elements of novelty and appropriateness (or effectiveness) compose most working definitions of creativity (Amabile, 1983). Even when we add Amabile's additional constraint of a heuristic rather than an algorithmic path to a solution, we are left with a variety of "creative" phenomenon that seem to be almost devoid of persons and personalities. For example, chance evolutionary adaptations qualify a wide range of phenomenon as creative—they are both new and effective. Gould (1990) provided a detailed account of the evolution of the middle ear from its beginnings as a brace bone for the brain. Noting that the evolution of the conductive middle ear resulted more from propinquity than thoughtful design, Gould concluded that "the watchwords of creativity are sloppiness, poor fit, quirky design, and above all else, redundancy." Personality is not even a factor in this account of the development of a new and highly appropriate conductive middle ear. Indeed, evolution is a matter of continuous "new and effective" adaptation, an intrinsically creative process taking place unceasingly among multitudes of species and without the intervention of human personality.

Obviously, creativity among humans engages the human personality, but how deeply have attribution biases clouded our thinking? Another attribution bias is known as the *self-serving bias* and is recognizable to even the most casual observer. The self-serving bias recognizes that people tend to credit themselves with causing positive events and attribute situations as causing negative events. Creativity in human affairs is generally perceived as a positive phenomenon (an assumption worth exploring in the scientific development of the construct), and the self-serving bias quite accurately predicts that many people will attempt to take credit for positive (creative) outcomes. The presence of such "natural" perceptual biases leads us to misassign the causes of creativity—to the person and at the expense of the situation.

OVERCOMING ATTRIBUTION BIASES IN CREATIVITY RESEARCH

Creativity in human affairs is clearly the result of an interaction between persons and situations. But how can creativity researchers pierce the veil of our own attribution biases in order to accurately understand the phenomenon that persistently shapes and reshapes our world? At the risk of a somewhat speculative aside, at least two approaches seem to offer some hope of success. One is well known and not only developing within creativity research but happily spreading to other areas; the other approach is less well known among academics but already in use by business and governments.

The first approach examines the past and we can only acknowledge once again our debt to D.K. Simonton (see the 1990 *Creativity Research Journal*), whose several historiometric techniques allow researchers to examine archival

data systematically and without necessary reference to the "large" personalities that acted upon the stage of history. We can also acknowledge the assistance of Thomas Kuhn (1962) and his retrospective observations of paradigmatic change. The second approach looks at the future—a future unclouded by attribution biases because the "large personalities" who will occupy that stage either do not yet exist or are presently "under construction." Only situational variables are available for analysis in futures research. From a "retrospective" perspective, situations are shaped by personalities who dominate our perceptual field and bias our causal judgments; from a "futures" perspective, personalities tend to fit into situations rather than create them.

Futures research seeks to identify the possible futures that situations and circumstances are most likely to create. Consequently, futures research may be viewed as a branch of creativity research. Business and government use information from futures research to more economically cooperate with their own evolving futures. Futures research seeks to identify and anticipate paradigm shifts (MacNulty, 1989) and frequently merges a variety of disparate methodologies ranging from environmental scanning, scenario writing, and expert assessment to demographic trend analysis and delphi techniques (Bledsoe, 1990; Didsbury, 1990; Huddleston, 1989). To my knowledge, futures researchers and creativity researchers have not collaborated—yet they seem to be potentially mutually beneficial partners. Since the future is a distinctly "still to be created" product, futures research offers creativity researchers an opportunity to contribute (and test) various principles of creativity. For example, componential definitions of creativity can serve as a framework for identifying the content of what is to be scanned within a given environment. If those principles are valid, they should identify with some accuracy the future that circumstances are likely to create. Both systematic inquiries into the past and predictive forays into the future offer means by which creativity researchers can overcome their own tendency toward attribution biases and examine the influence of situational variables on creativity.

EMPIRICAL EVIDENCE REGARDING THE RELATIONSHIP BETWEEN FRUSTRATION AND CREATIVITY

The remaining explanations for the distinction between empirical findings and real-world observations regarding the role of positive and negative affect on creativity involve shortcomings in the empirical research: the laboratory captures a distinct phenomenon, specific operationalizations do not match real-world observations, or both affect and creativity are more complex phenomena than what has been represented in the laboratory. This close examination of the empirical literature regarding frustration and creativity leads me to conclude that, although a variety of theorists have proposed that frustration, under

specific conditions, may be positively related to creativity, empirical studies have not captured this complex real-world phenomenon within the laboratory.

Note from the following review the many different ways both frustration and creativity have been conceptualized as well as operationalized. For example, in some studies frustration is simply goal blocking; in other studies, the apparent goal of frustration is to induce negative affect, and frustration is assumed to be present when negative affect is present. The appropriate operationalization of frustration is probably less important than consistency of operationalizations. The purported strength of the laboratory is the ability to control these variations. Hopefully this article will serve as an impetus toward clearer construct definition—particularly within the laboratory.

The notion that frustration was related to (among other things) creativity was part of a Freudian notion which contributed to the formulation of the frustration–aggression hypothesis (Dollard, Doob, Miller, Mowrer, & Sears, 1939). Freud (1933) argued that sublimation was the process by which frustrated libidinal energy was transformed into culturally acceptable but expressive works of art. Barker, Dembo, and Lewin (1941) also operationalized frustration in terms of a Freudian inspired frustration–regression hypothesis by interrupting a goal response (preventing children from playing with desirable toys) and attempting to measure regressive behaviors (lowered constructiveness of play). This theoretical approach and its operationalization were adjusted and elaborated upon by Child and Waterhouse (1953) when they examined the effect of frustration (operationalized as differential, bogus performance feedback) on the quality of performance on a combination of intellectual and motor skills. They argued that, when goal-directed behavior is interfered with, it produces a motivational change and that other responses are likely to occur.

Berlyne (1966) similarly conceptualized exploration and curiosity as a motivating force influenced by frustrating situations. Wong (1979) subsequently articulated a frustration–exploration hypothesis, which proposed that (a) uncertain frustration leads to exploration, (b) frustration–motivated exploration consists primarily of response-variation, and (c) exploration plays an important role in learning. According to Wong, frustration occurs when elements of uncertainty and conflict are present, induced experimentally by any situation involving frustrative nonreward, or the occurrence of nonreward in a context that has been associated with reward (Amsel, 1952) such as early extinction, successive acquisition and extinction, and partial reinforcement. While not conceptualized here in terms of creativity, the frustration–exploration hypothesis specifically proposes that frustration influences task motivation, a necessary component of creativity according to Amabile (1983). More directly, Pryor, Haag, and O'Reilly (1969) demonstrated that they could train what they termed *creativity* (expansion of response repertoire) in a porpoise by selectively rewarding only novel behaviors. Wong (1977) trained rats to vary their response routes from trial to trial using a similar procedure.

Wong (1979) further argued that a failure-free environment means the absence of challenge, recognizing McClelland's (1969) assertion that achievement-oriented individuals prefer moderately difficult tasks with a fair chance of failure. Similarly, Berkowitz (1964) pointed out that optimal challenge requires occasional frustration. In educational settings, Wong (1979) used the frustration–exploration hypothesis to suggest that attainment should be used as a shaping tool "so that students have to put forth serious efforts to explore more efficient, more sophisticated, or more creative ways to perform the task" (p. 142).

Albert (1983) recognized that "creativity taking place in the real world may be significantly different from the creativity observed in the laboratory or measured by psychometric tests because "it is as much the problems faced that generate one's 'creativeness' as it is the person involved" (p. ix). However, in spite of this recognition that frustration might sometimes lead to higher levels of situation specific creativity, almost all of the laboratory research assumes that frustration will always undermine creativity; that creativity is a traitlike ability that will manifest itself in traditional, global tests of creativity, and that frustration can only hinder, not shape or facilitate, creative output. Few of the researchers have operationalized or designed their studies such that an alternative hypothesis has an opportunity to be verified: that specific frustrations will facilitate the creation of specific innovations directly related to the frustration, particularly when interacting with some motivating individual difference variable... or in the plainer language of earlier observations, that the frustration of hunger may not create global creativity on psychometric tests but it will tend to produce some inventive means of obtaining food.

This concern with undermining creativity reflects some of the focus of Amabile's (1983) research emphasis on social factors that inhibit creativity by undermining intrinsic motivation. Similarly, Sethi and Sen (1981) studied 20 orthopedically handicapped children and compared them with 20 age- and IQ-matched controls. They found that the control group scored significantly higher on global measures of creativity but did not differ on self-reported measures of frustration or level of aspiration. Kakas (1984) used a laboratory setting to study the relationship between creativity (measured by the Signs, Circles, Number Combinations and the Sentence Completion Tests) and the Rosenzweig Picture-Frustration Study in 37 engineering students, and concluded that less creative persons react to a frustrating situation with aggression and that more creative persons react to frustration with a far greater variety of responses. This increased variability of responses supports the predictions of Wong's (1979) frustration–exploration hypothesis and indirectly supports the notion that frustration may lead to higher creativity, but probably mediated by one or more individual difference variables.

The construct of frustration has been theoretically explored and experimentally operationalized in a variety of ways (Lawson, 1965). Rosenzweig (1938)

proposed a general outline of frustration which conceived of the construct as an obstacle preventing the satisfaction of a need, including motivation (Lawson, 1965). Reactions to this obstacle included extrapunitive, intropunitive, and impunitive responses, and frustration tolerance should increase with age and development. The publication of *Frustration and Aggression* (Dollard et al., 1939) prompted a variety of responses among researchers including a very deliberate clarification on the part of the authors (Miller, Sears, Mowrer, Doob, & Collard, 1941) that they did not wish to assert that frustration always leads to some form of aggression. Their clarification recognizes the motivational characteristics of frustration: "Frustration produces instigations to a number of different types of responses, one of which is an instigation to some form of aggression." Instigations, of course, refer to a motivational component of the type included in Amabile's (1983) componential definition of creativity.

Other relevant learning-oriented experimental operationalizations of frustration include the extinction of an operant response (Miller & Stevenson, 1936), which produced an affective response in rats. Amsel and Roussel (1952) varied this procedure in a T-maze and subsequently offered evidence that such extinction procedures produced three possible types of effects: motivating immediately subsequent behavior, increasing drive stimulus whose reduction may be reinforcing, and inhibiting overt behavior. Prevention or blocking the completion of a reinforced response was also used as a frustration manipulation (Williams & Williams, 1943) and produced progressively weaker behavioral responses. Preventing a response aroused by goal stimuli has also been employed as an operationization of frustration, for example, making food inaccessible and delaying reinforcement following training (Screvan & Cummings, 1955) or interfering with an ongoing response sequence (Geier & Tolman, 1943). Other operationalizations that have been adapted or recommended to social psychological research regarding frustration are failure (McClelland & Apicella, 1947) and conflict (Lawson, 1965, p. 46). Lawson (1965, p. 45) noted that "many similar effects are observed with failure: there is often a tendency for a subject to increase his effort after failure, to try a variety of alternative responses, to show some kinds of emotionality." This comment unites with those of other researchers who have assumed or theorized, but not empirically demonstrated, that frustration can be motivating and result in a variety of (creative) responses.

Waterhouse and Child (1953) tested a relationship similar to that of frustration and creativity when they investigated the effect of differential, bogus feedback on the quality of intellectual and motor performance. According to their theoretical reasoning, frustration might decrease the quality of performance only to the extent that it interferes with ongoing responses. Frustration that was not distracting to the particular task at hand might prove to facilitate performance. However, this was a post hoc suggestion and their 2 $\times$ 2 design did not give opportunity for a more sophisticated trend analysis.

Other researchers have also suggested that frustration might facilitate performance by increasing problem solving motivation (Maier & Ellen, 1956), intellectual stimulation (Dewey, 1910), protracted challenge to subsistence (Toynbee, 1947), or substitution, escape, or energizing (Child & Waterhouse, 1953). However, I was unable to find a network of studies that permitted an investigation of anything other than a linear effect of frustration on creativity or experiments which focus on the potentially beneficial effects of frustration. One study with an applied focus (Heinzen, 1989) produced a curvilinear effect for frustration when the moderate level of frustration for the prospects for summer job hunting among college students was presented as "moderately challenging" as opposed to "absolutely impossible" or "no problem at all." Subjects in the moderately challenging condition generated significantly more ideas regarding how to find a summer job than did subjects in the other two more extreme conditions. In this context, frustration is conceptualized simply as goal blocking rather than negative affect; unfortunately, covarying affect was not measured.

Isen (Isen et al., 1987) investigated the relationship between affect and creativity from a cognitive/affect perspective. Her demonstration that positive affect (induced by a humorous film or small gift) facilitates access to positive material in memory (Isen et al., 1978) and that such positive material is more extensive than other material. Alternatively, negative affect (induced by a brief film about the Nazi concentration camps) was shown to be comparable to affectless arousal in its influence on how quickly subjects could solve the Duncker Candle task problem. Like previous researchers, Isen offered several caveats regarding the severity of the induction of negative affect and the generalizability of the neutral effects of negative affect on creativity.

Extending her hypothesis regarding positive affect as a cueing mechanism that accesses a complex memory context to situations involving negative affect suggests that increasing frustration might generate negative affect which would function as a cuing mechanism for items in a negatively oriented but still relatively complex memory store. A negative affect memory store may be less extensive (or less accessible!) than a positive affect memory store, but once it is accessed it can still produce some form of creative thinking.

From an experimental, empirical perspective the relationship between frustration and creativity is unclear, because it depends upon what is meant by frustration: goal blocking or negative affect. If it is simply goal blocking, we have a generally negative relationship with a suggestion of a curvilinear relationship probably based on individual differences in whether the block is perceived as challenging. If frustration means negative affect, then we are even less clear: several theorists and experimenters indicate that negative affect might have a beneficial effect on creativity by (a) increasing the range of responses, (b) acting as a strong but temporary motivator to resolve specific frustrations, or (c) constantly "stretching" individual abilities and creative thinking in an effort to escape the negative affect. However, empirical studies have not done a good job

of teasing apart these distinctions, even though their importance has been recognized and well articulated by diverse researchers. For example, Wong (1979) urged that "since the very nature of human existence involves frustration we might as well learn how to turn it to our advantage by following the frustration-exploration principle." The relationship between situational affect and proactive versus reactive creativity represents one way to pull apart this distinction.

PROACTIVE AND REACTIVE CREATIVITY

As Gould's (1990) account of the development of the conductive middle ear demonstrates, new and appropriate adaptations can be created without the intervention of human personality—without inspiration, frustration, incubation, or any other human participation. Creativity, as a phenomenon, does not require human inputs—it is sufficiently resilient to withstand the very worst of humankind's excesses. New and effective adaptations will occur even in the event of total nuclear holocaust. Creativity, as a phenomenon, will survive even if the human species does not. On the other hand, humans need creativity—if only to circumvent our own worst excesses.

This chapter proposes that the apparent discrepancies regarding the relationship between affect and creativity according to empirical literature and real-world observations are resolved by proposing that there are two qualitatively distinct kinds of creativity: reactive creativity and proactive creativity. Optimal creativity probably occurs when necessity (demand) interacts with abundance (supply). The kind of product that results depends on the "mix" of reactive and proactive creativity (see Table 6.1).

Table 6.1. Sources of Affect and Their Influence on Creativity

		Situation Affect: Positive	Situation Affect: Negative
Personality Affect: Positive		Proactive Creativity	More proactive than reactive
Personality Affect: Negative		More reactive than proactive	Reactive Creativity

Reactive creativity is the result of externally motivated demands and occurs in frustrating situations when an important goal is persistently thwarted. Reactive creativity can produce new and effective responses (as well as learned helplessness, depression, and displaced aggression), but is characterized by negative affect, often a sense of desperation as the organism searches for the one alternative response to escape pain. While such situations are extremely motivating and demand cognitive attention, that attention is accompanied by high anxiety and a simple, rigid set of cognitive associations whose purpose is to make the desperate situation go away. The eventual solution may be inventive but it tends to be a short-term "coping" type of solution to a problem. Reactive creativity is the more common occurrence in human affairs, providing frequent, small, unconnected solutions to individual problems. The interconnections and spreading concept activations (corresponding to the traditional measures of creative thinking as divergent thinking) tend to be few and limited, in keeping with the desire to avoid the negative affect of the situation.

On the other hand, proactive creativity occurs in situations characterized by positive affect and tends to address intrinsically motivating problems, situations, or concerns. Proactive creativity is characterized by positive affect—pleasure rather than pain, the desire to approach the situation rather than avoid it. Like reactive creativity, proactive creativity is also characterized by high levels of cognitive attention, but that attention is qualitatively different, because it encourages incubation and spreading activation, triggers rich and divergent cognition, and is perceived as attractive opportunities rather than persistently unpleasant problems. The creative products tend to spread to other areas, create further opportunities, and develop into longer lasting solutions. Proactive creativity occurs more rarely in human affairs, but when it takes place its impact is longer lasting and further reaching than reactive creativity (see Table 6.2).

Table 6.2. Distinguishing Characteristics of Proactive and Reactive Creativity

Domain	Proactive	Reactive
Affect	Positive/pleasure	Negative/desperation
Attention	High w/incubation	High w/anxiety
Cognitive network	Complex/divergent	Simple/rigid
Frequency	Low	High
Impact	Lasting/spreading	Brief/coping
Impetus	In the person	In the situation
Motivation	Intrinsic	Extrinsic
Orientation	Approach	Avoid
Perception	Opportunity	Problem
Resources	Rich	Poor

Curiously, the description of the individual who embraces the unpleasant circumstance, who disciplines himself or herself to accept and use the distress of negative situational affect, is reminiscent of Freud's sublimating creator and the humanistic descriptions of a self-actualizing creator. Perhaps distinctions proposed here complement the intuition of these early theorists regarding creativity.

EVIDENCE FOR PROACTIVE AND REACTIVE CREATIVITY

Hunger. Sorokin provided some dramatic evidence for both reactive and proactive creativity. As an unwilling "participant-observer" in the Russian famine of 1921, he combined a sociologist's training with an authenticity that commands both attention and respect. He wrote that "hunger serves as a whip, to lash the lazy human brain to work on certain things," and even more starkly "either find or discover and improve the production of the means of nourishment, or die" (Sorokin, 1985, p. 164). He noted the limited but distinct inventions produced by periods of starvation in Germany during World War I, "an increase in the production of replacements: the use in bread of the blood of animals; use of so-called mineral yeast as a source of proteins in replacement of real yeast; a mixture of plant proteins and fat instead of eggs; utilization of the fish waste, bones, carrion, and fecal matter; and ways of getting vegetable fat from fruit... These so-called inventions are numerous but lack variety" (p. 166).

Hunger is an impetus for reactive creativity. But Sorokin also noted that hunger was an impetus to proactive creativity—but only when the immediate hunger was past and while its unpleasant memory lingered. He notes the "culture of wheat, millet, and of several vegetables was introduced in Russia after the famines of the eleventh century" as well as other examples of agricultural innovations in Russia such as the "first agricultural journal... scientific investigations, and many reforms... after severe famines" (p. 171). Reactive creativity helped (some) survive; it had limited effects and led to few long-term innovations. Proactive creativity remained in the part of human personality we call memory and helped prevent many others from starving; it had further-reaching effects and led to more far-reaching agricultural advances.

Medical progress. Stern (1927) observed the frequent occurrence of multiple discoveries and inventions in medical progress and argued that "the history of medicine could be written without the mention of names of persons now being extolled as being 'responsible' for medical development" (p. 109). This recognition of the attribution bias is especially interesting in medicine, where recognition (and reward) for achievement are determined by the "priority of a day, week or month" (p. 109). Stern noted that the necessity for invention and cures has been constant across the centuries and concludes that "necessity, acting as a stimulus to research, cannot produce an invention or discovery

without the existence of the essential elements of knowledge" (p. 110). Stern documented his argument with long lists of multiple and almost simultaneous inventions, beginning with four researchers in four different countries. Between 1651 and 1653, each researcher "discovered" the intestinal lymphatics and their connection with the thoracic duct. Fifteen pages later, Stern's "appended list" of multiple discoveries has not noted any medical advances after 1906 and includes five researchers' discovery of adrenalin between 1897 and 1901. In this analysis, necessity represented a constant demand but was insufficient without a supply of "knowledge" in the medical culture. Stern regarded necessity as a stimulus demand but with a limited effect: reactive creativity. Far-reaching advances come about through an abundant supply of knowledge: proactive creativity.

Public Administration. Luther Gulick, writing for the 50th-anniversary edition of *Public Administration Review,* noted that crisis has been the historical precursor to innovation in public administration. Not so incidentally, he observed that the United States "is now again confronting one of these crisis-driven times for (paradigmatic) change, one in which 'public administration' has a major role to play" (Gulick, 1990, p. 600). Gulick's refined intuition regarding public service was developed across key administrative positions in city, state, and federal governments as well as international positions connected with the Ford Foundation and the World Bank. Gulick's remarkable career spans both World Wars and significant postwar activities. With a practitioner's passion, Gulick asserts that "forward steps have come as response to crisis" (p. 602) or what this chapter identifies as reactive creativity. But he also affirms a description of proactive creativity (and rather eloquently I think for one who could present a jaded perspective with far more justification than most of us): "The United States is sure to have a new and future dream to inspire the nation, a noble and inspiring challenge, bursting up out of the cheap, selfish, mercenary, dishonest conspiracies of clever interest groups which have been this nation's lot for some time" (p. 603).

CONCLUSION

Reactive creativity is the kind of creativity we frequently have to live with: a disgruntled lurching from one problem to the next, unable to pause for reflection or reevaluation, and permeated with negative affect. One nuisance problem is solved and another created; we solve that one, learn little from it, and go on to the next famine, disease, or political crisis. Proactive creativity is the kind of creativity to which most of us aspire: an intrinsically motivated problem-solving and idea-generating activity characterized by enjoyment, incubation, involvement, and an abundance of positive affect. The range of activities expands dramatically as the effects of proactive creativity diffuse and regenerate across domains.

Situations carry affect that systematically influences the creative process. Although the creative process itself is characterized by both positive and negative affect, the results of that process, as well as the process itself, are influenced by how an individual perceives and responds to the affective characteristics of the situation. For example, frustration is an intrinsic part of the human experience, and yet frustration has both theoretical, real-world, and some minimal laboratory support for sometimes facilitating creativity. Frustration may not represent the optimal conditions for creativity, but it does describe a common and unavoidable aspect of the human experience. Consequently, the influence of frustrating situations, and their customary "load" of negative affect, represent an opportunity for creativity researchers to identify the factors that help transform the motivating effects of frustration into tangible creative products.

The history of creativity research has passed through several stages. One way of perceiving those stages is a shifting emphasis from personality to situations to interactions between personality and situations. We might reasonably anticipate that the interaction between personality and situation accounts for more variance than either factor independently. An accompanying way of perceiving the history of creativity research is an increasingly precise understanding of the construct. Within this perspective, componential understandings of creativity clarify the construct, guide future research and make sense of previously divergent observations. In the componential understanding of creativity presented here, reactive creativity accounts for the observation that extreme necessity leads to inventive adaptations while proactive creativity accounts for the observation that abundance corresponds to wide-ranging inventiveness. Taken together, reactive and proactive creativity clarify the sometimes contradictory characteristics which fit the "new and appropriate" constraints of the definition of creativity and propose one way of reconciling the discrepancies between observations and empirical research.

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7

Generative Sources of Creative Functioning

Gudmund J.W. Smith and Gunilla van der Meer

This chapter adopts a functional perspective. Creative activity is thus associated with the operation of series of generative processes, rooted in emotive sources outside awareness. As pointed out by C.G. Jung and others, creative activity grows out of conflict and contradictions as an attempt to form a coherent pattern of the dark and light side of the person's experience. This implies that, besides emotion, anxiety is crucial in creative functioning. These problems are examined within a percept–genetic (microgenetic) frame allowing creativity to be operationally defined. A perceptual creativity test has been designed to find out whether subjects cling tightly to the conventional meaning of a stimulus (when exposure times are being gradually reduced) or whether they prefer their own idiosyncratic interpretations. The latter subjects are also more inclined to keep open channels leading to the subjective origins of their perceptual processes. A risk with this openness is that it can act as an invitation to "dark dragons" to enter consciousness. In case anxiety reactions to such intrusions become intolerable, the consequence could be a tightening of defensive activity, which, in turn, often obstructs creative functioning. A mild, anticipatory form of anxiety has proved to be most beneficial. The role of symbolization to avoid threatening confrontations is also discussed, together with a large number of empirical–experimental data.

In this chapter creativity will be understood as *creative functioning*, which may or may not lead to a creative product. As will eventually become more clear, creativity can be conceptualized as series of generative processes, fertilized by

sources outside awareness and producing new approaches to reality, deviant thoughts, different formulations of old problems, and sometimes, original high-level inventions. The nonconscious connection means that affect is necessarily involved in any creative activity. Because no cognitive activity, except perhaps the most habituated and routinized functions, can be devoid of affective connections, we have to ask what is specific about creative functioning and affect.

As we see it, creativity should be conceptualized within a broad context of personality functioning. The present chapter will therefore focus on the creative individual, and his or her emotions, dreams, early experiences, anxiety, and defensive strategies. The notion that creativity refers to cognitive somersaults somehow in splendid isolation from other aspects of the person seems to die hard, however. It may therefore be instructive to learn that modern neuroscience models constructed to take care of cognition do not only refer to the neocortex but to the limbic circuits as well (Squire, 1986). There is ample evidence to show that the primate cortex is structured around an evolutionary sequence involving more and more differentiated cortical regions but originating in a primitive limbic cortex (Pandaya & Yeterian, 1985; cf. Johanson, 1991). The most eloquent spokesman of this bottom-up or microgenetic view, where reality develops from the depths of the old brain, is Brown (1988). We will return to his work next.

PSYCHODYNAMIC FORMULATIONS

When trying to epitomize the special relation between creativity and affect, as understood in psychodynamic thinking, we choose to begin with C.G. Jung. According to Jung, humans are afraid of their unconscious and its affects because the modern world in which we live has forced us to be rational, and made us insensitive to signals from the inside and incapable of integrating them in a coherent psychic pattern. As a consequence, we become more slavishly dependent on our unconscious. The highly developed conscious mind has thus deprived itself of its means to utilize the deep affective sources.

It is important for the creating individual not to shy away from the dark side of his personality because that is where he can find his creative impulses. This crucial part of the unconscious was called *the shadow* by Jung. The shadow includes the symbols and negative sides of the personality, long since repressed, that still keep their numinosity or spell. This constitutes an ever-present, potentially destructive part of our personality; but not only negative, because even "good" tendencies become demons if repressed. Hence, the shadow also contains such positive qualities as normal instincts and creative impulses. Ego and shadow are inseparably linked together, like thought and feeling, but still engaged in an eternal battle, called "the battle for deliverance." This battle is

often symbolized by Jung as the hero's fight with the dragon, and it stands for the ego's triumph over the regressive tendencies. For most people the dark, negative side remains unconscious, but the hero realizes that the shadow exists and that he can draw strength from it. He comes to terms with its destructive powers and can achieve victory by mastering and assimilating the shadow (Jung, von Franz, Henderson, Jacobi, & Jaffé, 1988).

The following formulations by Storr (1976) bear witness to the influence of Jung's thinking:

> Man carries with him throughout life a discontent, varying in degree, but always present, as a consequence of his infancy. This drives him to seek symbolic satisfactions: ways of mastering the external world, on the one hand, and ways of integrating and coming to terms with his internal world on the other... His prolonged and unsatisfactory infancy is itself adaptive, since it leaves him with a "divine discontent" which spurs him to creative achievement. (p. 203)

Ernst Kris (1952) speculated in a similar vein, but in the Freudian tradition, when he distinguished between *inspirational* and *elaborational* phases in creation. The integrative functions of the ego allow a self-regulated regression, in the inspirational phase, where intense intellectual activity may be combined with an experience of passive receptiveness. The regression implies a shift from consciousness to preconsciousness. One consequence of this could be "the experience of clarification that occurs when after intense concentration the solution to an insoluble problem suddenly presents itself" (p. 312). The experience of clarification is an experience of affective coloring—of joy, happiness, relief.

Freud wrote in more than one place that psychoanalysis was unable to explain creativity. He said, for example: "It can do nothing towards elucidating the nature of the artistic gift, nor can it explain the means by which the artist works—artistic technique" (Freud, 1959, p. 65). Nevertheless, he speculated a great deal about creativity, mainly as a product of sublimation and wish fulfillment.

Jaques's (1990) formulations about creativity are influenced both by psychoanalysis and by cognitive psychology, above all Piaget. Consequently, to Jaques the cognitive activity leading to a new product, an original thought, is mainly unconscious, however complicated. This will, ipso facto, give affect a prominent role in creative processing.

Rothenberg (1979) very decisively dissociated himself from Kris's "regression in the service of the ego." One reason appears to be that, for Rothenberg, "primary process is a literal and obfuscating cognitive mode," whereas the creative functions observed by him (homospatial and Janusian thinking) are "figurative, abstract, and revelatory" (Rothenberg, 1981, p. 568). Rothenberg emphasized intentionality. But when engaged in creative work the individual

tries to master more and more unconscious material. The need to gain control over this material is a driving motive behind creative efforts. In this way certain primary process characteristics are still utilized in creative work. Affect is very much involved in creative functioning, in spite of all. Because his model is not process oriented, it is not clear whether Rothenberg sees affect as mainly postcognitive and a consequence of cognitive activity instead of its basic source.

These sporadic vignettes from the clinical (mostly psychodynamic) literature can be summarized as follows:

1. Without affective involvement, there is no motive force behind the individual's creative endeavours.
2. If affective involvement is avoided, there can be no open contact between adapted and unadapted layers of the psyche and hence no real challenge to our conventional way of perceiving and thinking.

Mere contact between affect and cognition–action–perception probably is not enough, as was most clearly suggested by Jung (1988) and Storr (1976). Creative activity grows out of conflict and contradictions as an attempt to form a coherent pattern out of the dark and light sides of the person's experience or to resolve the intrinsic frustrations of living. This carries over to the theme of anxiety, but at this point the microgenetic perspective should be introduced.

MICROGENESIS OF PERCEPTS

We will expound our reasoning within the frame of reference of a process model. This is not, however, just any type of process, but the microprocesses behind the experience of reality.

In German psychology in the 1920s these processes were called *Aktualgenese* (Sander, 1928). Werner (1956) translated the term to *microgeneses*. The outlook of both Sander and Werner was from the point of view of general psychology. Kragh and Smith (1970) adopted personality as their basic reference in what they called *percept-genesis*. We will return to this model later but choose the best way to introduce the notion of microprocesses by quoting Brown (1991). He wrote:

> Microgenesis refers to the unfolding of a mental content through qualitatively different stages. The temporal period of this unfolding extends from the onset of the mental state to the final representation of the content in consciousness or in behavior. (p. 1)

The affect theme is obvious in Werner's formulations. According to Werner, perception is initially physiognomic. At this level (i.e., before conscious recognition) "feeling and perceiving are little differentiated" (Werner, 1957, p.

129). In full agreement with this statement, Kragh and Smith (1970, p. 19) assumed that emotional quality may be conceptualized as one aspect of the contents of the marginal (preconscious) zone of experience.

Before presenting our own percept-genetic model, we would like to dwell a little more on the neurological model developed by Jason Brown. Brown was unaware of our work until a few years ago, as we were of his.

Brown (1988) suggested that the microgenetic process starts in the brain stem, where a two-dimensional image is created. Progressing through the limbic system and parietal lobe, the process transforms the two-dimensional image into an egocentric space or dream world. Not until the final stage, where the occipital lobe has been engaged, does the objective world emerge. The role of the sensual stimulation is to strip the process products of irrelevant contents, and to define the perceptual limits.

Meaning is picked up before form, an assumption supported by experiments with subliminal perception (e.g., Westerlundh, 1986). Meaning is carried through the microgenesis and colors our objective world. Cognitivists generally assume that affect is postcognitive, but in Brown's model (like in our own) it is precognitive. Affect and idea are merged to begin with (cf. Buck, 1990; Zajonc, 1980). Without contact downwards and inwards, the object space obviously becomes more and more devoid of meaning and affect.

Brown (1991) also showed interest in creative processing. In his model creative work does not just imply superficial reorganization but is new on a more fundamental level, aiming at reorganization of the totality of experience.

THE PERCEPT-GENETIC MODEL

The basic assumption in the model is that percepts (at least percepts of meaningful stimuli) come about as the result of microprocesses that usually remain outside consciousness, the end result of a process being more important for our mastery of reality than the process itself. Upon repetition, processes are quickly abbreviated, our reactions to the stimulation becoming increasingly habituated or mechanized. Experiments designed to uncover perceptual processes must therefore use fresh stimulation and portion this stimulation in small bits in order for the process to reveal itself step by step. The tachistoscope is thus an ideal tool, but certainly not the only one. Westerlundh and Sjöbäck (1986) used a so-called *amauroscope*, in which light quanta instead of time quanta are manipulated.

This process perspective would not in itself be very exciting in this context were it not for the additional assumption that percept-geneses are ultimately rooted in personality and the emotional-cognitive experiences accumulated from the beginning of life. What happens during percept-genesis is that an originally rich and varied meaning framework is gradually stripped of irrelevant con-

notations in favor of an approximate stimulus meaning. Of course, stimulus is an abstraction that does not enter the perceptual world. As in Brown's model, the stimulus sets the limits for the ultimate course of the percept-genesis.

The percept-genetic model is illustrated in Figure 7.1 (from Kragh & Smith, 1970). The process direction is from left to right in the figure. The wide circles to the left illustrate early process phases, where the representation of subjective material is rich and varied, often condensed without regard to spatial, temporal, and logical connotations, just as in dreams. Hence, the representation of objective reality (stimulus) is more or less hidden and unrecognizable. As the process continues, the circles become smaller. Stimulus contents gradually replace the private representations, but, even in everyday perception, the latter often remain in the background in an emotional aura, giving the percept an individual meaning. The reconstruction of a percept-genesis, and thus the communication between surface and depth in the individual, can be blocked by defenses or restricted by idiosyncratic cognitive styles, particularly if stimuli are threatening.

We thus believe, like Brown, that the final picture of the world is constructed from below upwards. The ultimate roots of our conscious life, our thinking, our decisions, and so on, are thus concealed. For instance, the choice deliberations

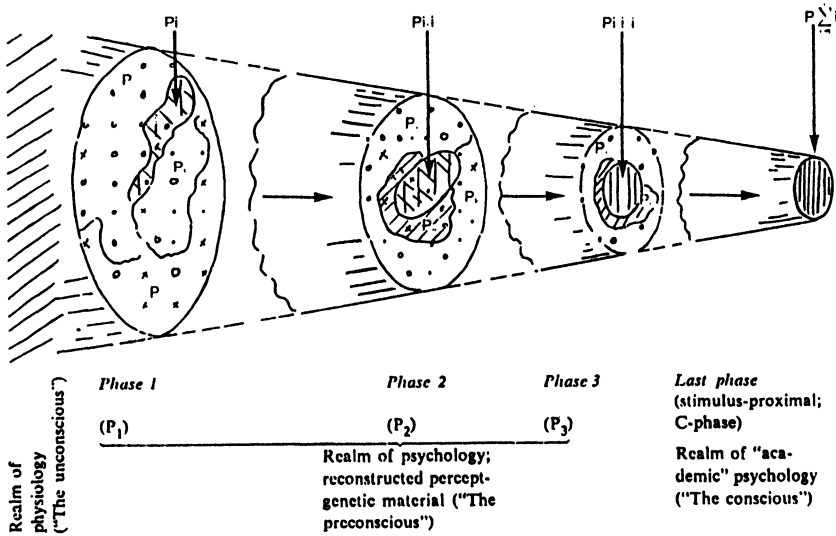

Figure 7.1. The percept-genetic model.
Note: Diagram of the transformations of meanings during the development of a percept. Phase 1: Loaded with personal meaning. Last phase: Stripped of subjective connotations.

studied by decision psychologists may not be the primary determinants of the eventual choice, but the terminal filigree-work necessary to attach a choice already made to the context of our conscious reality. It may often be an illusion that our thoughts and actions are the cause of emotionally tinged associations, and of affective reactions and anxiety. We are easily deluded to believe that what was once part of early precognitive stages of a microprocess, but does not reach awareness until the process itself is terminated, belong to a postcognitive stage. Rothenberg (1981) may have made that mistake when he concluded that unconscious thoughts are not engaged until after the creative intention.

There are some differences between Brown's microgenetic model and our own percept-genetic one. Some of these are important for a theory of creativity and affect. For example, Brown sees the progress of microprocesses as a reflection of the way the brain has evolved, but we prefer to see a close association between percept-genesis and ontogenesis. Early experiences are thus reflected in early parts of a percept-genesis, but the later parts are close to the level of present adaptation. This does not necessarily imply a point-to-point correspondence between percept-genesis and life history (for a further discussion, see Westerlundh & Terjestam, 1990). Moreover, repetitions of similar percept-geneses, in our view, lead to increasing automatization and diminished engagement of early experiences. This was the basis for our introductory statement that affect is not involved in the most habituated and routinized functions. Brown did not include automatization in his theory.

OPERATIONAL DEFINITION OF CREATIVITY

The Creative Functioning Test (CFT) was designed to find out how readily an individual communicated with early stages in his or her processes of reality construction. To achieve this, a thematic picture was presented in an ascending series of exposure times starting with subthreshold values. When the subject finally stabilized a correct interpretation of the picture theme, the series was turned upside down: By subsequently diminishing exposure times the experimenter eventually eroded the basis for a correct perception. Some subjects still clinged tightly on to the conventional meaning of the picture—they played safe—but others returned to idiosyncratic interpretations, often the same as they entertained in the beginning of the ascending time series.

To be encapsulated in the established meaning of the picture, unable or unwilling to choose alternative interpretations, would, as we saw it, be typical of the uncreative individual. Instead, his or her creative opposite would enjoy going beyond the established version of the stimulus meaning. This meant, in effect, that the perceiver reestablished contact with the beginnings of his or her perceptual process.

The validity of this interpretation has been sustained in a long series of

investigations using both children and adults, normal and pathological cases, as subjects (Smith & Carlsson, 1990). Lately, the test has also been applied in a study of how elderly people adapt to life (Smith & van der Meer, 1990). Details of the test procedure can be found in both of these earlier reports. It goes without saying that the test does not just distinguish between creative and uncreative subjects but uses a more differentiated scale. Additional information can be offered by the test results, namely, the degree of emotional engagement revealed by the extent to which the subjective interpretations consist of human themes (the stimulus picture being a still-life).

Our interpretation of the use of idiosyncratic themes in the descending series of the test as a readiness of the perceiver to keep open his or her channels to the origins of his or her perception of reality was corroborated by repeated findings that creative people reported closeness to their dreams. Incidentally, as Jung pointed out, it is via our dreams we get acquainted with aspects of our personality that we did not know of. This is what he called "the realization of the shadow." The shadow often appears in dreams personified as a black or dark shadow, or as a cellar or backyard (Jung et al., 1988).

Moreover, creative subjects easily communicated with early childhood memories. Typically, these memories were markedly sensual—the warmth of the sun on the stone steps where the child wanted to sit, the special granular feeling of beach sand, and so on—and they represented both positive and negative emotions, often of overwhelming importance to the child (like mother walking away from the child). Purely nostalgic or depressive projections were less typical. The early age to which the reminiscences referred was 2–3 years.

A more indirect confirmation of the childish connection in creative people was published in two recent investigations: one of people with a median age of 25 years (Smith, Carlsson, & Andersson, 1989), and one of people in their early 70s (Smith & van der Meer, 1990). Subjects were presented with series of brief flashes of an ambiguous face on a screen in front of them and asked to describe what they saw. Creative people significantly more often than uncreative ones alternated between young persons and adults, particularly when negative subliminal provocations like *I BAD* were used.

The young people noted by the middle-aged group were often children. In the group of elderly, they were teenagers or slightly older. We interpreted their face descriptions as projected representations of examinees' self-image. Thus, in creative individuals the self had two poles: an adult pole and a childish or youngish one. The age attributions in uncreative individuals stayed within rather narrow, middle-aged lines of demarcation.

This childhood connection may seem idyllic at first glance, like part of a H.C. Andersen fairy tale. But like these tales it has dangerous undercurrents. To open the doors of consciousness to dreams and infantile reminiscences may be to play with dragons, which, for the sake of equanimity, should better be left sleeping. One such dragon would be lack of conscious order, or chaos (Csikszentmihalyi, 1990).

Creative activity may be an invitation to anxiety, as Jung et al. (1988) already intimated and as exemplified below by means of our own studies. The affect of anxiety is closely tied to the operations of defensive strategies. It therefore seems natural to develop these themes by means of the Meta-Contrast Technique (MCT), a test of anxiety *and* defense strategies used to cope with anxiety.

OPERATIONAL DEFINITION OF DEFENSE

Defense has long been a key topic in psychoanalysis. But the cognitive aspect of defensive strategies has tempted academic psychologists, particularly cognitivists, to grapple with this intriguing topic. The growing interest in genuine human problems on the part of the psychological establishment, gratifying though it may be, has greatly complicated the nomenclature. It would not be possible to discuss, for instance, repression or isolation and rely on the reader to associate to such classical sources as A. Freud (1936) or Fenichel (1945) and thus know what the discussion was all about. This is the reason why we feel obliged, before discussing anxiety and defense in relation to creativity, to operationally define these concepts using a percept-genetic test method.

The MCT was developed based on experiments with subliminal perception (Smith, Johnson, & Almgren, 1989). It involves repeated tachistoscopic presentations of pairs of stimuli on a screen, one of them exposed immediately after the other. The second stimulus (B) in a pair is intended to offer a constant perceptual frame of reference to which the viewer has been adapted in advance. Within this frame, the development of the first stimulus (A) is going to be followed step by step, through a slowly ascending series of exposure times. To begin with, A usually does not manifest itself as a perceptual structure in its own right, but sometimes as changes in the B-percept. When, with prolonged exposure times, A begins to penetrate B, two alternatives are open. One alternative implies that the correct meaning of A is gradually accepted. If A is regarded as a threat toward B, however, various defensive detours may be used to avoid a direct confrontation. In order to increase the probability of the second alternative, A has been depicted as a threatening face looking through a window into the room where the main figure in B, a young person, is sitting.

Several defensive categories will be described below, together with a description of anxiety manifestations. All signs have been repeatedly validated against carefully selected criteria. A recent manual, for instance, has summarized data from about 30 studies where MCT results have been correlated with clinical or other relevant criteria (Smith et al., 1989). The development of defensive manifestations from 4 to 15 years of age was studied by Smith and Danielsson (1982) in a special project.

Anxiety may appear in many guises, here ordered in a descending series of gravity: (a) open fear or panic exhibited in the test situation; (b) grave signs such as broken structures in B, reports of defensive manifestations (see below) that do

not really help to disguise A, or intermittent or total loss of meaning in B; (c) moderate signs like the disappearance of the person in B from one exposure to the next or disproportionate emphasis late in the genesis on black structures in that picture; and (d) mild signs represented by black structures reported in the beginning of the genesis or reports of vague structures such as a misty window. One explanatory comment may be needed: Early signs in a genesis should be more latent than late signs, the latter being closer to the manifest level of adaptation.

The defensive manifestations have been organized in six main classes: repression, isolation, projection, depression, regression, and self-referential signs. Within each class we have tried to apply an hierarchical order starting, if possible, with the primitive or behavioral varieties. It should be underscored that, in the present context, the use of defensive strategies is not necessarily considered pathological. As we will soon see, some of the strategies described here rather facilitate than obstruct creative functioning.

Repression is often associated with histrionic disturbances. Here the spectre is wider. But repressive protocols in adults often differ from others by being lively and filled with dramatic events. The adult strategy is assumed to originate in direct denial at the behavioral level in children of preschool age: (a) eye shutting or other refusals to see the threat; (b) reports that the person in B has shut his or her eyes; (c) the threat becomes stiff or otherwise drained of life, disguised, or made harmless (the most typical sign in protocols of adults diagnosed as primitive hysterics); or (d) the meaning of the A-stimulus is transformed to something both very different and harmless, like a house, an oak outside the window in B, or a bike.

Isolation is a category that includes signs that are supposed to be indicative of obsessive disturbances. One typical characteristic of these strategies is the separation of the hero in B from the threatening emotion. Even negation implies a distinction of perception and the conception about something threatening: (a) magic and primitive isolation (e.g., when the perceiver tries to literally isolate the threat at the projection screen or to subjugate A with his "powerful gaze"); (b) increasing the distance between A and B; (c) denying the threat with a "not an unpleasant man"; (d) turning away the ugly face of A; (e) shielding the person in B from A by means of curtains, covering the whole window with a white surface; and (f) just refusing to see anything additional in B once the latter has been correctly reported.

The last class we are going to describe in detail involves *projective* strategies. They imply that the perceiver refuses to let the threat establish itself in its own right but interprets it via changes in the habituated perception of B. These changes are usually more accentuated in children than in adults, where stimulus-distant changes often represent gravely pathological paranoid ideas. In the present context a milder variant of projection is more relevant. Here the basic meaning of B is not violated but the size and perspective may change, as if B were made of elastic rubber.

The last strategy is *depression*. Depressive signs are classified as defensive strategies in so far as they alleviate anxiety by retarding the life processes. The percept-geneses reconstructed in the MCT thus becomes stereotyped and empty.

ANXIETY AND CREATIVE FUNCTIONING

Anxiety has often been associated with creative productivity. Eiduson (1962) observed it in scientists, mainly in combination with their research work. After studying artists, Hammer (1975) concluded that a certain level of tension and anxiety was a prerequisite for mature creative production. Accordingly, in their analysis of a group of scientists and humanists, Smith and Danielsson (1978) specifically attended to the problem of anxiety. The MCT was not employed in that study, but an interview disclosed strong emotional engagement coupled with an inclination to become distressed in these people, particularly those who scored high on the CFT.

The MCT was introduced later (Smith & Carlsson, 1990) to children aged 7–11 years. Interest was focused on a subgroup of 10–11-year-olds representing a developmental peak in creative functioning (after a slump during the preceding years). On the basis of the MCT, subjects were divided in three subgroups: those with excessive or grave anxiety or low anxiety tolerance (disclosed by the use of regressive defensive strategies), those with moderate anxiety, and those with very low or no anxiety. Professional artists judging the children's artistic products reacted most favorably to products of children with moderate anxiety. CFT scores also tended to be higher in this subgroup. When signs of high creativity in CFT thinned in a typically prepuberty cohort of 12-year-olds, the number of anxiety signs in MCT also decreased.

A direct test of the effects of anxiety on creative functioning was reported by Smith and Danielsson (1979). Subjects were aged 19–49 years; 21 were placed in an experimental group, and 22 in a control group. When the CFT ascending series had reached the point where the subject gave a correct report, the experimenter introduced a subliminal stimulus. It appeared immediately before the CFT stimulus in five paired presentations. The subliminal stimulus was a threatening face in the experimental group, and a meaningless geometrical design in the control group. After careful scrutiny in an interview each subject was characterized with respect to artistic or literary creative activities, oceanic feelings, early childhood memories, color dreams, attitude to dreaming, and anxiety. Based on these data, subjects were placed on a 4-step scale ranging from high creativity to a lack of it.

After equalization with respect to the creativity scale, the two groups were compared on the descending CFT series. The data may be summarized in the following way: Excepting the totally uncreative group, the effect of threat was to enhance the creativity scores. Most susceptible to the subliminal influence was the subgroup of medium or "latently" creative individuals, mostly consisting of

those who had once been creatively productive but were currently more occupied with the problems of everyday living. A ceiling effect prevented the manifestly creative from increasing their scores more than marginally. It is worth noticing that those who refused to acknowledge an inner world of fantasy were also those who resisted the subliminal manipulation.

A special study of psychiatric patients (Smith & Carlsson, 1990), using the same design, confirmed that, together with depressive retardation, excessive anxiety is a solid block to creative functioning. There were no psychotic or organic cases in this group of 31 adults aged 29 to 60 years. As could be expected, the subliminal threat was almost entirely ineffective.

We can use one of the subjects in this study to illustrate how creative functioning may come to a standstill as a result of excessive anxiety. The subject's MCT protocol was colored by anxiety of moderate strength. Her tactics for warding off the threat were a mixture of sensitive reactions and high-level repressive transformations, most of them rather tentative and inefficient. In the CFT she belonged to the group that received the subliminal threat.

In the following portions of a CFT protocol, the numerals represent specific exposure levels (1 equals 10 ms; 2 equals 14 ms; 3, 20 ms; and so on). The first exposure at level 1 is called 1a, the second exposure at the same level, 1b. Then follow 2a, 2b, 3a, 3b, and so on.

ASCENDING EXPOSURE SERIES PROTOCOL

.
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.

7b. Like a human figure, a shadow.

8a. Saw eyes, no, a head. Male, female perhaps.

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.
.

10a. Abstract contours—like a mushroom.

.
.
.

12b. Shoulder—and a head behind.

13a. Uncertain, looked like a vase, to the right perhaps a shadow over the mushroom.

.
.
.

16b. A bottle and a basket.

After this the picture is presented another five times, each presentation preceded by the subliminal threat.

DESCENDING EXPOSURE SERIES PROTOCOL

14. I feel uncertain again. Could it possibly be a human being?
13. Like a bottle or a body.

.
.
.

11b. It's becoming darker.

.
.
.

10b. The picture looks more compressed.

.
.
.

8a. *Only a small, small light...I didn't see the picture.*
8b. The same as before.
7a. The same object, but smaller.
7b. Still smaller.

The series continued to the end in the same constricted manner.

Our subject offered alternative interpretations of the theme in the ascending series, but, like many children, she carried an old interpretation along even when she has found a new one. This makes her final interpretation rather shaky, even if she seems to settle on the objectively correct meaning (a bottle and a bowl/basket). In the very beginning of the descending series, she again vacillated between two interpretations. Signs of anxiety (11b) and sensitivity (10b) appeared, and suddenly the structure of the picture collapsed entirely (8a), a sign of strong anxiety breaking through. After that, no alternative interpretations were offered. By continually shrinking the picture the subject appeared to distance herself from its dangerous connotations.

The subject was a craftsman, engaged in creative production. Even if the anxiety signs in the MCT were not grave, her defensive arsenal was probably ineffective, leaving her open to the subliminal manipulation. Her tentative attempts at offering alternative interpretations in the beginning of the descending series, even if they did not represent real deviations from an ambiguous final phase, at least promised a more creative continuation. When the effect of the threat had finally made itself felt, the series became empty and rigid.

We would like to speculate about why moderate anxiety seems to be typical

of creative individuals. In a developmental study, where one of the psychometric methods was the MCT, Smith and Danielsson (1982) defined anxiety as successively internalized childish fear of external situations. In classical psychoanalysis, anxiety was triggered when unacceptable impulses threatened to surface into consciousness. We do not flatly reject such a definition but find it too narrow. A more generous alternative would be fear of losing control, of being overwhelmed by chaos (cf. Csikszentmihalyi, 1990). In states of panic the loss of control is definite. Because creative individuals have a relatively easy access to the roots of their constructive processes, they have reason to be more apprehensive than others. They can more readily anticipate the risks of uncorking the bottle because they know of the genie crouching inside.

In addition, creative individuals appear to be very tolerant of anxiety. Even if creative people also mobilize defenses to alleviate unpleasure, the mobilization is often temporary. They seldom try to deplete their resources by regressing to primitive forms of defense, like the behavioral varieties typical of preschool children and often tried by anxiety-ridden psychotics (Smith & Carlsson, 1990). The main reason for this tolerance could be their ability to handle anxiety, not by warding off, denying, or distorting provocative contradictions and conflicts, but by transforming them to symbolic representations and thus making conflict resolutions easier to accomplish. At the same time, the state of moderate anxiety serves as a potent motive force for creative activity, without which the creative person would not feel really alive.

A supportive argument starts with observations made in many studies of creative people that flexibility is one of their most prominent characteristics. This flexibility could attest to their freedom from or, more likely, tolerance of fear and unpleasure. Perhaps this freedom is the same described by Freud (1961): "Another technique for fending off suffering is the employment of the displacement of libido which our mental apparatus permits of and through which its function gains so much in flexibility" (pp. 79-80). Associations to the just-mentioned symbolic transformations seem unavoidable.

DEFENSIVE STRATEGIES AND CREATIVE FUNCTIONING

Because anxiety and defense are twin concepts, part of the defense theme was presented in the preceding section. However, by further describing the defensive side of the picture, we will be able to throw more light on the main subject of the present chapter.

Kubie (1958) did not appreciate the idea, common among romantics, that neuroticism can be a fertile breeding ground for creative productivity. We agree with Kubie, because the percept-geneses of really creative individuals are seldom dominated by defensive blockings. One apparent exception to this rule is repression, particularly in its mature, high-level forms. Still, although this defense is the only one that is associated positively with CFT scores, defensive mixtures like repression, isolation, and sensitivity scored in one and the same

protocol are more typical of high creativity. Empirical proof for this was presented by Smith and Carlsson (1990).

The high-level forms of repression, as we have described them already, are stimulus-distant and flexible. They should not be confused with the more primitive, stimulus-proximal forms often found in histrionic cases. The former strategies attest to the ability of creative people to employ symbols as representatives of frightening intrusions in their private world, an ability facilitating the combination of conscious and nonconscious modes of operation, and thus keeping the communication "inward" channels open. As Greenacre (1957) and Arieti (1976) made clear, wealth of symbolization is central in artistic functioning taken more generally. Creativity itself can thus be considered as a high-level defense, or if one prefers not to stretch the defense concept too far, a coping strategy.

Storr (1976) described a compulsive side of creative people. In our subjects, the compulsive strategy of isolation apparently coexists with repression without blocking creative initiatives. The way they use isolation, we presume, is not primarily to screen off the affective side of themselves but rather to minimize and control annoying and irrelevant noise (from outside, but also from inside) in order to optimize the flow of ideas from relevant sources. They thus employ isolation in a flexible and adaptive way, and they are not prone to get stuck in one dominating defensive pattern.

When dominating, the constructive processes primarily found in compulsive people are countercreative (Smith & Carlsson, 1990). In a recent study of 70-year-olds, Smith and van der Meer (1990) reported interesting results of a cluster analysis. The most uncreative of the four clusters was dominated by isolation, defined by the MCT. Moreover, practically all signs of anxiety were absent. This is especially important given what was said about anxiety.

The negative effects of depressive retardation on creativity were outlined by Smith and Carlsson (1988). A typically depressive protocol in MCT is characterized by stereotyped repetitions of low-level interpretations of the A-stimulus: "something," "something," and so on. There are no meaningful associations, and no emotional coloring. The CFT series of these people are practically dead. A similarly empty quality is typical of percept-geneses resulting from repetition of the same stimulation again and again. The microprocesses become more and more abbreviated and automatized. When the emotional coloring has disappeared, the outcome is boredom, a most uncreative state of mind.

GENERAL DISCUSSION

Anxiety has been a crucial theme in our presentation so far. Without anxiety, it seems, creative functioning comes to a standstill. At the same time, there can be too much anxiety; anxiety tolerance is therefore crucial. In order to tolerate anxiety, one would need to be equipped with appropriate tools for mastering it,

preferably a broad array of easily accessible possibilities. A mild, anticipatory form of anxiety, also reflected in the MCT protocols, is probably favorable. It can be seen as a necessary prerequisite for what Jung termed *openness and readiness for inner signals*. According to Jung, this openness is easily lost in modern, sterile society.

It is not enough, however, to have free access to your inner thoughts and feelings. You must also be able to handle what is apt to come out of the bottle. Symbolization seems to be one of the crucial creative strategies, illustrated in the MCT by stimulus distant transformations of a threat. The MCT is built on the presumption that the perceiver's way of meeting an external threat to an identification figure is a reflection of his or her way of meeting an internal threat. To paraphrase a well-known psychoanalytic expression, it is a matter of how to handle the return of the repressed in an optimal manner.

Still, we have to inquire more precisely about the nature of symbolization. Symbols have more than just annotative character; they represent something above and beyond themselves. Consequently, symbols can signify the unconscious and conscious worlds at one and the same time, combining primary and secondary forms of thinking, if one wishes to borrow a useful psychoanalytic dichotomy. It is via symbols that, in spite of the risk of being overwhelmed by chaos or destructive forces, new images, thoughts, combinations, and ideas can be carried forth in processes of reality construction, symbols being filled with new, often explosive meaning behind a more or less innocuous surface. Even if anxiety and discomfort are apt to be companions of these processes, they are followed by joy and relief once the new product is accepted in consciousness.

A one-dimensional and inflexible defense strategy would easily block creative functioning. The depressive individual, for instance, retards his or her constructive processes in a stereotyped manner, fearing to enter the shadow side, to get stuck in darkness, to be devoured by it. The compulsive person, instead, does not recognize the shadow side, at least not as a creative possibility, and cuts off the crucial affective contact. To control is energy consuming. Little energy is left for "dangerous" play with unknown forces.

The involvement of affect has been a conditio sine qua non for our discussion of creative functioning. Two reasons have been emphasized in this chapter: First, without emotional/affective involvement there can be no deep and lasting motivation; and second, without open access to the roots of our constructive processes, we cannot break the dominance of sententiousness, of too much conventional order.

When discussing this topic specifically within the percept-genetic frame of reference, we should bear in mind what was just mentioned about the mastery of destructive forces which have been let loose in creative work. Access to the inner realm of the psyche may be essential for that kind of work, but "so is a strongly functioning ego, capable of judgement, inhibition of immediate impulse, persistence, and control" (Storr, 1976, p. 266). And we might add to this list, in the spirit of Erikson (1980), a strong feeling of personal identity.

Figure 7.2. Percept-geneses with or without generative sources for creative functioning.

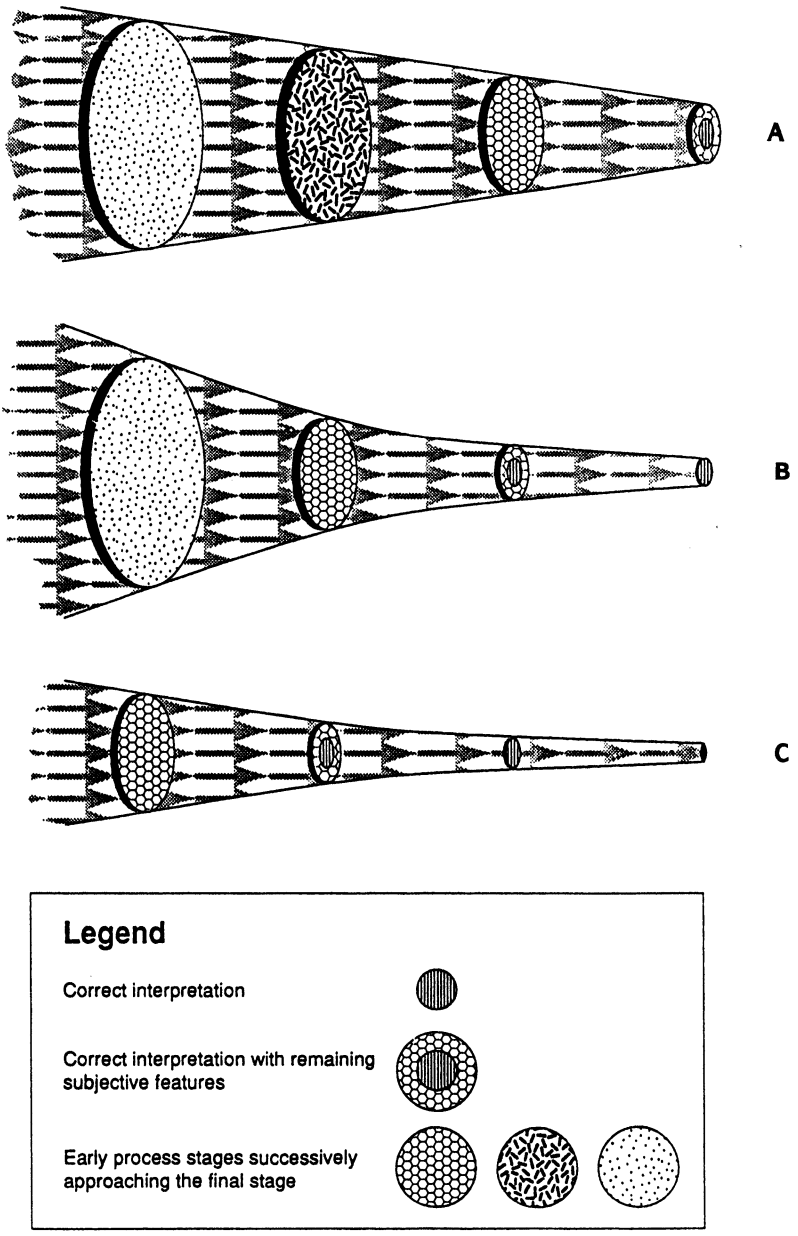

Illustration: Olle Olsson

Figure 7.2 is a variation of Figure 7.1, with three alternative types of percept-geneses. In alternative A, the qualities of early process stages permeate later stages close to the end stage. Alternative B shows a case where these qualities are quickly disqualified, in the process leaving the end stage stripped of emotional coloring (at least relatively, in comparison with alternative A). Alternative A is supposed to represent fertile conditions for creative functioning, and B a lack of such conditions.

In alternative A, reality retains much of the enticing and magic character typical of childish experiences. Such a person is capable of feeling awe. It is no wonder that many creative individuals tend to oscillate between childish and mature self-images, and that they like to reactualize their subjective interpretations in the descending CFT series.

In alternative B, the primitive roots of perception are in principle still accessible. But because of the rapid disqualification of early process qualities, the roots are more distant, and the reconstructive operations meet with greater resistance. Uncreative people are less interested in their childish past; they have definitely matured and left childhood behind; they believe in the indisputable reality of their final percept-genetic stages.

A percept-genetic process is shaped by life experience. The emotionally rich and varied life is likely to leave other marks on future constructive processes than a life experienced as monotonous and boring. It is, of course, not what we as independent observers believe should be judged as a rich or boring life, but how the individual himself or herself has seen it. The consequences could, in the latter case, be alternative C in Figure 7.2. Here not only the distance to early process stages has increased, but these stages themselves have dried out.

This has been shown to already be happening to many individuals in early middle age (Smith & van der Meer, 1990), perhaps because of the increasing pressure of daily existence in the 20s. But the loss of creative promise can also be apparent. For example, it has often been reported by university teachers that promising young adepts turn out to be disappointments in their 30s, if not before. In these cases, we suspect, promise can have been a misperception by teachers impressed by a young person's readiness to learn and adapt, not by the ability to generate fresh, deviant ideas. After a decade or so, these B cases have perhaps become C cases, surly and envious of more richly endowed A cases, ready to kill their work by means of destructive criticism. Psychoanalysts would probably diagnose them as compulsive anal sadists.

We have talked a great deal about inner contradictions. Normal life experiences abound with them, being more intrusive the more easily the subject can reconstruct early process stages. And contradictions breed inner conflicts and discomfort. But creative people, as our main argument implies, are in the possession of tools to resolve conflicts. In fact, they are motivated to use them. The more pronounced the contradictions, the greater perhaps the scope of the creative product. Important creative works are often the results of attempts to

"tame a tiger." Without contradictions, when one affectively loaded idea dominates the view of existence to the exclusion of all doubt, creative thinking is no longer possible. Religious fundamentalism is one example, as so terrifyingly described by Naipaul (1991). All solutions to life's problems are reduced to clichés, repeated over and over again.

But what of more cognitively oriented activities? For the superficial observer, they do not seem to be dependent on personal experience. Research workers do not function in exactly the same way as artists and poets (Smith & Carlsson, 1990). They depend more on repeated feedback from the objective world of science. They cannot, however, function creatively if they do not make their research problems part of their personal life, that is, if they do not introject them. The contradictions and puzzles in their research become internal contradictions that demand to be disentangled. A purely cognitive creativity is a dying myth.

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8

Making It or Finding It

Gordon M. Becker

This chapter explores the psychological meaning and the social implications associated with the current emphasis on being creative and compares it to an earlier emphasis on discovery. It is argued that the present emphasis on creativity encourages and supports the self-centeredness, egotism, competition, greed, selfishness, stress, and suffering that appear to be increasing in the world today, whereas the former emphasis on discovery encouraged and supported humility, self-improvement, compassion, and appreciation of others. It is further argued that the desire to create and the desire to discover are both based on dissatisfaction: one with the world and the other with one's self. Both attitudes, as well as the creations and discoveries that result from them, are shown to be more likely to increase rather than to decrease suffering. The chapter concludes that we can achieve more satisfaction, peace, and harmony if we place less emphasis on the "star" and, instead, give more credit and more encouragement to being a "supportive" team player.

This chapter explores the psychological meaning and the social implications that result from emphasizing creativity more than discovery in science and art. It is argued that educators and social scientists are now placing too much value on

*This chapter includes many helpful suggestions made by Mark Runco, and by students in the author's Personality Proseminar conducted at the University of Nebraska at Omaha (UNO) in the Spring of 1991.

creativity and are thereby supporting and perpetuating an unwholesome emphasis on "self-expression" and "self-esteem," both of which tend to increase self-centeredness, egotism, competition, greed, selfishness, stress, and suffering (Ellis, 1976).

WHAT DOES IT MEAN TO BE CREATIVE?

Whenever I read about research on creativity, I am reminded of a cartoon by Abner Dean showing a small hill in an otherwise flat, arid, and overcast land. At the top of the little hill is a tree. This tree is the only vegetation still standing. It looks dead like the rest of the land. A conglomeration of junk is unimaginatively arranged on the bare branches, with no obvious meaning or beauty. Naked people are filing by with their heads bowed, staring at the ground with vacant eyes, paying no attention to the hill, the tree, the junk, or a man on the hill beside the tree. A single ray of light shines on the man, who is beaming with joy, jumping up and down, pointing to the junk-laden tree, and shouting to the inattentive, expressionless people shuffling by, "Look! I made it myself."

The cartoon captures what we generally mean when we use the term *creative*: the ability to make something that no one else has made, to produce something novel, something original. The creative person conceives something new, makes something real that was unreal (i.e., fictitious, imaginary), actualizes what was formerly only potential. These are the commonly held conceptions of creativity, but researchers have not agreed, and still do not agree, on what they mean by creativity (Glover, Ronning, & Reynolds, 1989; Krebs & Shelley, 1975; Runco & Albert, 1990), or how to measure it (Brown, 1989; Hussain, 1988). Current research about creative people, about how they operate, and about what makes them the way they are (or prevents them from becoming what they could have been) are all worthwhile undertakings. The problems raised in this chapter are not that studies of creative people and creative processes are being undertaken, but rather that the term *creative* misleads people by emphasizing the ego and control rather than openness and cooperation. My contention is that the current use of the label *creativity* obscures the importance of discovery (Getzels & Csikszentmihalyi, 1976), of specialized, technical competence (Root-Bernstein, 1988),and it underplays the importance of asking the right question (Brown, 1989; Csikszentmihalyi, 1990; Ghiselin, 1952; Henle, 1974). These problems arise in part when the results of laboratory studies by "objective scientists" using unknown and unproven subjects are equated with the very personal and subjective experiences of renowned creative people. Misinterpreting what creative people say about themselves, especially their own use of the word *creative*, is another source of misunderstanding.

Roe (1976) argued for carefully distinguishing between the thing that is created and the process that creates it. Epstein (1990) stated that he

> avoided using the language of creativity in discussing generative phenomena. Such language is heavily value laden... and hence it may obscure an understanding of the generative phenomena on which it depends... the language of creativity is often reserved for the *product* of behavior, not for the behavior itself. The product is of necessity a poor index of the creative process.... The language of creativity obscures these distinctions and hence should be used with great caution. (p. 139)

Although Alvarez (1972) and Rosenberg (1966) suggested that the identity of the artist and the creative process are imbedded in the finished work, you can't be sure from the finished product alone whether the work was an accident or the actualization of something created or discovered. Some artists stare at the blank, raw media until something in the media emerges for them to see. They discover the eagle that lies within the uncut piece of marble, the landscape that lurks in the unpainted stretched canvas, the scientific law or relationship that exists in nature. Some artists, on the other hand, "create" the image themselves and then impose the work upon the media. Some scientists believe that we create our reality, whereas others believe that we discover it (Casti, 1989). Looking at the finished product, the viewer cannot tell which method the artist or scientist used. However, it is interesting to note the Csikszentmihalyi (1990) found that those artists who used a discovery orientation were more likely to be successful as "creative artists" than those who did not use such an orientation.

ON DEFINING CREATIVITY

Gedo (1990) defined *creativity* "as the healthy enjoyment of the search for novelty" (p. 35). The definition of creativity as a search process is misleading, in so far as creativity generally implies that something is *made* rather than *found*. If a search is successful, one finds something new. The label discovery fits such a process better than creativity. A more consistent definition of *creativity* would be "the healthy enjoyment of *making* something that is *original*." The significant differences between *making* something and *searching* for something is lost in Gedo's definition.

Moustakas (1961) defined creative as the "experience of expressing or actualizing" (p. 76) which "emerges from one's own search into oneself" (p. 78). He made "self-actualization" a creative act rather than a cleansing or polishing of something that has been obscured. His emphasis is consistent with the North American ideal of the self-made individual, with the glorification of originality, power, and production. Like Gedo's definition, "search" is a part of the process, but now only as a prelude to the creative act which is bringing forth (expressing or actualizing) the discovery. Something is discovered that was not apparent before. But it isn't finished; it hasn't been born yet. It is like a seed that must be planted and cared for. Moustakas's creative act appears to be much more like the actions of a farmer, gardener, midwife, or obstetrician, who brings forth what has already been conceived. They don't create the plant or the child, even though

they bring it to fruition. The farmer, the gardener, the obstetrician, and the midwife are considered to be skillful artisans rather than creative or creators.

Moustakas's use of the label *creative* reflects the ambiguous use of the word *creative* and the common confounding of actualization and discovery. The word *creative* emphasizes the power of the creator to *produce* something new rather than the skill and knowledge required to set the stage for, to recognize, to bring forth, and to show a discovery (Gruber, 1988; Root-Bernstein, 1988).

The beam of light shining on the creative man in the Abner Dean cartoon captures another aspect of what it means to create something. The label *Creator* is one that is given to God. Everyone who is called a *creator* acquires, in at least some small way, some godlike attributes simply from sharing the same label as God. Maybe that is part of the reason why the term *creative* has such positive qualities and why some people, today when the current belief is that anyone can be anything, aspire to be creators and, like a god, do their own thing (Shoham, 1985). Maybe that is why the label *creator* is preferred to *discoverer*.

Being godlike was not always desired. In fact, until the end of the Middle Ages, when the church was a dominant social force, people were cautioned to "know thy place" and not to aspire to be a god. The display of creative powers, in those days, was more likely to be attributed to the Devil rather than God. Early artists were respected as "tools" of God, channels, whose work was "inspired" rather than "created" by them. Those who created their own works ran the risk of being accused of witchcraft, sexual perversions, and other "immoral" acts. Art, acting, writing novels, and composing jazz for entertainment (in contrast to national or religious-inspired music) were, in the not too distant past, notorious occupations into which "god-fearing" persons would not enter.

Today, with the decline of the power of the church, artists, actors, scientists, and all kinds of creative people are not only highly respected,but also highly paid; their opinions are given great weight, and they achieve powerful positions in government and industry. The power to create is no longer feared but is now highly regarded.

How different it is to discover something. In contrast to the sense of personal power that accompanies creation, the discoverer is impressed with the thing discovered, its beauty and interrelatedness, including one's own intimate relatedness to things "outside" the self. The thing discovered takes precedence for the discoverer, and becomes the center of attention, rather than the person who made the discovery. Whereas the creator enhances his or her own ego, the discoverer loses at least some of his or her ego. The discoverer and the creator feel much different about themselves and others.

ATTITUDES AND MOTIVATION

Every act of creation or discovery does not require that the individual be motivated to create or discover. In addition to accidental discoveries and

accidental creations, there is also the type of creation that Moustakas (1961) pointed to when he stated that Martin Buber:

> expresses the indelible creativity of man as follows: "Every person born into this world represents something new, something that never existed before, something original and unique. It is the duty of every person to know... that there has never been anyone like him in the world, for if there had been someone like him, there would have been no need for him to be in the world. Every single man is a new thing in the world and is called upon to fulfill his particularity in this world. (Moustakas, 1961, p. 77)

In this way, the very act of living is creating. Every in-breath is new and different. Every out-breath is new and different. When we walk across the snow, the sand, wet earth, we create footprints, whether we want to or not, whether we like it or not. It happens. It does not require any motivation to make such impressions, to leave such marks in the world.

Every moment is truly new and filled with new creations. Every thought is slightly different, each, in some way, an original creation. There is no way that we can avoid or stop creating—or is there?

Ray (1991) wrote, "One of the biggest myths is that there is such a thing as *creative people*. THE TRUTH: *Everyone* is creative." He recommended "four tools" for being more creative: (a) "having faith in your own creativity" and "surrendering to the answer already in you"; (b) absence of judgment, especially regarding your own limitations; (c) precise observation of what's going on; and (d) asking penetrating questions. The attitude underlying these rules appears to be one of problem solving and self-actualization rather than of one trying to create something new. The label *creative* has become so popular that it is replacing these other terms, despite the inaccurate connotations of the label.

Many creative people see themselves as discoverers rather than creators, even though they call themselves creative. The distinctions between being creative, being a creator, and discovery are therefore very important (Bailin, 1986). It is interesting, in this regard, to review the attitudes of outstanding "creative" people. Rosner and Abt (1970) interviewed 25 creative people: 10 scientists identified by the editors of *Life* magazine for their achievements in science, and 15 artists nominated by the art critic Clement Greenberg as especially creative in their specific media field. The authors concluded that,

> along with a sense of surprise, is the feeling that nothing is really "created." Ideas may emerge unexpectedly but it is implied that they have been available all the time. One feels the process is one of discovery, of evolution... perhaps the most consistent factor that emerges is that of keeping an open mind... of attacking problems with a mind free of preconceptions, premature conclusions, and patterned responses. They call for a free and relaxed state of mind... A number of our contributors refer to having to depend upon one's self with no prescribed guide or rules; of "finding one's own way." On the other hand, we come across references

> to what may appear to be passivity on the part of the creator, as if he or she had nothing to do with the ideas or work. One cannot help but notice phrases such as "the idea came to me," "the solution presented itself," and "it was in the back of my mind." Given a certain modesty factor, it still appears that some individuals do not consider themselves to be the prime movers, but simply instruments through which certain operations take place. Of course, there is no question that the individual is responsible (though the phenomenological descriptions are enough to start one thinking along mind-body dualistic lines). (Rosner & Abt, 1978, p. 383)

Note that "the most consistent factor" that emerged was the importance of having an open mind. Having an open mind means to be willing to let ideas from outside the mind enter. This is much different from trying to create something, to emit rather than ingest. For both discoverers and creators, it is not enough merely to see something new. The new thing must be actualized so that others can also see it. The discoverer must show others the discovery, must present proof, must create a theory or experiment, or at least an acceptable demonstration or argument (Root-Bernstein, 1988). An open mind facilitates discovering something new, but the creative person must then close his or her mind, holding onto the new idea and make it visible to others. The open mind that characterizes the discovery phase is significantly different from the closed mind of the subsequent phase. Barbara Klugh (personal communication, August 22, 1991) stated,

> In some ways I think of the shifting from open to focused mind as wide angle lens to narrow (close-up) lens or as female (wide-angle, right brain, receptive) to male (focused, left-brain, linear). In a new situation I can often shift on purpose to a wide angle. This seems to decrease fears by just taking the whole scene in without judging it.

Note also that Rosner and Abt (1970) found "passivity on the part of the creator, as if he or she had nothing to do with the ideas or work...that some individuals do not consider themselves to be the prime movers" (p. 383). This attitude of not being a "creator" but rather "an instrument through which certain operations take place" is consistent with the emphasis on the "open mind" of the discovery phase. The person is willing to go along with whatever it is that is "creating" the idea without interfering with the process. An outsider thinks the person created the whole thing, including the idea, but many creative people feel that they are merely "instruments" serving some greater force rather than directing the show. This attitude of being an "instrument," of passivity, of having a "open mind" is significantly different from that of being "creative," of initiating and directing the activity. The person who conceives of himself or herself as the creator takes credit for being the master with sufficient power to conceive and bring to fruition the creation. The person who conceives of himself or herself as an instrument, on the other hand, takes credit for being a good servant to the prime mover or whatever it was that conceived such a wonderful

work. The creator admires himself or herself. The person who considers himself or herself as an instrument admires something beyond himself or herself. One is self-oriented; the other other-oriented. One is likely to become egotistical, the other humble. One is power oriented. The other service oriented.

Creations and discoveries are often deliberate "active, goal-directed" behaviors (Runco & Albert, 1990, p. 256), both of which spring from desire. The motivation to create is based on the desire to change the world, to add something that will make the world more satisfying, interesting, or exciting. Creating does not require changing the self. The desire to create stems from dissatisfaction with the world as it is. When we create, we work on the outer world. That, of course, could be a defense against and a projection of dissatisfaction with ourself (Nebel, 1988). Creative people do not have to look at themselves, but enhance the self (the ego) by taking full credit for the creation that they themselves made. The creation enhances their sense of power. The Western emphasis on being "action oriented," a "mover and shaker," one who makes the world a better place, leaving the campsite better than the way you found it, being objective, and not letting your personal feelings affect your actions, are all consistent with being "creative."

The desire to discover, on the other hand, stems from dissatisfaction with one's own knowledge about the world rather than from dissatisfaction with the world itself. When we search for something, we are dissatisfied with ourselves. There is something we do not know that we want to know. When we find it, we have improved ourself by increasing our own knowledge rather than changing the outside world. Although the credit for a discovery, like a creation, enhances the ego, the discoverer knows that luck, or grace, played some part in the discovery, and hence there are always elements of humility and gratitude whenever we find what we were looking for. The searcher/discoverer attitude is much more consistent with the Eastern view, working on the self rather than working on others. Of course the knowledge gained from discovery and the applications of a creation are often of value to others and make other people happier, which leads to many kinds of rewards for the discovery or creation.

Although creations and discoveries sometimes appear to be accidents, with no deliberate search preceding the discovery and no directed effort preceding the creation (cf. Gruber, 1988), most discoveries and creations, even the accidents, are preceded by enormous work and attention (Root-Bernstein, 1988). Serendipitous events are generally accompanied by surprise and sometimes awe that the world is capable of such miraculous things. Both the creator and the discover experience joy or sadness depending upon whether the new thing enhances or detracts from their life. Although the social criteria used to evaluate the worth of a creation are generally the same as those used to evaluate a discovery, both based on how much benefit others get from it, significant differences can be found in the personal criteria of creators and discoverers in regard to the importance of chance (accident) for the emergence of the final product. The

accidental nature of a discovery does not detract from the discoverer's satisfaction, because finding the "answer" satisfies the desire to know that generated the search, and the credit given by others is usually not diminished by the accidents or luck that might have played a part. The satisfaction for the creator, however, is diminished by accidents, because they show that the creator actually lacked adequate power to control the process that resulted in the creation. The creator cannot take as much credit as when the creation is made under the complete control of the creator.

THE RELATION OF CREATING TO SUFFERING

Shoham (1985) made a penetrating study of the creative, alienated, sensation-seeking, active, controlling Sisyphean personality type, and the revelation-oriented, self-effacing, intropunitive, truth-seeking, Tantalic personality type. He cited Albert Camus and argued that the inescapable failures of both Sisyphean creativity and Tantalic revelation result in existential despondency. In his words:

> Creativity... abrogates the object relationship between master and slave.... The Sisyphean rebel's creative involvement with his object-burden substitutes the jerky achievement-motivated jumps from one interim goal to another, which, once achieved, becomes stale and yet another goal must be found to take its place. Sisyphean creativity tries to achieve a Buberian dialogue between self and object. Inauthentic creativity is the petrified manufacturing of books, paintings and music to satisfy the tastes of the generalized other, so as to make the best seller list or to hit the "hit parade." Authentic creativity, on the other hand, is the extreme absorption of the creator in his task to the almost total extinction of his surroundings, other people inclusive.... For the Tantric rebel "artistic creation is a demand for unity and a rejection of the world." (Shoham, 1985, pp. 11–12)

The inevitable failures and suffering associated with creativity and with the demand for unity stem from wanting the world, or some aspect of it, to be different from the way it really is, or at least the way it is perceived. The struggle to get the world to match one's ideal can end only when one accepts the world as it is as ideal (no flaws). Buddha recognized that such acceptance depends on one's thinking and perception, and that, to stop suffering, one must *accept* the world as it is rather than *create* a new one. In the *Mahanidana Sutta: The Great Discourse on Origination*, he said:

> There are, Ananda, these eight liberations. What are they? (1) Possessing form, one see forms. That is the first liberation. (2) Not perceiving material forms in oneself, one sees them outside. That is the second liberation. (3) Thinking: "It is beautiful," one becomes intent on it. That is the third. (4) By completely

transcending all perceptions of matter, by the vanishing of the perceptions of sense-reactions and by non-attention to the perception of variety, thinking: "Space is infinite," one enters the Sphere of Infinite Space. That is the fourth. (5) By transcending the Sphere of Infinite Space, thinking: "Consciousness is infinite," one enters and abides in the Sphere of Infinite Consciousness. That is the fifth. (6) By transcending the Sphere of Infinite Consciousness, thinking: "There is no thing," one enters and abides in the Sphere of No-Thingness. That is the sixth. (7) By transcending the Sphere of No-Thingness, one reaches and abides in the Sphere of Neither-Perception-Nor-Non-Perception. That is the seventh. (8) By transcending the Sphere of Neither-Perception-Nor-Non-Perception one enters and abides in the Cessation of Perception and Feeling. That is the eighth liberation.... Ananda, when once a monk attains these eight liberations in forward order, in reverse order, and in forward-and-reverse order, entering them and emerging from them as and when, and as long as he wishes, and has gained by his own super-knowledge here and now both the destruction of the corruptions and the uncorrupted liberation of heart and liberation by wisdom, that monk is called "both-ways-liberated," and, Ananda, there is no other way of "both-ways-liberation" that is more excellent or perfect than this. (From Walshe, 1987, pp. 229–230)

Buddha is also said to have suggested the following,

Unflinching vigour I have stirred up, clear mindfulness I have aroused, my body impassible, calm, my mind concentrated and one-pointed. Then I... aloof from pleasures of the senses, aloof from unwholesome states of mind, entered into and abided in the first *jhana*[1] which is accomplished by initial thought and discursive thought... with the mind inwardly tranquillized and fixed on one point, I entered into and abided in the second *jhana* which is devoid of initial and discursive thought, is born of concentration and is rapturous and joyful... I entered into the third *jhana*... the fourth *jhana*... which has neither suffering nor joy, and is entirely purified by even-mindedness and mindfulness. With the mind thus composed, quite purified, quite clarified, without blemish, without defilement, grown soft and workable, fixed, immovable... my mind was freed from the outflows of sense-pleasures, becoming, speculative views and ignorance. In freedom the knowledge came to be: I am freed; and I comprehend that birth was destroyed, brought to a close the Brahma-faring, done what was to be done, and there was no more of being such or such... ignorance was dispelled, knowledge arose, darkness was dispelled, light arose even as I abided diligent, ardent, self-resolute. (Conze, 1990, pp. 60–62)

Thus the end of suffering comes, according to Buddha, from cleansing out rather than accumulating, from letting go rather than acquiring or holding on,

[1]*Jhana* is the Pali name for the Sanskrit term *Dhyana*, which T.O. Ling (1972) defines as follows: "Buddhist technical term for progression through certain mental states, the climax of which is a special experience of enhanced psychic vitality. The use of the term may have been pre-Buddhist" (p. 151).

from nondualistic thinking, from emptiness, from no more births and deaths, from the cessation of "creating." When desires no longer arise, one is satisfied with whatever is and whatever it becomes. This is in sharp contrast to the "hope to make some change" that characterizes creative people (Gruber, 1988). The satisfied person does not prefer something that is not already here, but rather enjoys everything as it is and as it changes moment by moment.

Becker (1990, 1991) showed that having no preferences maximizes personal satisfaction (expected utility), minimizes regret, and eliminates suffering. The proof is quite simple. Given any set of preferences for the possible outcomes (consequences) in a situation when the person does not know with any certainty which outcome will actually occur, the person's expected utility can be increased by raising his or her satisfaction for any of the outcomes. The maximum expected utility is achieved by raising the satisfaction of all outcomes so that they are all as desirable (high) as the most preferred outcome. When the same high satisfaction level is associated with all outcomes, it doesn't matter which outcome occurs. The person always gets the best—and hence is never dissatisfied with the situation.

What happens when something new is created? The outcome associated with the creation is either more, less, or of equal satisfaction as the best of the old outcomes. If it is better than the old best, then the creation increases satisfactions when it is obtained, but there is risk and regret when it is not maintained. Thus even the creation of a better outcome leads to regret if there is no guarantee that the new outcome will occur without exception. Because such a guarantee is, for all practical purposes, impossible in this ever-changing world, then even the creation of an outcome better than the best can increase rather than decrease suffering. If the creation results in less satisfaction than the old best, then it is another source of regret and suffering. If it brings the same satisfaction as the old best, then it increases satisfaction if the probability of the old best outcome is not lowered. Thus satisfaction can be increased only in those rare instances when the creation is both of equal or greater satisfaction than the best of the old outcomes, and when the likelihood of less desirable outcomes is not increased. Under many conditions a creation will increase risk and regret, and may even lower expected utility. This is another way of stating what Buddha said more than 2,000 years ago: birth is suffering (Walshe, 1987).

MENTAL HEALTH

There has also been considerable interest in the relationship between creativity and psychopathology (Andrews, 1961; Nebel, 1988; Prentky, 1989; Rosenberg, 1966; Shoham, 1985; Storr, 1976).

> Because highly creative individuals may display thinking styles similar to psychotics, it has been theorized that such individuals possess a predisposition to

> psychosis. This might explain why creative people are frequently perceived as "eccentric," like fish out of place in the normal ocean. This may also explain why so many highly distinguished individuals have been the apparent victims of some form of mental illness... similar cognitive, attentional, or information-processing strategies may be found in schizophrenics and creatives—the difference... between creative... and schizophrenics is one of voluntary control over processing of input... creatives were superior to schizophrenics and normals in tolerance for incongruity in information input... "creative thinkers" can tolerate strain (drive for incongruity reduction) and continue to employ broad categorizing strategies in concept formation, whereas non-creatives cannot. (Prentky, 1989, p. 259)

Prentky (1989) also quoted Krebs and Shelly (1975):

> The great creators often seem to be more the prey of intrapsychic conflicts than most of us; and when we consider those men of genius whose achievements depend especially on a power of abstraction and dissociation from the immediate impact of the physical, like Descartes, Newton and Shopenhauer, it is not difficult to show that their genius and their psychopathology are intimately related. (Krebs & Shelly, 1975, p. 110; Prentky, 1989, p. 251)

Many noted scientists, philosophers and artists have had mental illnesses, including Charles Darwin, Sir Isaac Newton, Michael Faraday, Gregor Mendel, Sigmund Freud, James Watt, Jack London, Robert Frost, Thomas Huxley, George Eliot, Robert Browning, Herbert Spencer, Thomas Carlyle, Florence Nightingale, Schopenhauer, Nietzsche, Tolstoy, Ibsen, Wagner, and Zola (Prentky, 1989). Roe (1953), Terman (1926), Cattell (1966), and others have found eminent scientists to be "emotionally unstable," but Cattell and Butcher (1968) concluded that the instability is based on high "emotional sensitivity" rather than weak ego.

The dominant Western (European and North American) emphasis on ego-psychology and self-esteem contend that the creative experience, which enhances self-esteem and the ego, is healthy. However, Ellis (1976) as well as ancient Eastern (Indian and Oriental) psychology, argued that enhancing the ego and self-esteem perpetuate suffering and are unhealthy. Buddha claimed that whatever is created is illusory, unreal, transient, and a condition for suffering. He discovered that we must stop creating desires and other problems if we are to eliminate our own suffering and the suffering of others. We must learn to walk like the greatest of American Indians, without leaving any footprints. We must lose the ego rather than strengthen it. We must transcend dualistic thinking, lose our attachments to ideas as well as things, and appreciate reality rather than wanting to change it.

The current emphasis on being original also derrogates the conforming person who is dependent on the expectations of others. In Moustakas's (1961) words,

> His every act erases his identity, beclouds his uniqueness. He behaves only in the appropriate ways. Maslow points out that the only way such a person can achieve safety, order, lack of threat, lack of anxiety, is via orderliness, predictability, control and mastery. If he can proceed into the future on the basis of "well-tried" laws and rules, habits, modes of adjustment which have worked in the past, and which he insists on using in the future, then he feels safe. But he experiences deep anxiety when he faces a new situation, when he cannot predetermine his behavior, when he does not know the acceptable form. Gradually the conforming person loses touch with himself, with his own real feeling. He is unable to experience in a genuine way and he suffers inwardly from a dread of nothingness. He is in deep despair.... In conformity life has no meaning. There is no true basis for existence. Cut off from his own real wishes, from his own capacities, the individual experiences no fulfillment, no self-realizing satisfaction, no sense of authentic relatedness. (p. 87)

But the existential despair that Moustakas described ends when the individual goes out, alone, for a walk, letting himself or herself fully experience the wind and the air, reestablishing an intimate relationship with nature, and, in Moustakas's words, "discovering" new capacities—rather than creating anything. It is obvious from reading his descriptions that, despite the way he defines *creativity*, despite the positive qualities he attributes to creativity, and despite the negative qualities he attributes to conformity and nothingness, it is not creativity but discovery and harmonious conformity with nature that arouse feelings of well-being and cut through despair.

Conformity, like tears, can arise from fear or strength. A person must be very strong to allow weakness to show, or too weak to prevent it from showing. So too, one can conform out of compassion for another, or out of fear for one's self. Moustakas and Maslow emphasized the ills associated with conformity arising out of weakness. However, there is also conformity arising from strength, from compassion, from concern for others over one's self. Conformity based on egolessness leads to open, intimate, and harmonious relationships. Conformity centered on the self results in hidden resentments, facades, deceit, and defensiveness. Self-assertion without concern for others also produces resentments (not always hidden) and often results in discord, fights, and alienation.

The emphasis on individuality and creativity often runs counter to the development of harmonious relationships. If several people do their own thing without regard to others, their actions are likely to interfere with someone else and to prevent harmonious relationships among the whole group. Because we are in fact interdependent, everyone's actions affect everyone else. It is very important that people recognize this and act accordingly. Unfortunately, the Western (especially North American) emphasis has been, and continues to be, on individuality and self-assertion. Although the importance of "teamwork" is recognized, our reward systems are oriented predominately to the "leader" or the "star," with "supporting players" given much lower billing and much smaller awards. The emphasis on creativity perpetuates and strengthens such an

orientation. We should be careful how we emphasize and encourage creativity, as compared to discovery; and we should be careful about the value we place upon being so unique as to deserve the label *creative* in contrast to being so in harmony with others as to be labeled *supportive*.

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Part III

Psychological and Biological Features

9

Psychoanalysis and Neuroscience in Relationship to Dreams and Creativity

Henry Krystal
Andrew D. Krystal

In this chapter we review and strive to integrate our knowledge and theories relating to perception, cognition, memory and recall, and the resulting postulates concerning the genesis of dreams and creativity. We point to the pontine oscillators as the generators of REM and D sleep, stimulation of the occipital cortex, and inhibition of the corticospinal tract. The feedback from the cortical association areas stimulate the thalamic, hippocampal-amygdalar complex, which in turn activates the affects and the related memory traces (both day residues and possibly wishes that had been primed *by the recent mental events, perceptual residues, and associations aroused in information processing). We review the psychoanalytic and experimental psychological indicators that perceptions are reworked from the vaguest, unconscious registration of mere outlines, to stimulus proximate versions, on which we can expect intersubjective agreement. In processing the question* What is that?, *associations are brought in with their affective charges, which stimulate defenses, usually an individual's predominant character traits, which include analytic or holistic perceptive and cognitive styles. None of these processes are linear, but are reminiscent of chaotic systems that manifest self-similarity, sensitive dependence on initial conditions and the capacity to generate novel, unpredictable behavior. Such characteristics appear to pertain to waking narratives, dreams, and are especially notable in creativity.*

INTRODUCTION

Human behavior is abundant with creativity. This capacity is crucial for adaptation to the widely variable challenges of life. Important elements of creativity are the expression of affect, use of symbols, and the incorporation of fantasy. Through work with individuals suffering from problems of substance dependence, psychosomatic illness, and the sequelae of psychic trauma, it has been found that problems in the nature of emotions and in the capacity for self-caring result in a marked defect in affective expression, symbolization, and fantasy generation (Krystal, 1988b). This work supports our position that the nature of affects and the capacity for self-caring and self-gratification are central to making creativity possible.

These core elements of one's character are so basic to our function that their footprints may be observed as a fundamental feature of the processing of all sensory information (Giora, 1981). Nothing is registered as a perfect reproduction, but, rather, perception is dynamic and information is subjectively processed and altered (Westerlundh & Smith, 1983). Similar processing occurs in dreams, phenomena we consider the prototypical creative acts (Giora, 1981). The form of the processing in dreams and perception is highly dependent upon one's capacity to tolerate affect, utilize symbols, sustain fantasies, and to the degree that novel versions of mental events are acceptable—they register consciously.

Our experience working in psychotherapy, and recent work by Stern (1991), suggests that the form of our day-to-day, waking, verbal reductions (narratives) are also dependent on these capacities and on close inspection may not be a simple linear production, but may turn out to be as convoluted and complex as a dream. Our waking function and waking creativity are tied to dreaming and perception, marked by a characteristic style often referred to as one's personality, which is dependent on the ability to utilize symbols, fantasy, and affect (Smith & Carlsson, 1990).

A number of recent studies have found evidence of "chaotic phenomena" in brain function (see below). Systems that are capable of "chaos" have the ability to produce novel and unpredictable responses, and are thus capable of conferring the capacity for human creativity. It is therefore suggested that the techniques of nonlinear systems analysis would be useful for studying the biology of creativity.

We will begin by reviewing some of the literature of dreaming. This will be followed by a discussion of the dynamic nature of perception, subjective reality, and the roles of emotion and character. It will be suggested that the development and maintenance of mature self and object representations are necessary for having the capacity for utilizing affects, symbols, and fantasies for self-caring, and therefore creativity. We will explore the creativity that permeates our waking function.

DREAMS

Hobson and McCarley (1977a) have extensively studied the neurobiology of dreaming. They have elucidated neuronal populations in the pontine reticular formation, nucleus gigantocelularis, and the raphe nucleus, which appear to cooperatively serve as the pacemaker for rapid eye movement sleep (REM). It is suggested that this system is responsible for blocking motor responses, attentuating external input, and generating novel internal input to the occipital cortex and forebrain. They postulate that the occipital cortex then produces visual experiences, while the sleeping forebrain processes these stimuli imperfectly due to being inactivated. Thus, dreaming is modeled after the function of the sensory system; however, the stimuli are hypothesized to originate in the brainstem rather than from the sensory organs.

In their review, Hobson and McCarley (1977) pointed out that Freud, in accord with the physiology of his time, considered nerves to be energy reservoirs, and because he did not know about membrane polarization, he thought of them as conductors, not generators, of electrical impulses. For this reason, Freud expected that neurons had to be charged, "cathected" with psychic energy derived from the body. This idea was transferred to the psychologic theory of dreams as the postulate that an unconscious sexual wish was necessary to produce a dream. Freud also did not suspect that neurons could have an *inhibitory* function. Although Freud's theories of dream interpretation (and even his inability to assert metapsychologically any autonomy of the Ego) were derived from his physiological views, the assumption of the nonsensical and therapeutically and heuristically useless nature of the manifest dream was the consequence of the topographic theory. Even the politics of his time were influential; Freud's attribution to the "system" conscious and preconscious was a device commonly used by the authorities of his day: censorship. The idea of censorship caused him to hold the manifest dream in contempt on the principle that *what was published was worthless*. Curiously, originally Hobson and McCarley shared the low opinion of the manifest dream, albeit they explained their condemnation quite differently. They called their theory of dreams an *activation-synthesis model*, based on the idea that the stimulation from the pontine "generator" presented mental material for processing in cortical cells. However, the cortex responded imperfectly because of its inactive sleep condition. They also agreed with Freud on the idea of mind–body isomorphism, which they described as follows: "Freud believed that the same rules of description and functioning might be applied to both body and mind and that both had the same structures, the *same* basic operating principles" (1977a, p. 1211; emphasis in original).

Based on this assumption, Hobson and McCarley proceeded to explain the phenomenology and principles of understanding dreams on the basis of state of

the art electrophysiology. Dreams, in their view, are produced in desynchronized sleep (D), as demonstrated by EEG evidence of low voltage, fast waves, and certain "sensorimotor" characteristics in terms of systems analysis; "activation of the brain; relative exclusion of external input; generation of some internal input which the activated forebrain then processes as informal; and blocking of motor output, except the oculomotor pathway" (p. 1336). Hobson and McCarley saw the D state as fully explainable by the spike of activity of the PRC (pontine reticular cells), which also blockades external input and spinal cord motor neurons. The pontine-geniculate-occipital spike, and wave of stimulation of active and inhibiting neurons, ends in stimulating the occipital cells in such a way that it can be imagined that visual experiences are produced. The eye movements are secondary to the wave of stimulation which proceeds from the PRC to the geniculate bodies and visual cortex. Hobson and McCarley asserted that in REM individuals were scanning the visual field, but actually following the "action" as it took place in the visual cortex as if on a screen (1977b, p. 1338).

Both of these influential theories are incomplete in that they ignore the role of affect and the importance of the processing of the dream stimulus. Whether the stimulus is felt to be due to an unconscious wish or the result of brain-stem pacemaker activity, the stages of processing that take place before one reports a dream leave an important mark on the dream.

Processing is observable in dream reports through factors like the amount of detail, the degree of rationality of the dream, and the presence of defensive operations such as displacements, reversals, condensations, and projections. These factors are perhaps the most characteristic aspect of an individual's dream. They are like the aspects of a painting that allow one to identify that it was painted by a particular artist, such as highly detailed realism versus coarse strokes of thickly applied paint. Just as such elements tend to be more reliable identifiers of the artist than the content of the painting, the form of a dream is more akin to the signature of the dreamer than is the content.

This is illustrated in the work of Giora (1981), who studied whether dreams "come out" as logical or irrational, one product of preprocessing. He found that his subjects formed a Gaussian distribution in terms of the rationality of their dream descriptions. In the middle of the curve were individuals who reported a range of dream rationality. However, on the extremes, individuals consistently had either highly logical or illogical dreams.

Thus, some individuals tend to have a very consistent form to their dreaming. People also tend to consistently make use of a particular defensive operation in their dreams, such as displacement or reversals. These factors bear an important relationship to a person's character structure, and, in fact, one may observe the predominant form of a patient's dreams change over the course of psychotherapy as changes take place in their character structure.

A high degree of creativity tends to be seen in those people who are able to

tolerate illogic in their dreams (Giora, 1981). This is because, as discussed below, both are manifestations of character structure. Giora suggests that individuals who cannot tolerate illogic are not likely to report an illogical dream, because they are compelled to keep reworking it until it makes sense to them. It is as if they did not have the freedom to explore in dreaming. Their intolerance of incongruity limits their ability to accept novel material, especially some containing "poetic" expressions of infantile or conflictual wishes and, thus, their creativity. We shall see below that creativity in dreaming and in waking behavior depends on the ability to tolerate one's affective signals and use them constructively.

Affect, and its role in the important creative function of dream processing, are missing from the two theories of dreaming described above. Including this factor in our understanding of dreams creates a bridge between character, dreaming, sensory processing, and creativity. We now describe the similar process of waking perception and the role of affect tolerance.

PERCEPTION, CHARACTER, AND AFFECT

Psychoanalysis has, until lately, managed to persist in limiting itself to Freud's simplistic view of perception (Krystal, 1985; Rothstein, 1986). Bucci (1985) has been the first "swallow in spring," succeeding to publish in a psychoanalytic journal an excellent report on dual coding of perceptions, showing that they may be registered in a primarily sensory fashion or transformed in a verbal, symbolic, highly processed manner. Krystal encountered much resistance over 15 years in presenting the progress of perceptive and cognitive studies, an updated picture of percept-genesis, and an information-processing model of the balance between maximum accurate registration and trauma prevention (Krystal, 1970, 1985). There is little room for doubt, after virtually a century of exploration (Gardner, 1985), that every mental event, whether it is a perception, impulse, or memory, is processed in multiple steps, from the vaguest unconscious stirring to a rejection or registration. The reworking of a percept has been demonstrated most clearly through tachistoscopic studies in which the progress can be followed, from the vaguest, unconscious impact that can be studied only indirectly, to the last phase of processing, to the conscious, "stimulus proximate" phase which may be expected to be useful in our intersubjective agreement or can be considered "a correct recognition" (Westerlundh & Smith, 1983, p. 605). But at the same time as the "microgenesis" or "percept-genesis" takes place, we are "parallel processing" the question: "What is it?" In order to try to divine the answer, we bring in associations. The associations, as every mental content, come with their own subliminal affective charge. This is a consciously unnoted affective signal that may mobilize the individual's typical predominant characterological defenses. *That is why the most important role of emotions are not*

those that we become aware of, but those minimal signals which are the "switches" in all of our information processing. This picture represents the "psychodynamics" of perception, cognition, and shaping of the representational system. It contains the "missing link" in our integrated dream formation model. To begin with, we can readily recognize what is missing in the Hobson and McCarley (1977) "activation-synthesis" model: emotions. Hobson (1988) felt that he did not need to complicate things that he already explained to his satisfaction. But Hadley (1983) reported that Bechtereva, by exploring over 2,000 zones of the brain with implanted electrodes, found "slow electrical processes" in some areas of the brain, which, when stimulated electrically, elicited the development of an emotional reaction. Hadley wrote (1983):

> The fact that so many areas are highly involved in a single aspect of a response to a stimulus (i.e., its emotional coloring) is suggestive of the polyfunctionality of cell populations... The concept of polyfunctionality led Bechtereva to propose that the brain contains two types of systems: one relatively rigid which is more or less independent of environmental influences; the other plastic and flexible with much capacity for adaptation to a wide range of environmental circumstances. These notions are quite reminiscent of Bowlby's environmentally stable and environmentally labile programmes. (p. 23)

In a later paper, Hadley (1985) demonstrated that the capacities for attention and even *attachment* depended on affect regulation in the hippocampal and amygdala system, in which the hippocampus played mainly an "error evaluation" role while the amygdala played primarily an "affect reinforce-register" role. Without discussing the merit of the specific anatomical locations, we just want to affirm a point Krystal had arrived at in a number of different ways (Krystal, 1970, 1973, 1985, 1988a): signal affects play an essential role in perception, memory recall, and, therefore, also undoubtedly in dream formation.

Cognitive, Perceptive, Dream, and Creative Styles

In the above mentioned study on trauma and the defenses, as well as the consequences of it, Krystal (1985) found that attention, perception, registration, and recall were consistent parts of the characterological make-up. In summing up his and other workers' findings, he stated, "individuals tend either to block the utilization of subliminal perception, or feel free to register consciously a greater proportion of them" (p. 159). Whether subjects are "decreasers" or "increasers" of their scope of conscious perceptions depends on their ability to tolerate the affective responses evoked by the perception. Individuals who are able to tolerate the particular affect involved can allow themselves greater perceptual freedom. Conversely, individuals who tend to block their perceptions

show impaired affect tolerance or disturbed ability to keep affects in a bearable range that is optimal for information processing, so that a reaction is based on one's best judgment and is in one's best long-range interest. People who cannot use their emotions that way are compelled to show "knee-jerk" responses.

A tendency to suppress perception, to become insensitive or dull, derives from a primary disturbance in the affective sphere and is often posttraumatic (Krystal, 1985, p. 142). Giora (1981), in the brilliant study already referred to, carried such observations much further, and succeeded in answering the question: What can we find that influences whether dreams "come out" as logical or irrational? He found by empirical studies that the attribute of logic of a dream falls on a normal distribution curve, with the majority having a mixture of dreams of varying degrees of clarity of the narrative. On the one extreme were individuals who consistently had logical dreams; on the other extreme, equally consistent nonsense dreamers. This did not surprise Giora, because he had already made a remarkable generalization. He found, as Krystal (1970) had, that many terms invented by students of perceptive and cognitive style could be brought under one rubric, which he called, *primary personality variable-scanning* (PPV). By the use of this concept, he could bring together individuals identified by Kretschmer in 1921 by the quality of *Spaltung*, that is, on the basis of whether they tended to *split* a percept and approach it analytically or piecemeal. Those who frequently used splitting had much in common with ones whom Witkin, Dyk, Fatlerson, Goodenough, and Karp (1962) would describe as scoring high in "field independence," and these same types were very much like the ones whom Schlesinger (1954), Holzman and Klein (1956), and Klein (1958) had identified by their tendency for scanning a field or scrutinizing various details.

The beauty of this generalization is that PPV scanning separates for us the people who tend to "take in" the whole picture or situation, who have a holistic rather than an analytic tendency. They tend to parallel process rather than work sequentially. This differentiation is impressive by the very multitude of investigators who discovered it and gave it their own names. Gardner, Holzman, Klein, Linton, and Spence (1959) described it as a *punctilious* versus a *less hesitant approach*, and Kagan, Moss, and Sigel (1963) called it a *reflective* versus *impulsive style*.

So, Giora summed up: "Analytic people work reflectively; they are fussy and extensively scan the perceptual and attention field" (1981, p. 317). But that's not the end of it. It turns out that the people who focus on PPV scanning, the analytically or punctiliously inclined, are also intolerant of cognitive or affective incongruence. As mentioned earlier, perception and all forms of cognition and verbalization, including dreams, progress through many stages from the vaguest, unconscious, "primary process-like," or right hemisphere-like holistic on to the final stimulus-proximate, suitable for intersubjective agreement. So, all things considered, Giora concluded, we now know why these field independent, heavy

scanners are not likely to report an illogical dream. They are compelled to keep reworking it until it makes sense to them. If, instead of the PPV scanning we were to consider Cattell's (1935) Index of (100!) Source Traits, then we begin to glimpse that there is an immense potential for new recombinations, so that, even in dreams, we can see a connection between freedom to explore and creativity for those who are not limited by the "analytic" type's inability to tolerate incongruity and ambiguity.

AFFECT TOLERANCE, CHARACTER, AND CREATIVITY

Individuals whom Krystal noted to have an intolerance of affect and who need to block their perceptions have been found by a number of researchers to consistently have a constellation of characteristics. They tend to approach situations analytically rather than holistically, tend to be fact oriented, process information serially rather than in parallel, and tend to be intolerant of cognitive incongruence, such as illogical dreams, or affective incongruence (Giora, 1981; Krystal, 1989). Further, Krystal noted that this constellation of findings, a tendency to suppress perception or to become "insensitive or dull," and to require logic in dreams was associated with severe disturbances in affective function and was often posttraumatic (1989, chap. 11). He found, in working with psychosomatic and posttraumatic patients, that neither classical Freudian, neurophysiological, or cognitive models adequately explained the phenomena he was observing (Krystal, 1990). He studied how under "good enough circumstance" affects have a developmental sequence progressing towards differentiation, desomatization, and verbalization, at which point they may be invaluable signals (Krystal, 1974). He found in his patients a developmental arrest or regression in this sequence, which was termed *alexithymia* (Sifneos, 1967). This was accompanied by cognitive impairment, marked by an inhibition in symbolic function. These individuals are characterized by an absence of fantasy and creativity, have hardly any dreams, and have extreme difficulty talking about or describing emotions (as the term *alexithymia* implies) or using them as signals. If such patients do have a dream, they cannot associate to it. If pressed for associations, they offer more details of the dream (Krystal, 1982-1983).

Krystal (1978b) also found that such patients had severe inhibitions in self-caring. This block was seen to underlie difficulties in cognitive style, symbolization, fantasy, and the constructive use of affects that rendered many of his patients unable to be creative. This inhibition was theorized to result from problems in the development of object representations (Krystal, 1978b, 1991).

In normal development it is hypothesized that mature self- and object representations develop out of an initial image of fusion of the mother and infant (Krystal, 1978b). Gradual, necessary frustrations are thought to allow a comfortable development of separate images of the self and object that

eventually allow the child to assume the maternal caretaking functions (Krystal, 1978b).

Krystal presented evidence, from his and other author's work (1978a, 1978b, 1988b), that, in situations of infantile trauma, severe deprivation causes a premature and overly abrupt breakdown of the fantasy of fusion with the mother. It becomes impossible for the infant to maintain the "fantasy" that the caring functions are part of itself, since at this stage the infant clearly does not yet have the maturity to exercise its own functions and finds itself with frequent unmet needs. As a result, a representation of the mother is formed to which these functions are attributed, and the infant develops a self-view that is devoid of most self-caring potential. An effect of infantile psychic trauma forces a premature disruption of the illusion of symbiosis and forces premature discovery of the external, uncontrollable object. As a result, the infant may have to reserve these functions solely for the frustrating mother, and this distortion in self and object representation may become a lifelong taboo. The violation of this "Promethean complex" carries the fantasy punishment of a "fate worse than death," i.e., "Hell," actually the return of infantile psychic trauma state.

Aggression toward the frustrating mother can lead to a "walling off" of the object representation of the mother. This occurs in order to protect the vital maternal object from the infant's own aggression. In this case the object representation of the mother is not even accessible to the traumatized individual as a self-caring mechanism. For example, such a person cannot call up an image of the mother, recalling what she might have done in a particular situation as an aid. In other words, she cannot be used as a "benign introject," or one might say, there is a lack of "object constancy" (Krystal, 1978b, 1988b).

The infant must even forfeit fantasy as a self-comforting measure to the mother, for whom is reserved all authority as the sole keeper of caring and soothing functions. This situation is made much worse as a result of living in a state of deprivation. Fantasy, symbol formation, and wishing are all based on recollections of previous gratifying experiences. The relative absence of such experiences, compared to numerous frustrating experiences, leaves the traumatized infant markedly hampered in these areas, especially since the occurrence of infantile trauma is likely to block the process of transitional object development and with it, the capacity for solacing (Hofer, 1980; Horton, 1981; Krystal, 1988b).

The inhibition in self-caring functions leaves the traumatized infant blocked from using its emotions as self-caring signals. During deprivation the infant becomes overwhelmed with its primitive affects. This hinders the progression toward desomatization, differentiation, and verbalization that normally takes place, so that affects can become useful, manageable signals. Instead of becoming potentially useful signals, they become objects to be feared. The result is the development of a style tailored to prevent being overwhelmed in the future. This includes an intolerance of affect, leading to a high degree of

blocking of perceptions that might result in disturbing emotions. The net result is a perceptive and cognitive dulling, aloofness, and an incapacity for using affects for any purpose including self-care, fantasy, dreams, or creativity (Krystal, 1989).

Krystal (1978a) noted a similar pattern in those who experience massive psychic trauma as adults. He noted that, in these situations, the critical event is a recognition of unavoidable danger and a submission to it. This breaks down one's belief in one's security, which is in large part a set of illusions related to the denial of death and of our actual state of helplessness. Like the traumatized infant, once the fantasized security of a protective union with the external world is broken down, a forfeiture of executive and self-caring functions ensues. This is marked by a state of submissiveness, cognitive constriction, and inhibition in fantasy and symbolic function. Faced with the abrupt consciousness of one's helplessness, they are forced to give up their self-caring function to external sources, rather than keeping it, since they now see themselves as helpless and not capable of self-maintenance.

Also, as in the case of infantile psychic trauma, affects become feared and must be warded off. Traumatized adults cannot utilize their affects for caring purposes. The result is an inability to use affects as signals. A regression ensues where affects become less able to be verbalized, less differentiated, and more somatized, leading to a regressive alexithymia. The same kind of dullness, absence of fantasy, and lack of creativity becomes pervasive.

Thus, the capacity for creativity is highly dependent on developing and maintaining a mature self-representation that allows the use of affects, symbols, and fantasy for self-caring purposes.

CREATIVITY IN WAKING BEHAVIOR

Assumptions about the straight-line, sequential nature and predictability of our waking thoughts and speech are based on a profound preference for linearity that is so deeply ingrained that we don't even realize their presence. The impression of a simple, serial progression of waking production can be easily overturned by a consideration of narratives. The work of Stern (1991) suggested to us that a narrative is much like a dream, composed of separate images, each potentially branching off to an infinite number of associations. Further, the continuity of the narrative is "filled in" just as we "prepare" a dream for verbal report.

Stern has presented studies on *micronarrative*, reporting one instance of a woman describing the events associated with fixing her breakfast. A paraphrased recollection of this presentation, of necessity much less complex than the original exposition, follows:

> The woman related that she opened the refrigerator and reached and saw a row of eggs, and picked the one before last. She broke the egg and put it in a blender. She

then got milk and poured it, too, into the pitcher. She suddenly realized that she had put in too much milk, violating her diet. She stood there momentarily trying to decide whether she should discard the mixture, or "fudge" a bit on her diet. At this point, the telephone rang. It was her brother telling her that he would be late. But she was concerned that the ringing of the telephone may have awakened her husband, so she was listening for noises from the bedroom and visualized her husband. Satisfied that her husband was still resting, she turned her attention to the brother, finished the conversation, then proceeded to fix her breakfast.

This simple example shows that the illusion of a straight-line sequential structure of the simplest narrative was blinding us to the parallel and highly branching nature of our waking mental function. Clearly, our behavior, including cognition, is extremely sensitive to small perturbations and is anything but simple and straight-line sequential.

Complex information processing took place on at least two levels in the above narrative. Processing was involved in the sensory events and in carrying out the actions described. In addition, as in dreams and in reports of what is perceived, information processing takes place after the action has already occurred, before the narrative of the events is reported.

In the execution of each of the many functions carried out, a constant series of incoming stimuli is processed, and for each individual, information is accessible according to his or her own style and capacity. It is only after this transformation has taken place that some portion of information becomes accessible for problem solving. Those with alexithymia are forced to keep from consciousness a greater portion of information, which is lost to problem solving. Those individuals with better affect tolerance and self-caring potential can then utilize the richer set of perceptions, affective responses, symbolic representations, and fantasy in synthesizing more creative solutions to the challenges faced. This is true whether the challenge is making breakfast, reading the newspaper, or standing in front of a canvas attempting to paint a landscape.

Making the jump in levels from the functions carried out in our waking behavior to the narrative itself, which is a report of those functions, adds another level of complexity. Here, as in dreams and the reports of one's perceptions, one can expect a wide range of variation in the degree of incongruity and illogic, use of symbols, elaboration of fantasies, and in general creativity in the reported material. The degree to which these are present will again be dependent on the individual's affect tolerance and self-caring capacity.

The high-level functions of reporting dreams and narratives are reminiscent of much of what is considered artistic creativity. Often, art is conceived as a description of something in differing degrees of abstraction, such as a novel, sculpture, painting, or piece of music. The object may be as abstract as a feeling, or abstraction may be attempted to the point of being object-less. In all such endeavors fantasy function, the use of symbols, and the expression of affect play a central role.

We have concluded, based on the work of the Lund group of psychoanalytically sophisticated experimental psychologists and others (Shevrin, 1986; Smith & Carlsson, 1990; Westerlundh & Smith, 1983), that there must be an additional element involved in creativity. This was the freedom to experience one's private feelings and impressions as if they were real, abandoning the need for consensus and overcoming the "correct meaning." We feel that a creative person is motivated not to give up the search for a good solution, but exercises the freedom to search, to find, and use any self-caring, self-gratifying, or self-enhancing view of one's world. To carry out these functions, one must have access to one's feelings and the freedom to carry out experimental thought and action, in defiance of commonly accepted standards.

As already mentioned, psychoanalysts have long been confused by Freud's statement, which he used to justify a different approach to dreams than to narratives, by saying that primary process had a tendency to immediate discharge, while the secondary process operated with fixed cathexes and therefore was not subject to such processes as condensation or displacement. Present-day knowledge is much more in harmony with Hadley's 1983 point, that both holistic, special, synthetic, nonverbal, and analytic, logical, "secondary process" operations go on all the time and contribute to all cognition, regardless of the state of consciousness. Both the specialization of the brain hemispheres and their integration are heavily dependent on developmental vicissitudes. Consciousness involves several spectra. Hoppe (1977, 1988) demonstrated that, in order to produce abstract, symbolic, creative, mental products, both hemispheres and both processes must be involved. He called the integrative, creative process *symbolexia*, and, when absent or defective, we encounter our old nemesis: *alexithymia*.

In short, at every level, the capacity for creative acts depends on the ability to tolerate affects, utilize affects, symbols, and fantasies, and exercise one's self-caring functions. Another way to conceptualize part of this process is the ability to maintain an integrated function of the two hemispheres of the brain.

CHAOS AND CREATIVITY

The neurobiology of creativity is not well understood. One crucial feature of any model of creativity is the ability to generate novel behavior. As we shall see below, "chaotic," nonlinear systems are capable of generating novel, unpredictable behavior and are, therefore, useful models of creativity. They also possess the capacity to shift quickly and easily between chaotic behavior and more ordered modes of function, which Skarda and Freeman (1987) suggest is an important element of neural information processing functions.

The study of chaos represents a relatively new approach to the study of complex systems and has revealed remarkable and, at times, bizarre structure in

such systems. In a similar way, Stern directed our eyes for the first time to our waking behavior and exposed its complex, highly branching, fine structure.

Similarly, Hobson and McCarley only demonstrated how REM sleep (D State) is produced and how the visual cortex is stimulated. They do not explain the spread of excitation to many of the associative and affective areas without which no image, never mind a meaningful pictorial sequence endowed with affect, is possible. We must look for a complex, nonlinear way by which excitation can bring together various memories clustered about the "key affect" of the dream. With it will be associated the multitude of words that will produce the important associations. Because of the breakup of every perception into its multiple components and characteristics, the processing of each part in a different location, and because these parts have to be passed on from the visual cortex to the hippocampus, then to the prefrontal cortex, and back to the hippocampo-amygdala system, so many traces are left at the synaptic junctures that we can borrow Adelson's statement that every perception is, in a way, an act of creation and every memory is an act of imagination.

The breakthrough that chaos theory brings to the study of complex systems is that it allows analysis of some systems that could not be studied by existing techniques. Previously, nonlinear systems had been written off as impossible to study, analyzed by "linearization," or studied by crude approximation. An example is the transition to turbulent, unpredictable behavior of fluids as they reach higher velocities.

The novelty of the chaos approach is that, while it abandons the search for the exact moment-to-moment descriptions of system behavior, it looks at overall aspects of system function. In so doing it was found that extraordinary order underlies the apparent randomness of many complex systems and that many simple systems have strikingly complex behavior. In fact, the term *chaos* is reserved for systems that settle into a state which is unpredictable but not random in that there is some order to it. As Basar (1990) writes "chaos introduces an intermediate between strict determinism and randomness" (p. 365). Not all behaviors are equally likely, but system behavior tends towards a subset of possible outputs, which is termed the *attractor* for the system (Babloyantz, 1990; Grassberger & Procaccia, 1983b). For example, a satellite orbiting around the earth may never be in the same place in space twice, but its behavior is not random. It is not equally likely to be anywhere in space. It tends to stay in a subset of trajectories that define a shape similar to an elongated doughnut surrounding the earth, which is its attractor.

Every system has an attractor. Nonchaotic systems settle into predictable, or periodic states. Those that are chaotic settle into a nonrepeating pattern, which is never exactly predictable, and this is termed a *strange attractor* (Basar, 1990; Russel, Hanson, & Ott, 1980).

It is possible to quantify the degree and nature of the order present by studying characteristics of the attractor. One measure of attractor order is called

the *dimension* (D). This is like the term *dimension* as it is generally used (a point has D = 0, a line has D = 1, a plane has D = 2, etc.). The dimension of an attractor is the number of factors necessary to describe the states that a system settles into: for a pendulum that comes to rest, D = 0; for an electrical circuit that produces a voltage sine wave, D = 1. Random signals have an infinite dimension. Chaotic, or strange, attractors have the curious property of having dimensions that are not integers but fall between the usual dimensions, such as D = 1.5, and are therefore called *fractal dimensions* or *fractals* (Grassberger & Procaccia, 1983a; Mandelbrot, 1967).

It is easiest to approach this concept by considering an example described by Mandelbrot of trying to measure the length of a coastline. A coastline is a curve, and so D = 1 would be expected. Yet, if one tries to measure its length with a ruler, one gets different lengths depending on the size of the ruler, because different degrees of detail are included in the measurements. For a strange attractor similar to a coastline, one can continue this process to infinitely small and large sizes of rulers and continue to find different lengths. Thus, it is as if the curve had width or filled the plane, to some extent. Yet it is not 2-dimensional. It is as if it were a structure of dimension between 1 and 2. The value of D between 1 and 2 for this example reflects the amount that the measured length changes with each change in ruler size on all scales. Fractals possess the property that the amount that the measured length changes with a change in ruler size is nearly the same on all scales. This is termed *self-similarity*. It is due to fractals being composed of patterns that repeat infinitely on all scales, such that they look the same whether you're standing a hundred feet away or looking at a section with a magnifying glass (Gleick, 1987; Mandelbrot, 1967).

These characteristics of nonlinear systems give an indication of the complexity and rich possibilities of their behavior. The complexity is reminiscent of the complexity of narratives and, especially, of dreams studied psychoanalytically.

In order to develop intuition about chaotic systems, it is first necessary to understand the differences between linearity and nonlinearity. Linear systems are those whose behavior may be described by equations that only involve terms that are constants or of the first order in any variables. For instance, $y = x + b$ is linear in that the output y is a function of x to the first order and is a constant. Such equations may contain derivatives and integrals, but all terms must be of the first order in the variables studied. An example of two simple nonlinear equations are $y = x^2$ and $y = 1/x$. These are nonlinear because the second and negative first order of x appear in these two equations. Linear equations can be very complex, but some of their basic properties generally make them solvable exactly, and their behavior predictable in a way which is usually not possible for nonlinear systems.

Nonlinearity in systems tends to arise because of feedback. This is a situation where the characteristics of the system change based on the changes of the input or output of the system. Systems that tend to produce chaotic behavior have self-

regulatory properties that keep the behavior within bounds, but this counterbalancing of forces can result in strange and erratic-appearing, though bounded, behavior. One can easily sees how this would greatly increase system complexity. An electrical example would be a circuit that contains a resistor whose resistivity decreases to a greater extent the larger the current delivered to it (Shaw et al., 1992). In another example, feedback loops appear in Shaw's structural model of creative behavior, outlined in Chapter 1 of this volume. As he points out, this model admits to chaotic solutions (Shaw, 1989).

We will now explore the behavior of a crude model of a person tying a necktie somewhat mechanically to develop some intuition about nonlinearity. It can be difficult to tie a necktie so that the length comes out as desired, if the initial guess is poor. This most often happens when one is in a hurry and making large jumps in correcting for errors; trying to get it right on the next guess, rather than making a gradual measured approach to the desired length. It turns out that the former process of tying a necktie is best modeled as a nonlinear process, while the latter, more careful approach can be modeled as a linear process. The difficulty in getting the length right once one is in nonlinear mode reflects a basic property of nonlinear systems. This property is an element that makes nonlinear systems useful analogies of human creativity, and so to develop this intuition, we pursue further understanding of tying neckties.

When one is not in too great a hurry, one might take an initial guess that is too long and will gradually decrease the initial length, resulting in a rapid approach to the desired length. In this case, overshooting of the desired length is minimal. When one is making large jumps in guesses, significant overshoot takes place, and then the situation becomes more complicated. Tying a necktie must be modeled as a feedback process. The feedback occurs because the person tying the necktie makes a judgment about how closely the length of the tied necktie matches the desired length and feeds that back by appropriately altering the length of the next guess. For the purposes of this exercise, we will utilize as a model of this simple feedback system the famous logistic equation whose behavior has been studied in detail, most notably by May (1976). The equation for this system is: $L(t+1)=A[L(t)-L(t)^2]$. Here $L(t)$ is the length at time t, $L(t+1)$ is the length at the next point $t+1$, and A is the size of jumps or differences in length between guesses chosen by the individual tying the necktie. This is nonlinear in that $L(t)$ to the second power appears on the right side of the equation. Note that $L(t)$ and $L(t)^2$ *are of opposite sign, providing a model of opposing forces.*

When $L(t)$ is small, the squared term is much smaller than the linear term and so $L(t+1)$ is greater than $L(t)$ and growth occurs. As the length grows larger, the effects of the second (squared) term become important, which decreases the value of $L(t)$ back toward the desired length. The smaller A is, the less the squared term influences system behavior, the more the behavior is reminiscent of linear system behavior, and the length more rapidly approaches the desired

length (see Figure 9.1). While this system is capable of chaotic activity, in this range of A it behaves very predictably (like linear systems) settling into a single state.

The crucial element in all potential chaotic systems is that there is feedback in the form of one factor that causes growth and one that causes decay. Here the first term on the right side of the equation causes growth, and the second causes decay. These competing forces keep the system function within limits. If the original guess is too short and growth is too fast (A is too large), the tie becomes too long (overshoot occurs). Then it is necessary to "shrink" the guesses back toward the desired end point, and if these guesses cause overshoot it is necessary to "grow" the length of the guess again, and so on. It is easy to see that, if the size of A is not small, one will not get quickly to an endpoint, but will end up having necktie lengths which jump back and forth around the desired length of the tie (Figure 9.3). In fact, with larger values of A (big jumps in guesses), a necktie that was being tied according to the logistic equation exhibits behavior that becomes totally unpredictable and never settles into one final state (see

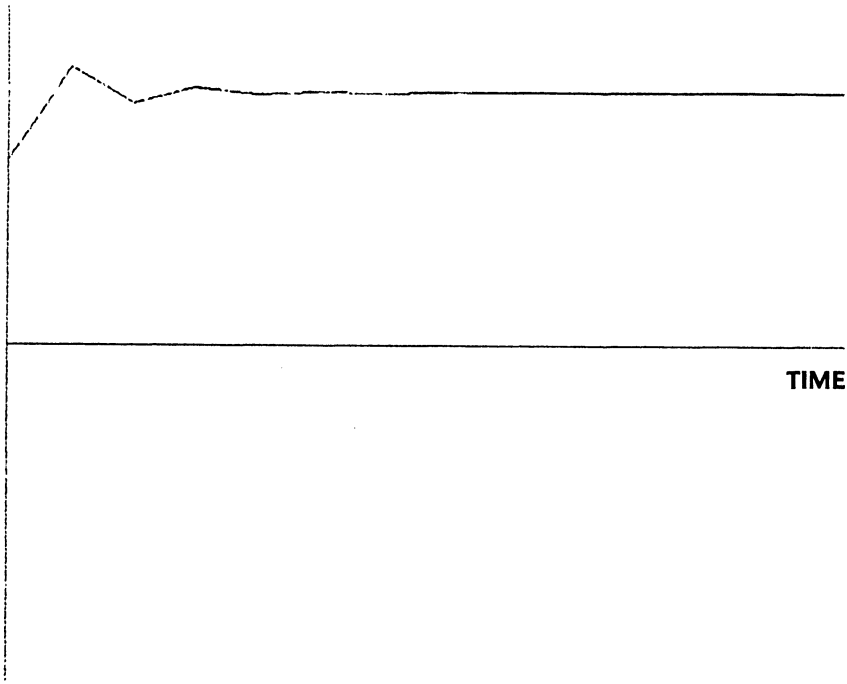

Figure 9.1. Logistic equation output with small A settles into one state.

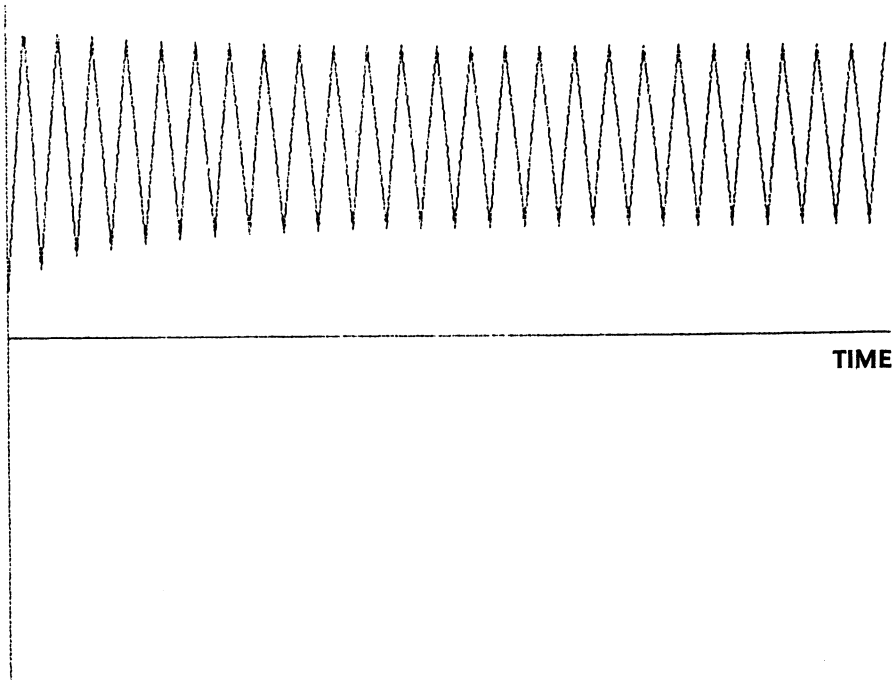

Figure 9.2. Logistic equation output settling into two states.

Figure 9.4). Of course, in this range it does not model well the process of tying a necktie (except in the case of a person who was incredibly finicky about his or her necktie length, but who made large jumps from guess to guess, and had infinite patience), but it does illustrate how the effects of simple feedback can result in staggeringly complex behavior.

Changing A changes the system to a different though similar system. There is a very regular progression that takes place as A is gradually increased, representing an increase in the size of jumps between incorrect guesses. This progression is the transition from predictable, ordered behavior to chaos. The system changes from settling into one state (Figure 9.1) (the desired tie length) to alternating between two states (Figure 9.2), to alternating among four states (Figure 9.3), and so on. This process, called *bifurcation*, continues until the system becomes chaotic, settling into a nonrepeating, infinite pattern (Figure 9.4). The graph of Figure 9.5 (points of $L(t+1)$ versus $L(t)$), connected as they evolve through time, reveals the attractor of this chaotic state and shows a very consistent order constrained by the growing and decaying forces. All of the points fall on the parabola defined by the question appearing above. Because this parabola is composed of an infinite number of points (if plotting continued

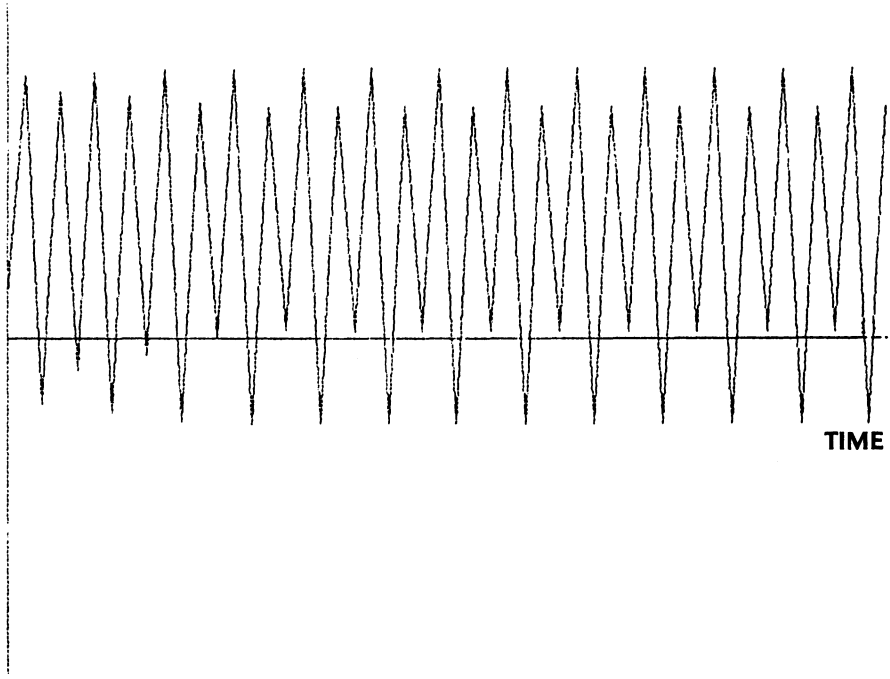

Figure 9.3. Logistic equation output settling into four states.

forever), it approaches being a curve and so is of dimension between a point and a curve, ($D = 0.538$) (Grassberger & Procaccia, 1983b).

The nonlinearity that exists in this model of tying a necktie is based on the system having feedback. The degree of lengthening or shortening that takes place—a basic property of the system—is strongly dependent on the input length. Therefore the properties of the system change depending on their function. Their behavior is therefore slippery and hard to predict. This sort of behavior is a basic property of all nonlinear systems. They change a great deal in response to small differences in input. This has been termed *sensitive dependence to initial conditions* (Graf & Elbert, 1990). As a result, such systems are capable of producing novel, unpredictable responses. Thus, chaotic systems embody an essential feature of creativity. They are systems capable of producing novel behavior.

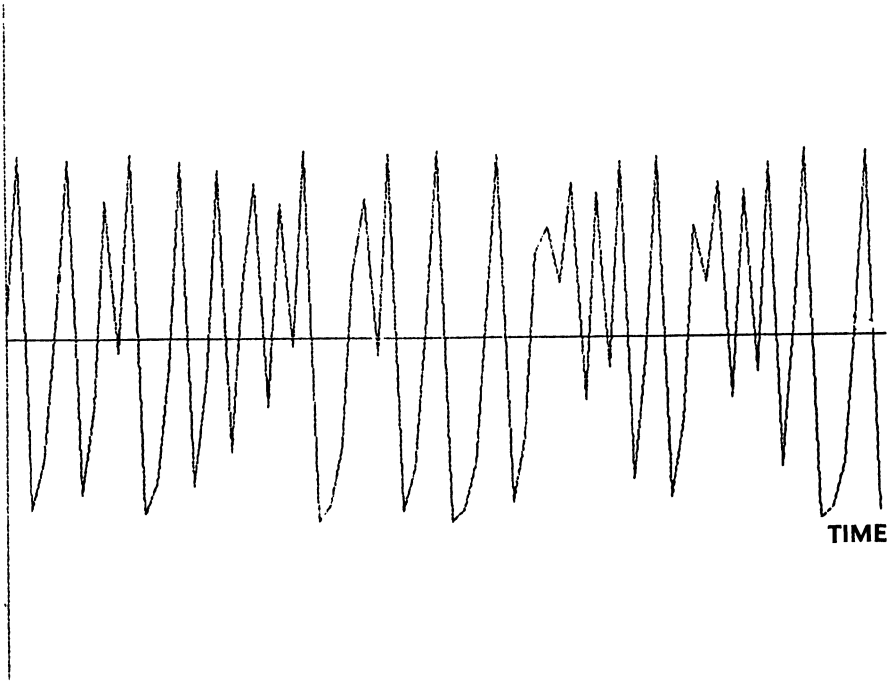

Figure 9.4. Logistic equation with large A chaotic behavior.

The capacity to bifurcate in response to small changes in the system and quickly switch between chaotic and ordered function is also a characteristic of nonlinear systems that makes them useful neural models. Freeman (1991) reported finding the presence of chaotic neural behavior in the olfactory system of the rabbit. It was noted that the behavior of the neurons of the olfactory bulb and prepyriform cortex are quite ordered when an odor discrimination is taking place. Immediately thereafter, this system quickly goes through a series of bifurcations into a chaotic state and remains in a chaotic state until presented with a new odor. Skarda and Freeman (1987) hypothesize that the ability to quickly switch in and out of chaotic function is crucial for being able to make a correct discrimination of an odor, and for adding new odors to a repertoire. Thus, there is evidence to suggest that nonlinear systems are involved in the processing and learning of perceptions. The importance of the ability to rapidly

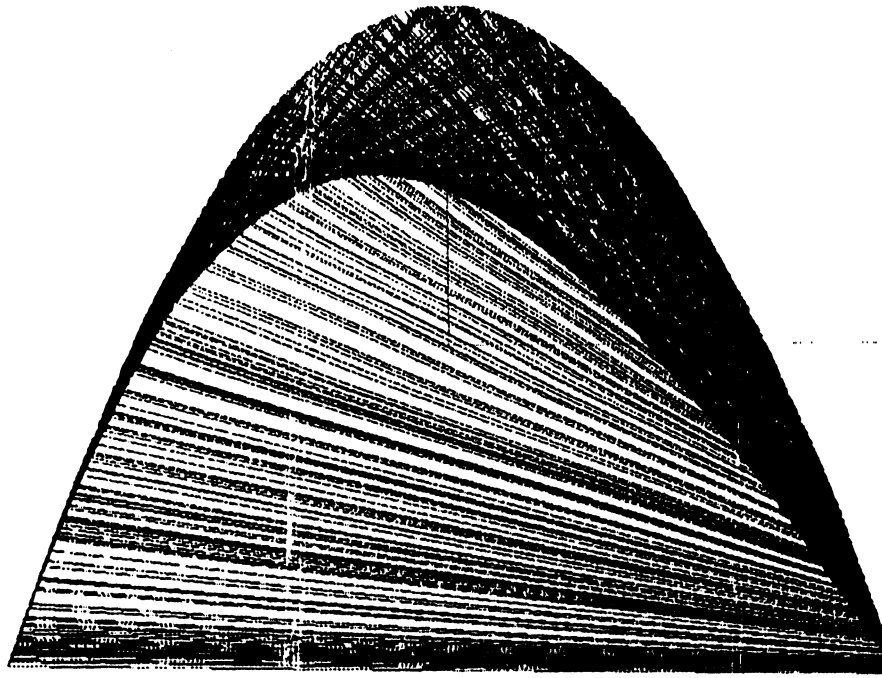

Figure 9.5. Phase plane attractor of chaotic logistic equation behavior.

change states in the rabbit olfactory system suggests that nonlinear systems are likely involved in many of the complex information processing tasks of the nervous system.

Many other features of brain function suggest strong nonlinearities that motivate models utilizing chaotic systems. First, feedback is the rule in brain function on multiple levels. Feedback circuits are ubiquitous throughout the brain from the level of individual cells to large networks. In addition, feedback from the environment about our state and performance is probably utilized for every function we perform.

A further piece of evidence to suggest chaos in brain function is that, at the most basic level, nonlinearity exists in all neuronal functions. The equations that describe the input–output relationship of neurons are highly nonlinear. For example, neuronal function saturates at high input levels, and so the neuronal activation function tends to look more like an s-shaped curve than a line. In addition, the neuron membrane conductance is highly dependent upon what the voltage is across it (Freeman, 1989). Thus, basic characteristics of the functional units of our brains are nonlinear.

In addition, properties suggestive of chaotic system behavior have been found in the human EEG (Babloyantz & Destexhe, 1986; Babloyantz, Nicolis, & Salazar, 1985; Basar, Basar-Eroglu, Roschke, & Schult, 1989; Krystal & Weiner, 1991; Layne, Mayer-Kress, & Holzfuss, 1986; Rapp et al., 1985) and in the electrocorticogram in conditions of waking, sleeping, and during seizures. Mpistos (1989), who found chaotic dynamics in the brain of the sea slug, suggested that the unpredictability of the system over time was an adaptive mechanism in that it "represents an information gain by which the brain naturally creates new response possibilities" (p. 521).

All of these factors motivate looking to chaotic systems to aid in our understanding of creativity and human behavior. Nonlinear function is ubiquitous in the central nervous system. The capacity for novel behavior and ability for rapid changes of state make chaotic systems attractive models of human creative function.

Now, with this introduction to the concept of chaos, let us return to the investigation of perception and creativity by the Lund group of experimenters.

PERCEPTION AND CREATIVITY

In the studies on perception previously referred to, Westerlundh and Smith (1983) were not at all distracted by the common psychoanalytic taboo about the primary process being forbidden in waking state perception and cognition. They simply said: "In creative work one engages not only cognitive but also intuitive, emotional—so-called primary process—aspects" (p. 630). In considering the approach, we realized that one had to have freedom to use imagination, have the courage and self-confidence to "stick" to mental products, abandon the need for consensus, and as these authors put it "overcome the compelling force of 'the correct meaning.' and... rely on one's own impressions as if they were real" (p. 631).

This group of investigators proceeded to test this hypothesis in a very convincing manner, and proved that the freedom to trust one's conceptions and resist the demands of society (incidentally, one of the three temptations of the Buddha) was essential in the process of creativity (Smith & Carlsson, 1990). Perception was studied by exposing the subject tachistoscopically to an image, until it was quite visible, and in the process the investigators demonstrated that perception was reworked many times from the first, vaguest, unconscious registration to the final stimulus proximal one on which one could expect intersubjective agreement.[1] Later, by using their creative function test (CFT),

[1] These investigators also demonstrated the psychodynamics of perception. While the perceptive reworking goes on, another process takes place related to determine "what is this?"; this question is handled by bringing associations, each with its affective charge. These signal affects motivate defensive operations, resulting in revealing the perceptgenesis that reveal defensive activity—

they shortened the exposure gradually reaching tachistoscopic subliminal periods, allowing those creatively capable to exercise their imagination according to their inclination (i.e., at random).

The illusion of the linearity and unquestionable continuity of the waking state narrative is as outdated as the illusory observation of the flatness of the Earth. The dichotomy *conscious–unconscious* is an anachronistic residual of the topographic point of view (Krystal, 1988a, 1989). Modern neuroscience recognizes a number of spectra of consciousness: selective modification of consciousness (by drugs and defensively), state-related memories, priming, and circumictal phenomena. It may be said that in relation to consciousness and memory, neuroscience, psychoanalysis, and various psychological schools have been working on chaos for years. Certainly narratives, dreams, and creativity are marked by sensitive dependence on initial conditions and the capacity for novel unpredictable behavior that are hallmarks of chaotic systems. An example is the study on percept-genesis, in which the subject, in reacting to tachistoscopic exposures to test objects, showed preliminary phases of perceptions colored by reflections of their early experiences, and interpreted in patterns related to childhood characterological defenses (Westerlundh & Smith, 1983, p. 608). The same studies demonstrated that a variety of stimuli can be presented in an ambiguous, or off-center position, or can be contrived to resemble familiar childhood psychosexual, psychosocial, or developmental crises, and a tested subject will readily interpret or modify the material so as to portray residues, potential memories of their significant past registrations. In other words, all of our future experiences are influenced in some measure by all the butterfly effects of the past. The influences are usually barely discernable even under especially favorable circumstances, but we can envision that sometimes they accumulate into significant positive achievements, or capacities, or like a hurricane, build up enormous self-destructive forces. But in the meantime, in the life of the average person, they sometimes brighten the night like lightning, or become a motivation to set out in search of adventure, and take a chance on modifying a part of the view of the universe which most people accept in comfort.

Although the phenomena are reminiscent of the behavior of chaotic systems, in being sensitive to previous conditions and capable of novelty, it is tempting, though impossible, to extrapolate nonlinear models of the brain to models of human behavior. Evidence suggests that models capable of chaos may be useful in understanding brain function at the level of neurons and their interactions. Future work is needed to bridge these levels and elucidate the neuronal underpinnings of narratives, dreams, and creativity, and to clarify the role of

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corresponding to specific levels of characterological traits (Westerlundh & Smith, 1983). In this fashion the residues and memories of daily activities and experiences become linked in groupings around specific affects, which can be evoked in REM sleep in the form of visual images.

chaos in the phenomena. Such work would further the cause of Grotstein (1990), who has utilized chaos theory in trying to understand psychotic function. In this regard, Freeman (1991) reflected on this issue of levels, based on his work identifying the importance of chaos in perception in the rabbit olfactory system:

> Consciousness may well be the subjective experience of this recursive process of motor, reafference and perception. If so, it enables the brain to plan and prepare for each subsequent action on the basis of past action, sensory input and perceptual synthesis. In short, an act of perception is not the copying of an incoming stimulus. It is a step in a trajectory by which brains grow, reorganize themselves, and reach into their environment to change it to their advantage. (p. 85)

Having developed a book of experiments on creativity, Smith, Carlsson, and their collaborators (1990) felt ready to think over their results. They had operationalized the process of percept-genesis, and observed the relationship between the P-Phases and the C-Phases of a percept, which we quoted and defined earlier as representing the "last," final, correct percept, and the P-Phase as the preliminary percepts. They used the creativity function test and found that subjects scoring above median on the CFT could be considered creative individuals.

In studying children, they found that creativity made its appearance at age 5–6, and then reappeared again at age 10–11. As we understand their results, creativity correlated with a criterion of literary-artistic (or aesthetic) tendency, and an inclination to retain their (subject's) final or stimulus proximal phase of registration. In other words, there is a sliding back to the fantasy and/or defense-dominated preparatory phase. Smith and Carlsson explain (1990) this phenomenon as follows:

> To be creative in any field, the individual must apparently escape the dominance over his experience of conventional conceptions of reality and play with unconventional alternatives. The breeding ground for these alternatives is to be found mainly within the individual himself. In scientific and humanistic work, as in esthetics creation, the individual must let his childish self question his rational, adult self in order to transgress the surface meaning of reality, i.e., to function symbolically. (p. 73)

The same individuals had favorable attitudes toward their dreams, and had early (before age 3) childhood memories.

Thus, we discover that individuals open to the ambiguities and nonlinearities in their inner world, feel more at ease with incongruities, novelties, and have a greater attachment to their curiosity and pleasure in changing things, than the ones for whom security and immutability have become a magically powerful sign of their *goodness*.

In a number of carefully conducted tests, Smith and Carlsson (1990) demonstrate that the motivation for a creative person not to give up the search for

a good solution (and, we could add, a vocalization to one's affective, vital, and oneiric needs) in a form suitable for communication, is derived from one's freedom to search, to find, and to use any self-caring, self-gratification, or self-enhancing view of one's (own) world. Because creative acts are revolutionary, there is a whole panorama introduced from competitive ambitions, to an urge to change the world.

CONCLUSION

In June 1990, we drafted a paper entitled "An Integrative Approach to Dreams," in which we were exploring some possibilities of mathematical modeling of the operation of cell assemblies involved in REM sleep. A part of it was read to a joint meeting of the Cincinnati Psychiatric and Psychoanalytic assemblies on February 13, 1991, and to the Michigan Psychoanalytic Society. Howard Shevrin, the discussant of this draft, commented that we presented a sequential process which he summed up as follows:

> It struck me that this new integration is intended to draw together recent developments in the field of dream research and to replace the older topographic and structural theories. The purely neurophysiological explanation offered by Hobson and McCarley is supplemented rather extensively by a number of other factors:
>
> 1. A neurocognitive representational hierarchy.
>
> 2. A perceptual-genetic account of the transitions from the unconscious to consciousness or from primitive to adaptive cognition.
>
> 3. A crucial role for signal affect.
>
> 4. A key place for personality or cognitive style.
>
> From the point of view of this synthesis, a dream is the outcome of a neural activation of a *representational hierarchy* organized sequentially according to *perceptual-genetic* principles, developing from primitive to adaptive representations, accompanied by *affect signals* that may abort or inhibit the sequence at any step in this hierarchical activation. Finally, the entire outcome is strained or screened through a particular *personality* or *cognitive* style, more or less given to emphasizing detail or relying on gross features.

Shevrin was critical of the emphasis on the characterological traits involved in the reworking of dreams and perceptions, for he felt that the paper suggested that working on dreams through obtaining the individual's associations was deemed superfluous. His conclusion was overstated, for we have made no such

suggestion, although we would say that we attribute *values* to the manifest contents of a dream. In particular it gives us clues as to the individual's defensive operations, which we can readily demonstrate, often quite convincingly.

Reflecting on these comments, it occurred to us that most analysts feel that *associations* are part of the cloth from which the dream is derived, and we have to go *through them* from the manifest dream contents to the latent dream thought. Mentioning the attentive, perceptive, cognitive, and memory styles seemed to cramp the style and therefore would probably not be *proper* analysis.

But as we see it, the reporting of dreams, processing of sensory information, reporting of narratives, and, in general, our waking function, all reflect an individual's characteristic style and are all marked by the same degree of creativity. This style is based on one's ability to tolerate affect and utilize affect, symbols, and fantasies in exercising self-gratifying functions. These capacities are in turn dependent on the formation and maintenance of a self representation that includes self-caring function, a process that may be derailed at any point by severe trauma. There is growing evidence for chaotic behavior in the nervous system. The unpredictability and capability for generating new responses suggest such systems as strong candidates for making creativity possible. While neural systems capable of chaos might confer the ability for creativity, only those that are able to exercise self-caring functions can express this potential. Those who are afraid of voicing anything that resembles a wish-fulfilling, self-gratifying fantasy must censor out the creative elements so that they do not become expressed.

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10

Affect, Hemispheric Specialization, and Creativity

Klaus D. Hoppe

This chapter illuminates the topic of the book by including the relevant importance of the specialized differences of the two hemispheres of the brain. Relations between hemispheric specialization and affect are described. An experimental study of commissurotomy—or "split-brain" patients—and a precision-matched control group showed a diminution of imagery, fantasies, and symbolization in the commissurotomy patients, comparable with postencephelitic Parkinson patients before their awakening. Discursive and presentations symbolization are combined through a transcallosal process, called symbollexia. *Nonoperated alexithymia patients carry a* functional commissurotomy, *which can be recorded by a brain/mind profile and treated in psychotherapy. EEG findings of the experimental study support the view that creative acts occur on two planes at once, and that this bisociation, in a dual brain, promotes creativity. The chapter concludes with a discussion of* cosmic heroism, *the union of passion with renunciation, and the convergence between science and religion, with which the creative person learns the art of living, loving, and dying.*

Art is the creation of forms symbolic of human feelings.—Susanne Langer (1977)

In the above quotation, Susanne Langer combined creativity with symbolization and feelings. This is the topic of this chapter. It deserves an essential holistic-humanistic approach.

Oliver Sacks, touched by the profound interaction with his patients, suffering and awakening from postencephalitic-parkinsonism, outlined "meta-physical terms" that bring "disease—the man—the world together" (1983, p. 206). In his other remarkable book, *The Man Who Mistook His Wife For a Hat* (1985), he asked for a *personalistic* sort of neurology, or—as Luria, the founder of neuropsychology called it—*romantic science*.

Romantic science has been not only expressed by poets and philosophers, like John Donne, Leibnitz, Novalis, and Kleist, and modern existentialists and psychoanalysts, like Binswanger, Freud, Jung, Rank, and Ernest Becker. It is also a topic for quantum physicists, like Einstein, Bohr, and Heisenberg. Thus, I would like to include the view of Fred Allen Wolf (1984), who described the "physics of hate and fear" and "love and photons," in my first section; Susanne Langer and Oliver Sacks in the second on hemispheric specialization and affect; and Ernest Becker in the last section on creativity, hemispheric specialization, and affect.

AFFECT

Emotions, feelings, mood, and affects are often used interchangeably, as demonstrated by the Oxford Universal Dictionary. It defines *affect* as "a mental disposition," *emotions* as "a mental feeling" (pain, desire, hope), and *feeling* as "a condition of being emotionally affected" (pleasurable or painful). For this chapter and title of this book, the word *affect* was chosen because it refers to the mood of inner subjective feelings, as well as to the external manifestations of these feelings, and it combines psychological and biological components. The biological components or "visceral emotions" lie in various structures of the limbic system, wherein feelings are represented by the neocortex.

The term *affect* is the same in English, German, French, Spanish, and Portuguese. Psychoanalytically, it connotes

> any affective state, whether painful or pleasant, whether vague or well defined, and whether it is manifested in the form of a passive discharge or in the form of a general mood. According to Freud, each instinctual drive expresses itself in terms of affect and in terms of ideas. The affect is a qualitative expression of the quantity of instinctual energy and of its fluctuations. (Laplanche & Pontalis, 1973, p. 13)

Thus, the word *affect* seems to be the most appropriate expression of romantic science. In his book *Star Wave*, Wolf (1984) boldly suggested that quantum physics can be thought of as a "psychological science as well as a physical one" (p. 6) and heralds the beginnings of "humanistic physics" (p. 7). Following this concept, Wolf metaphorically suggested that each atom behaves as if it had an ego of its own, which is lost when atoms combine in order to form a group identity of molecules (p. 134). In analogy to the fundamental interaction between

the electron, one of the smallest particles of matter, and the photon, a particle of light, Wolf postulated psychic units, called *morphemes*, which behave like electrons. Through the interaction of positive and negative morphemes with photons, love and hate were conceptualized (pp. 137, 144).

Wolf even spoke of the "death wish" of all electrons (p. 140): to return to the state of oneness with the universe of light. In contrast to the annihilation-fear and "hate" of electrons, photons "desire" to be in the same quantum state (p. 145) and can be equated with feelings of love (p. 152). According to Wolf, thought and emotions may be complimentary attributes (p. 153), and through nonlinear neuronal connections, waves allow feelings and thoughts to arise in our brain (p. 154).

The "microcosmic" psychophysics of Wolf bridges over to the more firmly rooted "macrocosmic" connections between the cortical hemispheres and affect dealt with in the next section.

HEMISPHERIC SPECIALIZATION AND AFFECT

The global understanding of hemispheric specialization was formulated by Roger Sperry in the following way: "We found that each disconnected hemisphere was capable of sustaining its own conscious awareness, each largely oblivious of experience of the other" (see Zaidel, 1985a, p. 9). This understanding of the dual brain represents the basis of my own research on split-brain people. It is also the springboard of enumerable papers and books, many scientific and many more or less scientific, often uncritically connecting hemispheric specialization with playing tennis, skiing, driving, drawing, and sex, so that Marcel Kinsbourne was correct in calling it "dichotomania" (Galin, 1988).

During the last few years, hemispheric dichotomy has been challenged and differentiated by emphasizing the difference between the anterior and posterior brain. The posterior regions of the hemispheres actively participate in perceptual tasks, and the anterior regions are involved in the generation of emotional expressions. According to Kinsbourne and Bemporad (1984), the posterior cortex specializes in representative functions (i.e., representation of information about the environmental context), whereas the anterior cortex has regulatory functions.

According to Kinsbourne (1988), the left hemisphere seems to be responsible for the maintenance of ongoing behavior by decoding in rapid serial formation plans from its posterior to its anterior specialization. In contrast, the right-hemisphere specialization includes the detection of novel and unexpected events and the arrest of ongoing behavior. Kinsbourne emphasized two dimensions of affect in connection with the differentiation between elation-depression and relaxation-anxiety. Positive affect of calmness is associated with left-hemisphere

functioning, whereas joy is associated with right-hemisphere functioning. Depression of the anxiety type is related to the left anterior area, and anhedonia depression to the right posterior area. Further on, Kinsbourne (1988) stated: "In the more severe primarily psychiatric depressive states, one would expect left-frontal and right-posterior deficits to co-exist" (p. 152). Mild neurotic or reactive depression could be characterized as disorder, originating with left frontal underuse, and involving impulsive, ill-conceived behavior and instability, but without anhedonia or lack of motivation.

Concerning this rather complicated model of Kinsbourne, I would like to agree with the conclusion of Eran Zaidel concerning dual-brain theory: "We believe it is theoretically premature and methodologically costly to abandon the structural approach to dual brain theory at the present time, however over-simplified it appears" (1985b, p. 394).

With regard to the interhemispheric and intrahemispheric representation of anxiety and hostility, I would like to mention the findings of our experimental study at UCLA concerning *alexithymia* and the split brain (TenHouten, Hoppe, Bogen, & Walter, 1985). This study tested the hypothesis that commissurotomy or split-brain patients, lacking a connection between the symbolic and affective perception of the right hemisphere and the verbal capabilities of the left hemisphere, would be limited in affective verbal expression compared to normal controls. Eight cerebral commissurotomy patients, and eight precision-matched normal control subjects, were shown a 3-minute videotaped film, symbolically depicting the death of a baby and a boy. The symbolic and affective contents of the film were conveyed through visual images and background piano music. There are no spoken words in the film. After three of the showings of the film, the 16 subjects were asked questions about the symbolic and affective content of the film; after the second showing, they were instructed to write four sentences about the film. Verbatim responses to 20 questions and one instruction were scored for the Gottschalk and Gleser (1969) verbal content analysis scales of anxiety and hostility.

Our study of Gottschalk-Gleser content analysis revealed a significantly higher level of the complex of shame- and total-anxiety, in combination with hostility directed both inward and outward, in split-brain patients than in the matched normal control group. This result corresponds with superego functions on a childhood level that I found in commissurotomy patients (Hoppe, 1978). Their strict, punitive conscience directs hostility towards themselves, sometimes also in angry outbursts towards authority figures outside, whereas a fearful avoidance of sex and a submissive clinging to an external idealized figure indicate shame and total anxiety. Thus, the person who is restricted to the fixed set of rules of his or her left hemisphere and of his or her early superego components cannot develop creativity, because he or she is deprived of symbollexia and the access to symbolization and imagery of his or her right hemisphere. This individual can daydream about hostile revenge and sexual

involvement, but is incapable of romantic or more elaborate and metaphoric fantasies (Hoppe, 1988, 1989).

The geographical examination of the handwritten responses of our eight split-brain people and eight control subjects also demonstrated an increased inhibition and repression of feelings in the split-brain people (TenHouten, Seifer, & Siegel, 1988).

This behavior and human condition of split-brain people can be compared with patients suffering from postencephalitic parkinsonism so vividly described by Oliver Sacks (1983) in his book *Awakenings*. Of course, the postencephalitic parkinson patients showed a much more blocked affect and thought process (which can be then unblocked and awakened by the use of L-dopa). However, both patient groups are candidates for romantic science because, as Sacks stated, "any description of a right-hemisphere syndrome reveals the physical foundations of the persona, the self" (1985, p. 3).

In addition to the horizontal access of interhemispheric and intrahemispheric connections, discussed by Hoppe (1990a, 1990b), a vertical access of connections between hemispheres and the reticular formation, of subcortex and brain stem (awakeness, alertness, and activation) as well as the limbic system are important for affective responses and affective disorders.

Although emotions are not only lateralized from the limbic systems to the right hemisphere, its cognitive representations (feelings and symbols) occur in both hemispheres. TenHouten (this volume; TenHouten, Hoppe, Bogen, & Walter, 1986) presented experimental evidence suggesting that the right hemisphere plays a special role in perceptual judgments of a variety of affect-laden stimuli. It is more involved than the left hemisphere in all types of affective processes.

According to Langer (1942), a discursive symbolization is articulated and needs a secondary thought process (cf. reality principle; Freud, 1911). Presentational symbolization represents the logic of feelings as expressed in fine art, mystical experiences, or music, and exhibits primary process attributes, such as condensation and displacement.

According to Luria (1967), the right frontal lobe is involved in the perceptual analysis of semantic images of a series of pictures that depict the stages of a story, and for the cognitive representation of the expressive elements of these images. The right temporal area is known to be involved in the grasp of the significance of visual images and music.

In expressive people, the presentational symbolization and imagery in the right hemisphere is transferred to the left hemisphere via the corpus callosum. I call this transformational process of verbalizing presentational symbols *symbollexia* (Hoppe, 1985a, 1986). In the left hemisphere, symbols and images are comprehended and verbalized in the Wernicke and Broca areas. Between these two speech centers, neuronic connections and centers for speech encoding facilities a process of inner speech (see Figure 10.1).

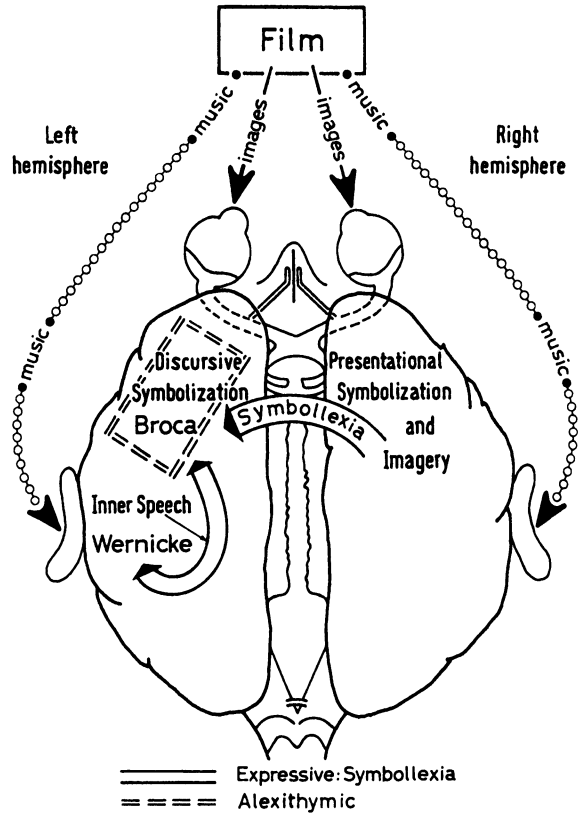

Figure 10.1. The transformational process of symbols.

Commissurotomy patients lack symbollexia. Their predominantly discursive symbolization in the left hemisphere corresponds with alexithymia in people who have not been operated on but function in a similar way. I described this type of alexithymia as reflecting a *functional commissurotomy* (Hoppe, 1977, 1978) and found it in survivors of severe persecution (Hoppe, 1984a) and in some Catholic priests (Hoppe, 1984b). Alexithymia is also described in psychosomatic and somatoform disorders, psychogenic pain, and substance use disorders (Taylor, 1984).

How can this integrative understanding of brain functions and affect help therapeutically? Concerning psychoanalytic psychotherapy, Noy (1986) recommended restoring a sound cognitive balance between the primary and secondary processes. For several years, I attempted to restore a cognitive balance in patients treated by psychoanalytically oriented psychotherapy (Hoppe, 1984b; Hoppe &

Kyle, 1987). By using the hemispheric *brain/mind profile* developed by Loye (1983), patients can learn about their right and left hemispheric brain functions. After giving the information of this profile to the patient, the therapist can attempt to work through marked imbalances between the two hemispheric styles and to stimulate more creative and affectively balanced processes.

According to their brain/mind profile, patients who had difficulty in associating and in recollecting dreams and fantasies were predominantly using left hemispheric thinking. After a discussion of the profile results, these patients were more aware of their intellectual and emotional blocks, and more motivated to be open to free association, dreams, and fantasies, represented in their right hemisphere. In addition, resymbolization was attempted and sometimes guided imagery was used in order to stimulate symbollexia and a hemispheric bisociation (Hoppe & Kyle, 1990).

These integrative therapeutic endeavors correspond with activation of positive affects, like joy, love, gratitude, bliss, ecstasy, and happiness, which Horton (1988) recently connected with zones of the right parietal cortex. According to Luria (1973), so-called tertiary zones of the posterior cortical region are involved in the transition from direct, visually represented synthesis to the level of symbolic processes.

Joy and humor are definitely connected with the right hemisphere. Sperry, Zaidel, and Zaidel (1979) obtained significant emotional responses in the right hemisphere of two commissurotomized patients who were selectively confronted with affect-laden stimuli. The one patient signaled "thumbs down" when he recognized the picture of Hitler with his right hemisphere and responded to his own photo by a tongue-in-cheek "thumbs down" gesture, accompanied by a broad grin as a sign of subtle sense of humor. Sperry and Zaidel concluded that the emotional responses from the right hemisphere were somewhat more intense and less restrained and qualified than those from the left. They spoke of an affective aura, which is rapidly transferred from the right to the left hemisphere through brain-stem mechanisms.

Thus, we can assume that affective language is mainly represented and spoken by the right hemisphere. Both hemispheres are able to sustain affect.

CREATIVITY, HEMISPHERIC SPECIALIZATION, AND AFFECT

Considering the importance of the right hemisphere for affective language, presentational symbolization, intuition, music, and art, and the importance of the left hemisphere for verbalizing and organizing these faculties, working together via symbollexia, I proposed the concept of *hemispheric bisociation* as a neuropsychological basis for creativity (Hoppe, 1988, 1989).

In contrast to split-brain commissurotomy patients, the expressive persons of

the control group in the experimental study of TenHouten et al. (1985) verbalized mutilation-separation anxiety and death-separation anxiety when scored using the Gottschalk-Gleser verbal content analysis scales for anxiety and hostility. Because of their emphatic identification and scenic understanding of the film, they were able to imagine the symbolically depicted death of the baby and the boy, to experience empathetically the pain, grief, and sorrow caused by it, and were able to express it creatively by being open to both hemispheres and the creative act between the two hemispheres called hemispheric bisociation. In his ingenious book *The Act of Creation* Koestler (1964) described bisociation as a conditio sine qua non for creativity. In reference to the dual brain and its hemispheric specialization, the left hemisphere follows a fixed set of rules. This code governs the matrix of an overwhelming possibility of choices expressed by the right hemisphere. As Koestler put it: "By living on both planes at once, the creative artist or scientist is able to catch an occasional glimpse of eternity looking through the window of time" (1978, p. 146).

Interestingly enough, the EEG analysis of our experimental study supported this hypothetical concept of hemispheric bisociation. In comparing alexithymia, manifested in seven commissurotomy patients and one control subject, with expressiveness in seven control subjects and one commissurotomy patient, TenHouten, Walter, Hoppe, and Bogen (1987, 1988) found the following results:

1. In alexithymic subjects, the right temporal area (T4) was less activated, suggesting an inadequate grasp of the significance of visual images and music of the film.
2. In alexithymic subjects, the two language areas of the left hemisphere (Broca's [F3] and Wernicke's [T3]) were less activated, suggesting a possible lack of inner speech. In addition, the higher left parietal (P3) activation might be interpreted as inhibition of conducting inner speech between the two language areas.
3. Alexithymic subjects showed a higher coherence between the right frontal (F4) and left parietal (P3) areas, suggesting a possible interhemispheric aspect of inhibition of expression. In contrast, expressive subjects had a higher coherence level between the right frontal (F4) and left temporal (T3) areas, which suggests a possible mechanism facilitating the transformation of the affective understanding in the right hemisphere into the verbal expression of the left hemisphere.

These inter- and intrahemispheric findings in the right and left hemispheres are very important for our topic of creativity and affect. Because alexithymic people cannot fully grasp the significance of visual images and music in the right hemisphere, they are impeded in hemispheric bisociation and can only follow the fixed set of rules of their left hemisphere. The possible lack of inner speech between the two language centers of the left hemisphere increases the

fixed rules further. In addition, the suggested interhemispheric inhibition of inner speech deprives these individuals from the affective and symbolic understanding of their right hemisphere, and thus from "looking through the window of time."

Hemispheric bisociation combines the view through the window of outside time (*erlebte Zeit*—Hoppe, 1978; or *clock time*—Loye, 1983), registered in the left hemisphere, with the view through the window of inner time experience (*gelebte Zeit*—Hoppe, 1978; *spatial time*—Loye, 1983), experienced mainly in the right hemisphere. Hemispheric bisociation also makes use of homospatial and janusian thinking (Rothenberg, 1979), which transcend space and time.

CONCLUSIONS

If we follow Bogen's (1975) speculation that each hemisphere represents the other in the world in complimentary mapping—the left mapping the self as a subset of the world, and the right mapping the world as a subset of the self—we appreciate the importance of our brain hemispheres for creativity. Open to the presentational matrix of self-asserting and self-transcending choices of the right hemisphere, combing it with the discursive power of the left hemisphere via symbollexia, we may experience our being in the world as an infinite act of creation.

Ernest Becker (1973), quoting Rank and Kierkegaard, proposed the combination of *passion* to develop creative work with full force, with renunciation of that very work because it cannot give by itself salvation as creative solution. For this goal "cosmic heroism" (Becker, 1973, p. 91) of man as "theological being" is necessary; creativity means fulfillment of the agape love-expansion (p. 174). Becker spoke of a twin ontological need of man, after the first step of self-reflection with accepting and integrating the shadow (Jung, 1951), to make the second step of surrendering to God in a "heroic transcendence" (p. 209). The creative man originates a new symbolic transcendence.

In my book *Gewissen, Gott und Leidenschaft (Conscience, God, and Passion)* (Hoppe, 1985b) I dealt with the same union of passion with renunciation, describing the development from a private world of paradise to cosmic empathy and the pilgrimage to the absolute during the psychotherapy of Catholic priests and religious leaders.

Let me close this chapter on affect, hemispheric specialization, and creativity with Roger Sperry, who started the split-brain research. Sperry (1988) discussed his view of the convergence between science and religion. According to his new mentalist thinking, the humanist paradigm, contents and qualities of inner experiences are given primacy over the more basic physiochemical forces. The higher, more involved macroforces supersede the less involved microforces in controlled hierarchies.

This new outlook on existence combines formerly antithetical features from both sides of the old spiritual–physical dichotomy into a single consistent world view synthesis, not only from below upward, following the course of evolution, but also from above downward, via macroforces. The principle of control from above downward, referred to as *downward causation* by Campbell (1974), Popper (1978), Popper and Eccles (1977) and Sperry (1988), can be applied at all levels throughout nature. The upward and downward controls work conjointly and continuously during the onward progression of events in time and are less sequential than spatial, coherent and structural, using the right and left hemispheric functions.

Thus, by combining science with the concept of a higher order, passion with renunciation, the creative man, on the bridge of cosmic empathy, learns the art of living, loving, and dying (Hoppe, 1984a).

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11

Creativity, Intentionality, and Alexithymia: A Graphological Analysis of Split-Brained Patients and Normal Controls

Warren D. TenHouten

Spoken words are the symbols of mental experience, and written words are the symbols of spoken words.—Aristotle

The concept *alexithymia* refers to a cognitive-affective disturbance with the following features: First, there is a lack of feelings for words. The alexithymic person does not lack words for feelings in the same way that a color-blind person can say, "The sky is blue." Although the word *alexithymia,* coined by Sifneos (1973; Nemiah & Sifneos, 1970), has the literal meaning, "no words for feelings," the meaning of this aspect of alexithymia is better conveyed by the Greek word, *athymoalexia,* which means "no feelings for words" (Philippopoulos, 1977). The alexithymic thus has difficulty describing his or her feelings to other persons. Second, the alexithymic person not only has difficulty in verbally identifying feelings but also in distinguishing feelings from bodily sensations. Third, there is in alexithymia a lack of symbolizations, known as *dyssymbollexia* (see Hoppe, 1985), and an impoverishment of fantasy life, resulting in a utilitarian mode of thinking (Sifneos, 1973). Finally, there is a social ineffectiveness, characterized by overconformity in interpersonal relation-

ships. The sociological content of this aspect of alexithymia is broadened in the present chapter to include a diminished emphasis on productive engagement in the world and a lack of intentionality. It has been found that alexithymia is common among persons suffering from psychosomatic disorders, but psychosomatic phenomena are not ordinarily taken as definitive of alexithymia.

A study of eight commissurotomized patients indicated that these patients were highly alexithymic (Hoppe & Bogen, 1977). In the split-brain surgery, the corpus callosum and other structures directly connecting the left and right cerebral hemispheres (including anterior commissure, dorsal and ventral hippocampal commissures, and in some cases, the massa intermedia) were severed (Bogen & Vogel, 1962). The initial hypothesis was that these patients would have—as a split-brain syndrome—a restriction in their ability to talk (which is left hemisphere dependent) about feelings (cognitively represented emotions, primarily by the right hemisphere).

In a second experiment, eight split-brained patients were paired with eight precision-matched normal controls (TenHouten, Hoppe, Bogen, & Walter, 1985a, 1985b, 1985c, 1985d, 1985e; TenHouten, Walter, Hoppe, & Bogen, 1987, 1988). All 16 subjects were shown a 3-minute videotaped film ("Memories: If Truncated in Mourning") four times, in a single experimental session. This film portrayed, with visual images and background piano music, the deaths of a baby and of a boy. After the first showing of the film, a number of questions were asked of the subjects; after the second showing, they were instructed to write four sentences expressing what they felt about the film.

Content analyses of the transcripts of the spoken and written responses were first carried out (TenHouten et al., 1985a, 1985b, 1985c). The objective of these analyses was to measure alexithymia and thereby test a number of hypothesized differences between the commissurotomy and normal groups, on the basis of this verbal content. Commissurotomized patients were found to be significantly more alexithymic than controls, on three levels of content—lexical constituents, sentences, and global interpretation of fantasy and symbolization.

During the single experimental session for the two-group study, brainwave data were continuously recorded. Analyses of EEG data acquired during the four presentations of the videotaped film showed a relative lack of interhemispheric communication, as indicated by alpha-band coherence in the electroencephalogram, to be an intermediate link between corpus callosotomy and alexithymia (TenHouten, Walter, Hoppe, & Bogen, 1987). It was shown, by means of instrumental variable and covariance structures analyses, that callosotomy decreased interhemispheric communication, as indicated by alpha-band coherences between homologously placed electrodes over left and right frontal, temporal, and parietal lobes of the brain. Decreased interhemispheric coherence, once reduced by callosal section, in turn resulted in a deficit in the ability to verbally articulate feelings and emotions.

The results of this study have implications for the study of creativity and

pathological lack of creativity. Following the splitting apart of the left and right hemispheres, patients seemed to have a degraded experience of symbolization. They used few affect-laden words (a face valid index of alexithymia); their relatively frequent auxiliary verbs suggests a passive and indirect personal style; they used relatively few adjectives, suggesting speech that is flat, dull, uninvolved, and lacking in color and expression. Further, they were found relatively less apt to fantasize about or imagine the symbols (of the filmic stimulus). Such evidence from our two-group experiment shows a lack of creativity in the contents of their spoken and written verbal productions, and we have been able to describe these patients as dull, flat, colorless, unexpressive, passive, indirect, lacking fantasy, unimaginative, unresponsive to symbols, and describing circumstances surrounding events rather than feelings about these events. The evidence suggests, albeit indirectly, a lack of creativity in the lexical-level content of their spoken and written verbal productions. On the basis of these results and his psychiatric interviews, Hoppe (1977, p. 151) further characterized these commissurotomy patients as symbolizing in a discursive way, using mainly secondary-process thought, as opposed to a presentational structure consistent with primary-process thought. They also show a concreteness in their symbolizations, with an emphasis on stereotypic denotations.

In this chapter another level of data will be examined, with the aim of finding more direct measures of creativity and intentionality. The data to be analyzed consist of the handwriting of subjects, in the four sentences they wrote about the film used in the experiment. Through a quantitative method of measuring and interpreting handwriting it was possible to measure creative aspiration, creative organization, goal directedness, expressions of feelings (an indirect measure of expressiveness/alexithymia), libidinal energy, and a general concept referring to the dynamic portion of the personality—to goal-directed activities directed toward performances, accomplishments, and the mastery of reality. The construct validity of these concepts will be studied by examining pairwise correlations. After results are discussed, a number of theoretical suggestions are offered which link creativity, intentionality, and the brain.

METHOD

Handwriting, as psychomotor gesture, reflects cerebral organization. Bogen's (1969) demonstration of dysgraphia in the left hands and dyscopia in the right hands of eight commissurotomized patients (four of whom were included in the research reported here) first demonstrated functional specialization in the isolated cerebral hemispheres of the human brain. In this chapter, we study the script produced by the right hands of the split-brained patients (compared to normal controls). The specific method to be used here is the Psychogram, an outstanding quantitative technique of graphological analysis in which particular

features of eight "sectors" or "constellations" of personality structure are inferred from detailed features of handwriting. This technique was developed by Roman (1952), and given formalization and elaboration by Anthony (1977). Roman emphasized that the objective of graphology in general, and the Psychogram in particular, is to represent an integrated and synthetic view of the personality. The 40 quantitative graphological variables of the Psychogram are partitioned on a conceptual, a priori basis into eight sectors. Roman (1952, p. 127) wrote that "no... single component or feature of handwriting can be interpreted without reference to all the others, even though for purposes of analysis we... set them apart, view each one technically by itself.... The single feature as such is significant only in relation to the group to which it belongs."

Data from the following five sectors were analyzed[1]:

X_1 intellect, aspirations, and creativity;
X_2 goal direction and ego strength, "I" emphasis;
X_3 gestures of emotional release;
X_4 fullness of libido, energy, and drive; and
X_5 control of gestural structure.

Sector X_1—*intellect, aspirations, and creativity*—is measured by six graphological variables:

good organizational structure (V_1);
innovative simplification of form (V_2);
upper zone elaboration (V_3);
upper zone height (V_4);
originality (V_5); and
expressiveness (V_6).

Sector X_2—*goal direction and ego strength*—reflecting integrated personality, is characterized by:

fluidity of movement and rhythm (V_7);
active trizonal dynamics (writing above and below baseline) (V_8);
"I" emphasis (V_9);
middle zone height (V_{10}); and
firm writing stroke, with consistent pressure (V_{11});

[1] The other three sectors were also analyzed by the same factor analytic technique. No differences were found between patients and controls for factor scores representing the items in these sectors. The sectors not used are X_3, Positive Orientation Toward Others and the World; X_6, Repression; and X_7, Social Inhibition and Overcontrol.

Sectors X_4 and X_5—*emotional release* (V_{19}–V_{20}) and *libido and energy* (V_{23}–V_{26})—have as their graphic signs:

connectedness (V_{19});
fluctuation, as opposed to regularity (V_{20});
fullness, as opposed to meagerness (V_{23});
lower zone length (V_{24});
lower zone elaboration (V_{25}); and
pressure (V_{26}).

Two variables from Sector X_4 were excluded from analysis on conceptual grounds (see later) and Psychogram Sectors X_4 and X_5 were joined in a composite sector.

Finally, Sector X_8—*control*—is indicated by:

slant consistency (V_{37});
consistent and even spacing between letters (V_{38});
alignment control (V_{39});
regularity (V_{40}).

THE DATA

The handwriting specimens were scored for the 40 Psychogram variables by a professional graphologist, Marc Seifer. He was provided information on the age and sex of each subject (which is standard procedure in graphology) but had no knowledge of status as a member of the experimental or control group. Each of the Psychogram indicators are rated from 1–10. The scores of the 16 subjects for the graphic indicators to be used in the analysis, by individual and group, are shown in Tables 11.1 and 11.2. Fragments of the graphological specimens on which the scoring is based are displayed in Figure 11.1. The commissurotomy patients are identified by their initials (AA through LB) and their matched controls, by Caa through Clb.

ANALYSES AND RESULTS

Analysis of Individual Graphological Signs

The first step in the analysis was to compare the group means for the 20 Psychogram variables retained for analysis. The results of these analyses, based on one-tailed matched-pair *t*-tests (Dixon, 1975), are shown in Tables 11.1 and 11.2. Ten variables differed significantly. Because single graphic signs are not

interpretable, no hypotheses were tested here. Uncorrected statistical significance ($p < .05$) is used rather as a screening criterion for variables in the following description.

Commissurotomy Patients' Handwriting

Commissurotomy patients, in comparison to normal controls, have less form and arrangement in the elaboration of the writing's upper zone (V_3) and write in a less expressive way, as their writing lacks consistency in effort and direction (V_6). They are relatively constricted in their expression of self, as their graphic gestures lack individual distinctiveness.

The writing of patients lacks rhythm and coordination of movement, organization, creative form (V_7), and trizonal dynamics (V_8). In addition to its arrhythmic quality, their handwriting lacks an effective articulation of the letters with connecting strokes, which indicates a lack of "creativeness of the graphic expression" (Anthony, 1977, p. 8).

Table 11.1. Psychogram Scores, by Individual and Group for Sectors XI and X2

ID	Expressions of Aspirations and Creativity (X1)					Goal Direction, Ego Strength (X2)					
	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11
Commissurotomy patients											
AA	5	5	4	4	4	3	1	2	3	4	1
NW	5	5	5	5	6	3	3	4	5	6	3
DM	3.5	4	5	4	2	2	2	2	4	6	2
NG	3	7	5	5	6	2	2	3	3	4	4
RY	2	5	4	5	5	4	3	2	3	6	3
CM	6	6	6	5	7	3	3	4	4	5	2
RM	4	5	5	6	4	2	1	2	6	7	1
LB	4	5	5	5	5	4	4	5	6	5	3
Mean	4.06	5.25	4.88	4.88	5.06	2.88	2.38	3.00	4.38	5.38	2.44
Normal control subjects											
Caa	3	3	6	6	5	5	3	5	6	7	6
Cnw	8	6	6	5	6	6	5	6	7	6	4
Cdm	7	7	6	5	7	6.5	5	6	5	3.5	6
Cng	6	5	5	5	6	2	2	5	5	5	2
Cry	5	5	6	5	5	4	4	5	4	5	4
Ccm	6	6	5	4	6	3	3	3	4	4	2
Crm	3	6	5	5	6	2	2	3	3	4	2
Clb	4	6	8	8	6	5	4	3	5	4	5
Mean	5.25	5.50	5.88	5.38	6.19	4.25	3.62	4.50	4.88	4.81	3.94
$t(7)$	−1.55	−0.46	−2.16	−1.00	−1.53	−2.17	−3.42	−2.05	−0.92	0.83	−1.93
p value	0.08	0.34	0.03	0.18	0.09	0.03	<0.01	0.04	0.19	0.22	0.05

Table 11.2. Psychogram Scores, by Individual and Group, for Sectors X4 and X5: Form Level (FL) and Functional Productivity (FP)

ID	Emotional Release X4 (V19–V20) Libido–Energy–Drive X5 (V23–V26)						Control X8				Form Leve	Funct. Prod.
	V19	V20	V23	V24	V25	V26	V37	V38	V39	V40	FL	FP
Commissurotomy patients												
AA	4	9	4	2	3	5	3	6	4	1	43	56
NW	3	8	6	6	7	5	4	5	4	3	60	71
DM	2	9	5	3	3	5	4	5	3	1	39	51
NG	3	7	3	3	6	5	4	6	2	2	51	63
RY	6	8	6	4	4	6	3	5	2	2	46	61
CM	3	7	6	5	5	3	6	6	4	3	53	63
RM	3	9	6	5	5	6	4	7	3	1	41	65
LB	6	6	6	5	5	5	3	6	3	3	64	64
Mean	3.75	7.88	5.16	4.19	4.75	5.19	3.88	5.88	3.12	2.00	49.25	61.75
Normal control subjects												
Caa	6	6	7	6	6	6	6	5	3	3	82	82
Cnw	6	3	7	6	5	5	6	6	6	6	90	90
Cdm	3	4	6	5	6	5	5	6	6	6	78	78
Cng	2	7	4	6	6	6	5	6	4	3	50	68
Cry	7	5	4	6	6	5	4.5	3	3	3	57	63
Ccm	3.5	7	3	4	5	3	6	6	7	3	47	62
Crm	2	7	4	6	6	5	2	6	3	1	47	57
Clb	6	6	5	4	4	5	4.5	5	5	3	55	66
Mean	4.50	5.62	5.31	5.44	5.50	5.00	4.88	5.44	4.63	3.56	58.88	70.75
$t(7)$	−1.40	3.00	0.34	−1.93	1.16	0.00	−1.90	1.00	−3.00	−2.39	−1.73	−1.93
p value	0.10	0.01	0.37	0.05	0.14	0.50	0.05	0.18	0.01	0.02	0.06	0.05

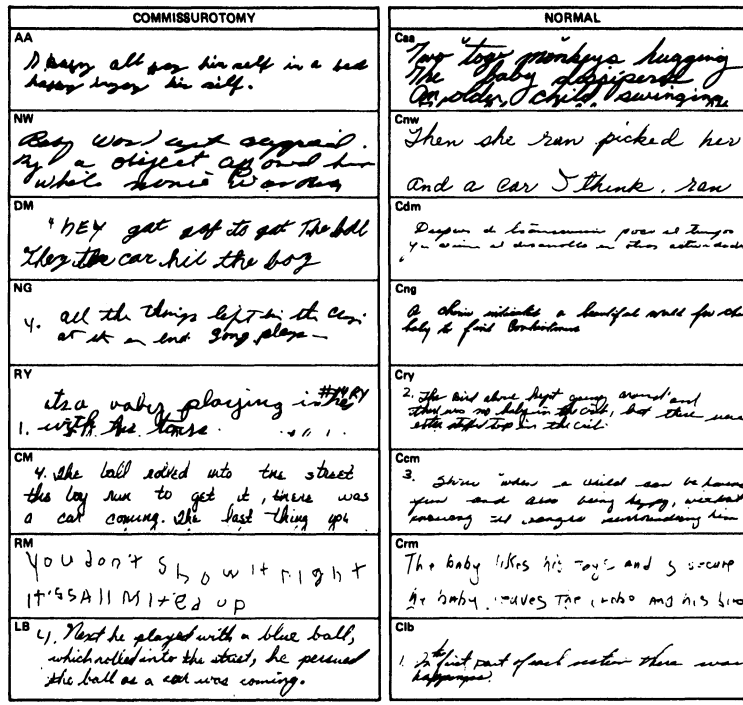

Figure 11.1. Selected handwriting specimens for commissurotomized and normal control subjects.

Patients are infirm in their writing stroke (ductus) and show an arhythmic alternation of pressure and release. Here, they can be said to lack control of sensuous expression (V_{11}). They do, however, express and symbolize emotions through their handwriting (TenHouten, Seifer, & Siegel, 1988). The writing of these patients is, in general, irregular in slant, pressure, proportion, and spacing (V_{20}). Their writing is also restricted in lower zone length (V_{24}). The lower zone is widely interpreted by graphologists as a symbolization of sexuality and libidinal energy.

The commissurotomy patients' handwriting can be further described as having an instability in the consistency of the slant of the letters, which is interpreted as indicating a lack of social involvement. There is inadequate control over alignment and direction of lines and spaces between lines (V_{39}). And finally, there is a general irregularity in these patients' script, which has been associated in graphology with feelings of guilt, self-consciousness, and self-neglect (V_{40}).

Thus, a split-brained person would appear, through these graphic signs, to be socially uninvolved and ineffective. They appear unable to act purposefully in

the world, lacking consistency in effort and direction, and reluctant to act in their self-interests. They would appear to suffer from self-consciousness, guilt, and self-neglect. Similar results were found in content analysis of phrases (TenHouten et al., 1985d). They lack control of sensuous expression, lacking sexual and libidinal energy. Finally, they lack the articulations, connections, and rhythms that characterize creative forms.

Anthony (1977, p. 2) stated that "the single graphic items are only mutually corroborative and almost totally insignificant by themselves, just as no single syndrome has meaning except as it combines in the total personality synthesis." Given this limitation, a reduction in the dimensionality of each of the four sector's variables will, with one exception, be carried out separately by sector.

Separate alpha common factor analyses (ACFA), with varimax rotation, for the variables of each graphological sector, were carried out in an effort to discover latent concepts underlying the categorized graphological signs. Then, using ACFA again, a second-order reduction of the dimensionality of the dataset was carried out using the first-order factors as input variables. The first factor resulting from this analysis was interpreted substantively, and its most important graphic variables were used in a discriminant function analysis. Because the latent concepts are produced by an exploratory, inductive method, it will be necessary to present considerable tabled data.

Expressions of Aspirations and Creativity

The factor analysis results for the Sector X_1 variables, V_1-V_6, are shown in Table 11.3. The correlations between these variables are positive, with the exception of that between Organization (V_1) and Upper Zone Height (V_4); r = −.20. There is a two-factor solution, using the criterion of retaining factors with eigenvalues greater than one.

Table 11.3. Correlations, Communalities, and Rotated Factor Pattern Matrices: Six Aspirations and Creativity Sector Variables; Eigenvalues and Percentages of Variance Explained

Correlations						Commu-	Rotated	
Var.	V2	V3	V4	V5	V6	nalities	CA	CO
V1	.38	.25	−.20	.42	.36	.45	.08	.67
V2		.19	.02	.58	.07	.36	.02	.60
V3			.75	.24	.53	.98	.96	.22
V4				.09	.34	.65	.79	−.15
V5					.29	.61	.15	.77
V6						.33	.49	.29

Factor	Eigenvaue	Pct. of Variance
1, CA	3.86	64.4
2, CO	2.14	35.6

In order to interpret the first factor, it is useful to refer to Anthony's (1977, p. 3) definition of *aspiration* as a desire for the realization of values—of "ideals, ambitious intellectuality, power, honor, excellence.... Graphologically, it is commonly reflected by the upper zone elaboration... and upper zone height." These two variables have associated with them the highest coefficients in the rotated factor matrix. This factor also attracted the variable *Expressiveness* (V_6), which Anthony (p. 9) defined as those graphic movements sufficiently distinctive to differentiate one individual from another. These can include a flair for dynamic design and spontaneous movement on the positive side or by a stultifying rigidity and static immobility on the negative." Given these interpretations of the three items loaded most heavily on this factor, it can be named *Creative Aspiration* (CA).

The second factor attracted the other three Sector X_1 variables. *Organization* (V_1) refers to the writer's overall use of space and of movement in time (ease of forward motion). Here, the emphasis is on form and design, figure and ground, and on unity, coherence, and coordination. If *creativity* is defined (Anthony, 1977, p. 3) as "the ability to produce new forms, to restructure stereotyped situations, to invent or innovate, to redefine, to improvise," then organization can be interpreted as a rather global measure of creativity. In addition, Anthony (p. 3) stated that "high scores for simplification (V2) and originality (V5)... are indicative of creativity." Simplification of form means economic short-cuts in writing, seeking economy of time and motion, and seeking what is essential. *Originality* has the common-sense meaning of the term, here referring to "spontaneity... and creativity in the handling of space, form, and movement" (Anthony, p. 8). These three variables form a factor which can be named *Creative Organization* (CO).

Bogen and Bogen (1969) and G. Bogen (1986) argued that an interaction between the propositional mode of information processing of the left hemisphere of the brain and the appositional mode of information processing of the right hemisphere is necessary for creative thinking and the highest cognitive functions. They make a methodological suggestion (1969, p. 20): "To demonstrate that division of the corpus callosum leads to a loss of creativity, we need some *measure* of creativity." In earlier reports, we have seen that the expressive end of our alexithymia measure is indicative of a creative and symbolically rich expression of emotions and feelings in the form of words.

To measure CA and CO for each subject, the subject's scores were first standardized. The variables were then weighted by their factor score coefficients, and the weighted variables were summed. We were then able to formulate and test two hypotheses.

Hypotheses 1 and 2 were that commissurotomized patients, in contrast to intact normal controls, would show deficits in Creative Aspiration and Creative Organization.

These hypotheses were tested with one-tailed, paired t-tests. The means for the two groups are shown in Table 11.4 (columns 1–2). Both hypotheses were supported, $t(7) = -1.92$, $p < .05$ for Creative Aspiration, and $t(7) = -2.19$, $p < .05$ for Creative Organization.

Goal Direction and Ego Strength

The five variables assigned to Sector X_2 can, on substantive grounds, be easily separated into Goal Direction and Ego Strength. The two ego-strength variables, Middle Zone Height (V_{10}) and "I" Emphasis (V_9) are excluded from analyses: Middle Zone elevation can indicate either inordinate egocentrism or effectively

Table 11.4. Factor Scores for First-Order Factor Analysis, for First Second-Order Order Factor INT and for Discriminant Functions Scores (INT2), by Individual and Group

ID	Creative Aspiration CA	Creative Organization CO	Goal Direction GD	Libido: Lower zone LZ	Emotional Release ER	Control CT	Second-Order Factor INT	Discriminant Funct. INT2
Commissurotomy patients								
AA	−1.51	−.46	−1.49	−2.06	−.66	−.96	−.85	−.47
NW	−.34	.32	.02	1.53	−1.53	.11	−1.50	−2.18
DM	−.25	−1.72	−1.08	−1.68	−.47	−1.08	−.42	−1.99
NG	−.47	.08	−.58	.11	−.37	−.73	−.34	−.23
RY	−1.18	−.90	−.61	−.95	−.43	−.78	−.33	−3.03
CM	.52	1.17	−.06	.07	−.36	.22	−.71	−1.18
RM	−.36	−1.37	−1.54	.06	−1.22	−1.07	−.97	−1.82
LB	−.31	−.50	.84	−.11	.47	−.09	.62	−.89
Mean	−.49	−.42	−.56	−.38	−.57	−.55	−.56	−1.47
Normal control subjects								
Caa	1.16	−.88	.56	.92	.08	.30	.33	1.04
Cnw	.28	1.09	1.63	.09	2.42	2.08	2.45	2.85
Cdm	.27	1.54	1.81	.43	1.63	2.03	1.49	2.38
Cng	−.46	.25	−.19	.97	−.24	.16	−.09	−.47
Cry	.66	−.05	.80	.80	.61	−.03	.77	1.20
Ccm	−.52	1.72	.18	−.21	−.35	.70	−.79	1.37
Crm	−.32	−.08	−.77	1.00	−.39	−1.77	−.15	1.10
Clb	2.81	−.20	.48	−.99	.80	.30	.48	2.36
Mean	.49	.42	.56	.38	.57	.55	.56	1.47
$t(7)$	−1.92	−2.19	−2.99	−1.18	−2.46	−2.54	−2.38	−4.88
p value	<0.05	0.05	0.02	0.14	0.02	0.02	0.02	<0.001

functioning ego strength (p. 4); an elaboration of the word *I* is also apt to be confounded, because it can indicate "actual superiority or a compensatory reaction to counterbalance feelings of inferiority" (Anthony, 1977, p. 10).

The factor analysis results (in Table 11.5) indeed show variables V_9 and V_{10} to form a weak second factor, Ego Strength, that did not differ by group and which will not be further considered.

Three variables were associated with the Goal Direction (GD) factor. *Rhythm* (V_7) means rhythm of movement in writing, rhythm of distribution and form in the organization of component elements, rhythm of form, and balance between contractions and releases. Handwriting with disturbed rhythm signals maladjustment—ranging from mild inability to function productively to the extremes of catatonic constriction or manic release. *Trizonal Dynamics* (V_8) indicates the extent to which the *I* establishes "functional autonomy and self-actualization in... interaction with society" (Anthony, 1977, p. 10). *Firmness of Ductus (Stroke)* (V_{11}) is scored on the basis of (a) stroke curvature, an elastic and flexible stroke, indicating balanced and meaningful functioning; contraction, curlicues, stiffening, tension, and rigidity, indicating overcontrol; (b) stroke borders, marked and distinct outlines indicating control; and (c) pen pressure and rhythmic stroke pressure indicating the "impression" one makes on the environment. These three items, taken together, provide for the factor-analytic measure of Goal Direction.

Hypothesis 3 can now be described: The level of Goal Direction should be lower for patients than for controls. Scores for factor GD are shown in Table 11.4 (column 3), by individual and group. It can be seen that only one patient, LB, received a higher GD score than did his control, Clb. Comparison of the group means showed a significiant difference in the predicted direction ($p < .05$).

Table 11.5. Correlations, Communalities, and Rotated Factor Pattern Matrices: Five Goal-Direction and Ego-Strength Variables; Eigenvalues and Percentages of Variance Explained

Correlations					Commu-	Rotated	
Var.	V8	V9	V10	V11	nalities	GD	ES
V7	.70	.38	−.19	.62	.80	.89	−.09
V8		.58	−.02	.58	.73	.83	.17
V9			.47	.33	.93	.49	.83
V10				−.04	.45	−.14	.65
V11					.47	.68	.04

Factor	Eigenvalue	Pct. of Variance
1, CA	3.34	66.9
2, CO	1.66	33.1

Emotional Release

Sector X_3—*Gestures of Emotional Release*—contains information interpretable as alexithymia. This graphological sector is used, in Anthony's (1977, p. 4) terms, "to symbolize the depth of expression of one's feelings. It offers a synthesis of physical, psychological, and biological outlets as they combine to release the emotions."

Two variables associated with this sector seem highly problematic for this analysis. The *Linear-Pictorial* dimension refers to the extent to which the patterns in the writing emphasize either linear strokes and abstract reasoning, with little concern for form, or more rounded, ample, and elaborated shapes and forms, producing pictorial images. Presumably the pictorial style is more expressive of emotions, but the equation of a visually oriented cognitive style with emotionality seems strained.

Sharpness-Pastosity (V_{22}) is open to two interpretations, depending on the overall "negative" or "positive" quality of the writing. Sharpness in the writing can indicate positive self-awareness, refinement, sensitivity, or idealism if the writer is "positively self-aware." However, "Negatively, sharpness indicates asceticism, coldness, resentment, lack of realism, and narrow scope of available experiences, or inner remoteness" (Anthony, 1977, p. 16). *Pastosity* results from holding the pen far from the point and manipulating it loosely, resulting in a dense, sometimes blurred, and pasty or pastose character. A "positive" evaluation suggests warmth, a wide scope of experience, capacity for enjoyment, sense of humor, and a sense of color. In a negative context, pastosity can mean lack of self-discipline, susceptibility to sensual distraction, crudeness, excesses, or brutality (Anthony, 1977, p. 4).

The other two variables have more straightforward interpretations. *Connectedness* (V_{19}), the linkage of letters in words, indicates an ability of the person "to connect experience purposefully, to discern relationships on a common sense basis.... Disconnectedness, in contrast, is a gesture of isolation, enclosure, rest" (Anthony, 1977, p. 15). The *Fluctuation-Irregularity* (V_{20}) contrast is interpreted as an ability to integrate intentions and actions (fluctuations) and an instability based on repressions or imaginations. Because fluctuation is said to be experienced as the positive precursor of negative irregularity, it is assigned lower scores (0–5) in the Psychogram scoring.

The two problematic items, V_{21} and V_{22}, were excluded from analyses. Items V_{19} and V_{20} were combined with the four variables assigned to Sector X_5, a procedure justified by Anthony's (1977) statement that Sectors 4 and 5 are closely related. He wrote (p. 4), "Naturally, one's manner or extent of emotional release will depend to a great extent upon the libido strength one *has* which needs to be released or relieved." For this analysis, the scoring for V_{20} was reversed (new score = 10 minus the Table 11.4 score).

The ACFA results are displayed in Table 11.6. There is a three-factor solution. The second factor, as can be seen in the rotated factor matrix coefficients, attracted variables V_{19} and V_{20}, the two items retained from the Emotional Release sector. This factor will be called *Emotional Release* (ER).

The first factor (LZ) attracted the items *Lower Zone Length* (V_{24}) and *Lower Zone Elaboration* (V_{25}). The length of the lower zone refers to loops and stems of letters projecting below the baseline, which constitutes the lower zone. The upper zone variables cluster on the Creative Aspirations Factor, and the lower zone refers to libido and sexuality. Anthony (1977) explained:

> This zone portrays the primary energies of the person as well as his expression of material needs, biological imperatives and instinctual urges. The length and form of the lower loops are influenced by the individual's store of psychic energy.... Largely, the lower zone displays the reservoir of unconscious, unorganized, psycho-physical potential. (p. 18)

Variations, embellishments, and adornments of the lower zone lengths are possibly interpretable as practical and earthly realism, as well as materialism and sensuality. Hoppe (1978, p. 20), in this connection, observed in 12 commissurotomy patients "a lack of libido; sex drives are repressed."

The third factor attracted *Meagerness/Fullness* (V_{23}) and *Pressure* (V_{26}). Fullness, primarily expressed in the middle zone, is interpreted by Anthony (1977, p. 17) as the development and differentiation of spiritual, emotional, and instinctual levels of life. Meagerness signals a dearth of imagination, asceticism, and a poverty of inner resources. Pressure refers to tension on the down stroke and relaxation on the up stroke. High pressure indicates "psychic energy, tenacity, self-consistency, depth of emotion" (Anthony, 1977, p. 18). This factor was named *Fullness/Pressure* (F/P).

Table 11.6. Correlations, Communalities, and Rotated Factor Pattern Matrices: Two Emotional Release and Four Libido–Energy–Drive Variables; Eigenvalues and Percentages of Variance Explained

	Correlations					Commu-	Rotated		
Var.	V20	V23	V24	V25	V26	nalities	LZ	ER	FU
V19	.47	.37	.18	−.08	.15	.41	−.06	.53	.34
V20		.25	.51	.39	−.15	1.19	.37	1.02	−.15
V23			.36	−.01	.31	.49	.08	.31	.62
V24				.78	.15	.91	.86	.26	.30
V25					−.01	.89	.94	.01	−.10
V26						.30	.03	−.08	.54

Factor	Eigenvalue	Pct. of Variance
1, LZ	2.96	49.3
2, EX	1.83	30.4
3, FU	1.22	20.3

Hypotheses 4-6 were that for each of these three factors—Emotional Release, Lower Zone, and Fullness/Pressure—levels should be lower for commissurotomy patients than for normal controls. For *Emotional Release* (Table 11.4, column 6) we find the strongest result: For each of the eight pairs of subjects, patients showed less emotional release than did controls ($p = .02$). The results for the *Lower Zone* factor (Table 11.4, column 5), however, showed inversion for three of the eight pairs of subjects. Although the means differed in the predicted direction, they were not significantly different. The results for the third factor, *Fullness/Pressure,* showed virtually no difference by group.

Control

This sector has a straightforward meaning. Anthony (1977, p. 5) wrote: "Handwriting control indicates the dominance of conscious, volitional force." Further, a person high on control "is usually very conscious of what he is doing" and has "will power,... firmness, and endurance."

The ACFA results for the control variables are presented in Table 11.7. The correlation matrix shows that variable V_{38} (consistency and even spacing between the letters) is barely correlated with the other variables. Correlations between the other variables are high. The correlations of variables with the first factor (CT) shows that V_{38} has a zero correlation, and that the other three are high and positive. Thus variables V_{37}, V_{39}, and V_{40} were used to interpret this factor.

Slant Consistency (V_{37}), the parallelism of down strokes, indicates integration of the self in social and cultural life. *Alignment Control* (V_{39}) of the lines of the script and the direction of the lines indicates the writer's sense of direction, concern for order, and valuation of time. Anthony (1977, p. 25) wrote, "Good alignment control is found in persons who can organize their daily schedules and routines and maintain functional integrity toward the fulfillment of objectives." *Regularity* (V_{40}) refers to those aspects of size, pressure, tendency, movement,

Table 11.7. Correlations, Communalities, and Rotated Factor Pattern Matrices: Four Control Sector Variables; Eigenvalues and Percentages of Variance Explained

	Correlations			Commu-	Rotated	
Var.	V38	V39	V40	nalities	CT	CT2
V37	.03	.60	.64	.49	.69	.12
V38		.14	−.05	.07	.00	.27
V39			.63	.84	.75	.53
V40				.85	.96	.48
Factor			Eigenvalue		Pct. of Variance	
1, CT			2.77		69.2	
2, CT2			1.23		30.8	

form, and arrangement which are volitionally controlled by the writer, signaling conscious control, drive, and motivation.

The second factor (CT2), which weighted control of alignment positively but regularity negatively, did not—when analyzed by the usual method—differ by group, and will be ignored.

Hypothesis 7 was that control of handwriting—as indicated by slant consistency, alignment control, and regularity—would be lower for commissurotomy patients than for normal controls.

When considered separately, patients were significantly lower than controls for V_{37}, V_{39}, and V_{40} (Table 11.2). When combined in a factor score, the result was again significant in the predicted direction ($t(7) = -2.54$, $p < .025$; Table 11.4, column 7).

Second-Order Factor Analysis

The six factors derived above that successfully discriminated the two groups—Creative Aspiration, Creative Organization, Goal Direction, Lower Zone, Emotional Release, and Control—were subjected to a second-order factor analysis, in which the input variables are themselves derived through factor analysis. The results of this ACFA are displayed in Table 11.8. This is a two-factor solution. The Control variable had a complexity of two, with no differences in its loading on the two factors. Goal direction also had a complexity two, with a slight preference for F1 over F2. Creative Aspiration and Goal Direction strongly preferred F1, and Creative Organization and Lower Zone were most definitive of F2.

In an effort to interpret the first factor, we first examined the variables that loaded heavily on their first-order factors. Then, Anthony's (1977) multifaceted

Table 11.8. Correlations, Communalities, and Rotated Factor Pattern Matrices: Six Second-Order Factor Score Variables; Eigenvalues and Percentages of Variance Explained

	Correlations					Commu-	Rotated	
Var.	CO	GD	LZ	ER	CT	nalities	INT	F2
CA	.09	.50	.16	.45	.38	.21	.43	.16
CO		.60	.34	.42	.75	.54	.21	.70
GD			.39	.82	.90	1.07	.80	.65
LZ				.01	.30	.23	.07	.48
ER					.77	1.10	1.05	.06
CT						.94	.66	.67

Factor	Eigenvalue	Pct. of Variance
1, INT	4.79	79.9
2, F2	1.20	20.1

descriptions were used for a conceptual continuity in these descriptions. Through this procedure, it was possible to notice such a continuity in the following *positive* interpretive phrases, which will be cited verbatim from Anthony's (1977) text:

VARIABLES	*KEY PHRASES*
V1. Upperzone Elaboration	"desire to form, build, or arrange" (p. 7)
V4. Upperzone Height	"interest and aspirations above the daily routine, the intellectual guiding principle" (p. 8)
V6. Expressiveness	"consistency in effort and direction" (p. 8)
V7. Rhythm	"personal equilibrium and adjustment to... environment" (p. 9)
V8. Trizonal Dynamics	"psychical energy... goal-oriented behavior" (p. 9)
V11. Firmness of ductus	"control... meaningful functioning.... making an 'impression' on the environment" (p. 11)
V19. Connectedness	"ability... to connect experiences purposefully. ...Willingness to engage in encounters with reality (p. 15)
V20. Fluctuation	"integrates... intentions with... actions in a fluent and rhythmic manner" (p. 15)
V37. Slant Consistency	"wide scope of activities and interests" (p. 24)
V39. Alignment Control	"functional integrity toward the fulfillment of objectives" (p. 45)
V39. Regularity	"movement and arrangement... volitionally controlled by the writer... ability to concentrate, firmness and resolution" (p. 26)

What sort of concept would seem to be implied by the above? Certainly there is an implication of intentionality, and this term will be used. Intentionality refers to the dynamic portion of the personality, to goal-directed activities directed toward performances, fulfillments, accomplishments, and the mastery of reality. The meaning of this very general concept would seem to be satisfied, as an approximation, by the above-cited descriptive phrases, which characterize factor F1 (INT).

Intentionality is related to the concepts *alexithymia* and *psychosomatic disorder.* Although the notion of intentionality has not been directly used in the alexithymia literature, it can be seen to be implicitly present. Marty, de M'Uzan

and David (1963) have observed in their psychosomatic patients an impoverishment of relations to external and internal psychic objects. They call this utilitarian, operational way of thinking and acting, of which this impoverishment is an aspect, *penseé opératoire*. De M'Uzan (1974, p. 462) noted that the alexithymic patient, in interactions with a therapist, is apt to act in a way that "is courteous and correct but libidinally very poor." Krystal (1982, pp. 358, 360) similarly saw the alexithymic as "oriented to 'facts' and... there is a striking lack of wish-fulfillment fantasies." He also argued that the alexithymic has a "sterility and monotony of ideas, and a severe impoverishment of the imagination." Nemiah and Sifneos (1970, p. 30) saw the alexithymic individual as "characterized by thoughts that are more stimulus-bound than drive-oriented."

Hypothesis 8 was that commissurotomy patients, in comparison to normal controls, should show a relative lack of intentionality in their graphological signs and gestures.

The scores for Intentionality (INT), by individual and group, are shown in Table 11.4 (column 7). The expected difference is found in six of eight subject pairs: the inversions are weak. A comparison of group means shows the group differences to be statistically significant and in the predicted direction ($t(7) = -2.38$, $p = .02$).

In the item-by-item analysis, we found 10 items for which the group means were significantly different. Of these 10 variables, only Lower Zone Length—an empirical indicator of libidinal energy and sexual expression—failed to contribute significantly to the Intentionality factor. Of the 11 INT variables, then, 9 significantly differentiated the groups.

The meanings of the two variables, which loaded significantly on factors that in turn loaded on the second-order factor INT, but which did not themselves differentiate the two groups, were quite different. Upper Zone Height (V_4) is interpreted by Anthony (1977) as showing a spirit of abstraction and the presence of integrating principles. Abstraction might be a correlate of Intentionality but its meaning is far from the definitions of Intentionality used here. The variable Connectedness (V_{19}) indicates integration as opposed to disintegration (i.e., gestures of isolation and enclosure). The patients whose cerebral hemispheres have been surgically disconnected, and who possess an isolated cerebral lateralization, showed a lack of connection and an isolation in their writings, this symbolizing a sense of their own duality. These two variables were excluded from the final analyses, which were confined to the nine variables that meet two criteria: (a) they were selected as Intentionality variables on the grounds that they loaded heavily on the factors that in turn loaded on factor INT; and (b) they individually produced significant differences between the two groups.

Discriminant Function Analysis

The final methodological procedure was to examine the extent to which the two groups could be discriminated by the nine surviving variables. The method of

discriminant function analysis (DFA), using Rao's V, was used for this purpose of determining the effects of group membership on the nine variables. The DFA results are shown in Table 11.9. Of the nine variables available for the stepwise analysis, only five were selected. These variables were Fluctuation, as opposed to irregularity (V_{20}); Alignment Control (V_{39}); Regularity, or volitional control (V_{40}); Pressure, or firmness of ductus (V_{11}); and Rhythm (V_7).

The utility of these five variables in separating patients from controls is shown by the canonical correlation coefficient η of .84. A Wilks' γ of .29 (p = .01) indicates significant residual discriminatory power of the variables to discriminate the groups. The variables' contribution to the discriminant scores is measured by their pooled within-groups correlations with the discriminant function. The strongest variable is Fluctuation, at .57. The other four variables' correlations ranged only from .35 to .40. Fluctuation was also the first variable selected. The tests of Wilks' γ, Rao's V, and changes in Rao's V clearly indicated that all selected variables were highly significant in their contributions.

The DFA classification results indicated that 15 of 16 subjects (94%) were correctly classified, as only normal subject Cng was misclassified (p (Group|Score) = .80). Her discriminant function score of −0.47 overlapped her control NW's score of −0.24. All commissurotomy patients had negative scores, and all normals except Cng had positive scores.

The discriminant function scores, shown in the right column of Table 11.4 (variable INT2), replicated the factor analysis results and suggest in the split-brain person a lack of intentionality.

Table 11.9. Discriminant Function Analysis Results

Variable	Step Entered	Wilks' Lambda	Prob.	Rao's V	Prob.	Change in V	Prob.
Fluctuation (V20)	1	.55	.004	11.5	.0007	11.54	.0007
Alignment (V39)	2	.49	.009	14.7	.0006	3.27	.0705
Regularity (V40)	3	.38	.007	23.0	<.0001	8.33	.0039
Pressure (V11)	4	.32	.009	29.3	<.0001	6.31	.0120
Rhythm (V7)	5	.29	.015	34.9	<.0001	5.54	.0185

	Pooled Within-Group Correlations: Functions by Variables	Standardized Discriminant Function Coefficients
Fluctuation (V20)	.57	2.06
Alignment (V39)	.40	1.38
Regularity (V40)	.39	−1.80
Pressure (V11)	.35	.79
Rhythm (V7)	.38	.79

Eigenvalue = 2.49; Canonical Correlation = .84;
Wilks'
1
Function 0 = 0.29;
$x^2(5) = 14.4$,
$p = 0.013$.

Intentionality, Functional Productivity, and Form Level

There are two global measures of handwriting provided by Anthony's (1977) version of the Psychogram. These are called *Functional Productivity* (FP) and *Form level* (FL). A high level of functional productivity in writing implies the person is able to function effectively in work and in daily routines on the material and concrete levels (as opposed to cultural and abstract values).[2]

Although Functional Productivity and Intentionality share two variables, and thus are not independent measures, their meanings are distinguishable. There are obvious reasons for the commissurotomy patients having difficulty coping and adapting. They have histories of neurological problems, histories of severe epilepsy, and have undergone commissurotomy. Thus, it is reasonable to expect that patients will have lower FP levels than will controls. The data, by individual and group, are shown in Table 11.2 (column 12). For six of eight paired comparisons, FP is lower for patients; the two inversions are of negligible magnitude. The comparison of means yields $t(7) = -1.93$, $p < .05$.

The Form Level index is based on graphic indicators "of expression, thinking and being... as a socio-cultural entity" (Anthony, 1977, p. 32). High FL is indicated by organization, simplification of form, naturalness and spontaneity, and by alignment control. What FL measures, in general, is the quality of the script. Scores of 55 or less are considered to have poor form, reflecting poor ego organization; scores of 56–69 indicate average form; scores of 70 or more represent good form, and an integrated ego structure.[3] Six of eight patients had poor form levels, the other two average form. Two controls had good form, the others average form. Note that FP and FL overlap for several variables. Thus, FP and FL have different meanings, but they are not independently measured.

As with FP, we expected that the commissurotomy patients would produce script of less overall quality. Data for FL, by individual and group, are presented in Table 11.2 (column 11). The result was directionally as expected, with three inverted pairs; $t(7) = -1.73$, $p = .06$.

The theoretical and speculative remarks in the literature which indirectly use approximations to the concept *intentionality* cited above—by Marty et al. (1963), de M'Uzan (1974), Krystal (1982), and Nemiah and Sifneos (1970)—would implicitly seem to suggest what the data here have shown. In both alexithymia and psychosomatic disorder there is an impoverished level of

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[2] Form Level is measured by adding indicators V_1–V_2, V_5–V_8, V_{11}, $V_{13}V_{15}$, the mean of V_{23}–V_{25}, and the mean of V_{33}, V_{36}, and V_{39}. Four items in the FL measure are not presented here: they are Naturalness–Spontaneity (V_{12}), Slowness/Speed (V_{14}), Horizontal Expansion (V_{15}), and Arcades (V_{33}).

[3] Functional Productivity is measured by adding items V_1–V_2, V_5, V_9–V_{15}, V_{24}, V_{26}, V_{33}, V_{36}, and V_{39}. This variable overlaps with the Intentionality measures INT and INT2 for items V_{11} and V_{39}. Five measures in the Form Level measure are not present here: they are Garlands (V_{13}, $V_{14}-V_{15}$), and Angularity (V_{36}).

Table 11.10. Correlations Between Expressiveness/Alexithymia (ALX), Psychosomatic Personality Structure (PPS), Intentionality (INT2), Functional Productivity (FP), and Form Level (FL)

Variables	PPD	INT2	FP	FL
Alexithymia (EXP/ALX)	−.45*	.39*	.20	.29
Psychosomatic (PPD)		−.32	−.19	−.28
Intentionality (INT2)			.52**	.59**
Funct. Productivity (FP)				.81**

*$p < 0.05$; ** $p < 0.01$.

relations to objects and goals, and a lack of dynamic energy in relation to these objects. There is a lack of intentionality, which degrades ability to sustain focus on objects. The present hypothesis, that commissurotomy patients, in comparison to normal controls, lack such psychic energy focused on objects suggests in turn that a lack of intentionality, alexithymia, and psychosomatic disorder should all be positively associated. We reported earlier (TenHouten et al., 1985d) a correlation of $r = -.45$ between Expressiveness/Alexithymia and Psychosomatic Personality Disorder. The correlation between the INT2 measure of intentionality and the expressive end of the alexithymia variable was positive as expected ($r = .39$, $p = .03$). The correlation between Intentionality and Psychosomatic Personality Disorder (PPD) was, as expected, negative ($r = -.32$, $p = .06$).

We can also expect, on conceptual grounds, that Form Level and Functional Productivity (correlated at .81, $p < 0.001$) will vary directly with Expressiveness/Alexithymia (ALX) and with Intentionality (INT2), but inversely with Psychosomatic Disorder (PPD). These results were all obtained (Table 11.10). Note that INT2 was correlated with ALX at $r = .39$ ($p = .03$) and with PPD at $r = -.32$ ($p = .06$). Thus the three main variables developed in this study were correlated with each other, in the expected directions, at statistically significant or nearly significant levels. It is also consistent with substantive expectation that the best Intentionality measure, INT2, would correlate positively with FP and FP. These results were also obtained, as INT2 was correlated with FP at $r = .52$ ($p < .01$) and with FL at $r = .59$ ($p < .01$).

DISCUSSION

The analysis of 20 graphological features has been used to analyze five sectors of graphological productions. Through the method of factor analytic reduction of the dimensionality of the sectors, it was possible to test eight hypotheses. It has been shown that commissurotomy patients, in contrast to precision-matched normal controls, show deficits in Creative Aspirations, Creative Organization,

Goal Direction, Libidinal Energy, Expression of Feelings, and Control. The strongest result was that, for each of the eight pairs of subjects, patients showed less emotional release than controls, which replicates our earlier findings of alexithymia following cerebral commissurotomy.

A second-order factor analysis, using these six factors as input variables, led to the discovery of a lack of Intentionality in these patients. This variable is diffusely measured by the factor-analytic procedure. The intepretation of the Intentionality variables, after deleting two of them, was sharpened and rendered more parsimonious by discriminant function analysis. The DFA sharply discriminated the two groups (with 15 of 16 subjects correctly classified). On the basis of this analysis, the surviving five variables can be used to produce an operational definition of Intentionality. A person predisposed to act with intentionality can be expected to show, in his or her handwriting, the following features: (a) an ability to integrate intentions with actions in a fluent and rhythmic manner; (b) good alignment control, indicated by parallel lines, unwavering and straight—here reflected in a sense of direction and orderliness, and an effective use of time, all suggesting a functional integrity toward the fulfillment of objectives; (c) writing that shows a naturalness and spontaneity in voluntary control of size, pressure, form, and arrangement; (d) writing that is firm, with rhythmic alternation of tension and release in pressure and stroke—an elastic and flexible stroke shows meaningful functioning, the making of an effective 'impression' on the world; and (e) contractions and releases that are balanced and rhythmic in movement, distribution, and form, which shows an ability to perform productively.

Note that in this description the emergence of the importance of rhythm. Note also that the strongest group difference for individual variables, as indicated by the magnitude of the *t*-statistic, was Rhythm ($t = -3.42$). The patients' handwriting had as global features lack of coordination and rhythm, lacking intentionality and goal-directedness.

The special importance found here in the rhythmic or arrhythmic quality of handwriting in our comparison of patients and controls was anticipated by Seifer (1977), in his graphological analysis of persons claiming direct contact with extraterrestrial beings. He wrote (1977, p. 56): "Psychomotor coordination is most important in analyzing the intercortical integration of the writer." Fragments and arrhythmic writing, he reasoned, lack a fluidity of movement. He explained (1977, p. 61): "Rhythm... displays the person's ability to coordinate psychomotor movements away from the body (release) with movements toward the body (contraction)." Rhythm involves a tuning in of outside stimuli and simultaneously an active, intentional expression of emotions and creative effort.

There are numerous limitations of the findings presented in this chapter. First, the abstract concepts indirectly measured by graphic signs, such as creativity and intentionality, have not been studied previously, and little was known about their validity. Three kinds of validity, however, were established

here: (a) predictive validity was obtained in the tests of hypotheses; (b) construct validity was obtained through the pairwise correlation analysis of concepts measured here and in earlier reports of this study—all correlations were in the predicted direction, though all were not significant; and (c) with respect to the discriminant function INT2 measure, the obtained η of .84 means that 71% of the variance in group membership was explained by the discriminant function. Because group membership is a criterion external to the variables, η can be considered to be a concurrent criterion-related validity coefficient. If we take the subset of the INT-function items as themselves forming a measure of intentionality, then the result validates the finding that the patients, when sociodemographic and other factors are controlled through precision pairing of subjects, manifest a lack of intentionality.

Second, the lower levels of creativity and intentionality of the split-brained patients could be an artifact of patients having lower intelligence levels than controls, which were matched by sociodemographic characteristics but not by cognitive criteria. It is well known that tests of creativity correlate with tests of general intelligence. Third, these patients are known to suffer from deficits in skilled motor performances (Zaidel & Sperry, 1977), which could account for the poor form level of their handwriting, as well as variables more central to this chapter. And fourth, the results would be rendered even more tenuous if it should be found that writing per se is bilaterally controlled by the two cerebral hemispheres. Bogen's (1969) findings of nearly complete agraphia in the left hands of these patients following callosal section, along with only poor form level in the right hands of these same patients, suggests that is unlikely.

Graphology, as a measurement methodology, is appropriate to the extent to which handwriting is an active and generalized symbolic system of gestures. The use of a graphological level of measurement is supported here by its predictive and content validity. The hypotheses advanced on the basis of graphological variables, distinguishing two groups that were coded, by a professional graphologist, have been consistently supported by the data. On the other hand, the use of graphology is a highly indirect way to measure any personality characteristic or syndrome. Thus the results of this phase of the study, especially those dealing with intentionality, must await cross-validation by future experimental studies using different measurement methodology.

The present study of alexithymia in split-brained and normal subjects was motivated by the hypothesis of a lack of connection between the cerebral hemispheres as a mechanism of alexithymia. Through an analysis of alpha-band EEF coherence, we did find low hemispheric connection to be a causal link between corpus callosotomy and alexithymia. In the present analysis, a related concept has emerged, that of intentionality.

The functioning of the frontal lobes of the human brain provide the neurophysiological substrate of intentionality. More specifically, relations between dorsolateral and orbital cortex and sensorial cortex mediate intentional

processes (Fuster, 1980; Stuss, 1986). The frontal lobes abstract certain features from perceptual images and recombine these abstractions into models which form the basis of decision making and action. Sensory inputs not screened out by "habituation" are fitted into these images, or used as indexical summaries (as in Pribram's, 1981, "episodic processing"). These abstract mental images, or category prototypes, of prospective conduct enable rehearsal, in the mind, of acts.

The frontal lobes developed out of, and remain closely linked to, the limbic system, which provides emotional response to images and models, which in combination with temporal-lobe memory input and information about the body and environment, enable the frontal lobe to carry out meaningful, goal-directed behavior, acting in the interests of the self. The goal-directed behavioral program of the frontal lobes extends to intentions and plans. These programs are complex results of social development (Luria, 1966) and are formed with the participation of speech, which plays an important role in abstraction, categorization, and generalization, and in the control and regulation of behavior. After lesions of the frontal lobes, patients are apt to be rendered less spontaneous and less able to take initiative. They lack a critical attitude toward their own behaviors, have disturbed regulations of activity, lose the controlling functions of intentions upon behavior, and have a disturbed regulatory role of inner speech.

In our exploratory EEG analysis (TenHouten, Walter, Hoppe & Bogen, 1988), a possible lack of inner speech during exposure to the film in the alexithymic subjects was suggested by the left hemisphere alpha-band autospectral results, in which we found in the more alexithymic subjects higher levels of alpha rhythm in two channels, the left frontal (F3) and the left temporal (T3). These results suggest alpha activity might have been less desynchronized by linguistics processes in Broca's (F3) and Wernicke's (T3) regions in alexithymic subjects than in nonalexithymic subjects. This possibility is also consistent with the low F3–T3 coherence in alexithymic subjects, which suggests that for alexithymics these two language areas not only were less activated but also might have been sharing less information.

In order to act with intentionality, it is necessary that the frontal lobes are able to evaluate the results of one's own actions. The frontal lobes carry out a complex process of matching action and initial intention, to evaluate success and error, so that action can be corrected and modified as necessary (Luria & Homskaya, 1964). Luria (1973) viewed intentionality as a core responsibility of the frontal lobes, according to which a person cares about the state of future affairs, develops a program and carries this program through, overcoming distractions and obstacles.

Although the findings of this chapter are tentative, and more research is needed, there would appear to be important linkages between intentionality and creativity. On the one hand, creative ideas can be stimulated by the dialectics of hemispheric interaction. But creativity means more than an idea; also required is

that something actually be created, a creation. This requires will power and intentionality, according to which a person is able to care about a state of future affairs, the realization of a creation, develop a program to realize this state, and sticks to this program in spite of distractions and obstacles. On the other hand, the intention to solve a problem can lead to the deliberate and systematic production of ideas that results in creations. Whatever the neural substrates of creativity may prove to be, there would seem to be dynamic reciprocal effects between intentionality and creativity.

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12

Creativity of Religious Symbols

Joachim Scharfenberg

Centered around a case study of the therapy of the son of a Nazi perpetrator in Germany, I try to show how strongly the mythological power of an ideology can be prolonged from generation to generation. Therefore, remythologizing our culture cannot be regarded as a solution. However, resymbolization is a creative possibility. Such a process of religious resymbolization can be observed in the role of the former East German church and its leading role in a revolution without violence.

RATIONALIZATION AND MYTHOLOGIZING

During the last several decades the creative power of religious symbols has constantly been overlooked. The objective of this chapter is to prove that this is due to a particular rationalization, on the one hand, and to mythologizing on the other.

Rationalization is a very common defense mechanism. It is often used against the overwhelming power of affect. But it seems to have failed vis-à-vis anxiety. We know more and more about less and less, but the problem of anxiety seems to remain unsolved. The only thing to be done is to displace anxiety and fear where there is nothing to worry about (like the recent upwelling of hostility against foreigners in Germany), and to feel secure where there should be fear for the sake of the survival of mankind in an age of nuclear and ecological catastrophes. These mechanisms might be supported by a universal system of hidden meaning

that can be constructed out of the leftovers of religious tradition. Such a thoroughly unhistorical repetition of that which prevents the return of repressed material might very well be called a *mythology*, and should be distinguished from the creative use of religious symbols.

No doubt in ancient times mythology was a very fruitful and inspiring source of creative imagination. The Judaeo-Christian tradition joined in this stream of thinking and expression, but after the Cartesian split into the sphere of "objective reality" (*res extensa*) on the one side and an only "subjective guessing" (*res cogitans*) on the other, the new developing sciences were striving for the exclusion of the subjective factor. Symbolic language became a subject of everlasting quandary. In order to get as close as possible to reality, the symbolic language that keeps together object and subject, as the corpus collosum does between the two hemispheres (Hoppe, 1985), was even regarded as a kind of sickness of language. This, according to Hume (1757), was due to the inability of our ancestors to think clearly and to express themselves properly. Even in the field of theology, the disability of rationalism and symbolic expression can be observed. According to Karl Barth (1954) religion was regarded as a kind of original sin because of the effort to grasp the reality of God and objectify it. Rudolf Bultmann (1948) especially called the symbolic mythical expression in the biblical language a mischief ("Miβgriff") because it tries to objectify the Eternal. In contrast, Paul Tillich (1962) was for a long time the only one in the field of theology who showed some appreciation for symbols and emphasized their importance as the "real language of religion." However, he suggested a tension in religious language between the sacramental and the prophetic, which in any case should be maintained. Otherwise, if the constitutive element and the prophetic element split and separate, the first one will be bound to become heteronomous and demonic, the latter empty and skeptical. Symbols are representatively pointing in the direction of the Holy and ultimate, which both is and is not present in reality at the same time.

The critique of religion of Feuerbach, Marx, and Freud made very clear that religious symbolism very often was misused in the sense of oppressing and exploiting people. Freud (1927) claimed that religion would "disappear with the inevitability of a natural process." But this prophesy, which was supported even by the German martyr and theologian Dietrich Bonhoeffer (1964), did not prove to be true.

In our times a new interest in religion (not necessarily connected to church membership) is growing. There is especially a new interest in ancient mythology, which to a certain degree may be called a remythologization of religion, and we have to find some criteria that will make it possible to differentiate between a creative use of religious symbols and its opposite. I claim that this may be possible by differentiating between remythologization and resymbolization, and will illustrate this with the help of clinical and political examples.

THE RETURN OF THE REPRESSED

What can be called the most astonishing event in European history is the fact that, after almost 200 years of Enlightenment (which according to Kant is the "outlet out of self-imposed dependence"), the most powerful ideology that finally let Europe fall into ruins was created in the shape of a mythology.

Similarly, as in the antique mythology, which doubtlessly functioned to diminish the fear of the natural forces, the main ideologist of Nazi ideas, Alfred Rosenberg (1932), in his *The Myth of the Twentieth Century,* planted into the mind of the masses the idea that externalization of terror into concrete objects would free man from the traumatization of terror within himself. This idea has been carried by an entire generation. Concentration camps, where people were locked up and then killed, provide a perfect example of "fencing in fear." In these camps the fascists placed people on whom they projected all of their own instincts that frightened them and that they were unable to acknowledge, all of those things regarded as inferior and parasitic. In this process, a comprehensive myth becomes linked with spiritual powers, the unacceptable becomes routine.

In order to survive this deeply frightening possibility of the "Hitler within us" (de Mause, 1982), not only Germans, but all of humankind, have tried to adopt a means of repression. However, wherever repression exists, no true solution can occur. That which is repressed recurs. This is precisely what we are witnessing, in the second generation after Hitler, in such frightening detail. It shows up especially in the phenomenon of falsely placed anxiety, which again projects our anxiety on to innocent people and tries to erect totally illusionary defenses in the face of the real terror. When there is no symbolic expression of guilt by means of a superpower, as for example in the seventh chapter of Romans, the terror of one's own potential must once again be fenced off, as in the literal concreteness of the atomic and ecological holocaust.

Psychologists today have the unique opportunity of seeing the mechanisms of repression in the generation of the children of the perpetrators and victims. It is of course not possible to be totally objective in this observation. One must pay the price of discovering the frightening possibility of the Hitler within us.

CASE STUDY

What I described above can be exemplified by a case history:

Mr. B., at the beginning of counseling, is a 37-year-old, slim, well-trained, athletic man of impressive stature, but with insecure, almost groping movements by which one immediately noticed that he tried to avoid eye contact. Even when he did achieve eye contact, he could not maintain it.

He was in a caring profession, and had already completed various therapeutic

modalities. He presented himself with the problem of his fatherlessness. This was also expressed in a very smooth, a bit obsequious, establishment of contact. He was brought up in a household of women. His grandfather died during the first days of World War I, and the discharge document—which was drawn up and personally signed by Kaiser Wilhelm II—belonged to the family heirlooms. His father died in 1945. Mr. B. had no recollection of him personally, but his father was continually present throughout Mr. B.'s childhood through his picture above the piano and through his mother's stories. His mother provided for him and for his sister under the most difficult external conditions of deprivation. She made it possible for him to attend secondary school and to study the same subject as his father. However, he failed the doctoral exams, which he had taken for granted he would pass (as his father had done). Alone, he was unable to overcome this obstacle and lapsed into work mania which, until he began treatment, absorbed and ate away all of his life's expressiveness.

At the beginning of therapy, Mr. B. constantly fluctuated between ideas of inferiority and ideas of greatness. For him there was only work; all other activities he deliberately set aside. In the area of relationships there was only occasional sexual contact. Indeed, in his friendship with a woman, it appeared to be hardly possible for him to be in any sexual involvement. He did not enter into any social involvements and avoided any kind of social contact. He voted for the conservative Christian Democrat Party, but without conviction, and left the church. However, as he later realized, he had very strong religious ideas and feelings, even if merely in the loneliness of his own heart. He had never been sick in his life, but has a constant hypochondriacal awareness of his body.

His inner stability was assured through a distant camaraderie with colleagues and his girlfriend, through crisp but changing sexual relationships, through work (the more the better), and through his therapy. However, this therapy was not allowed to change anything.

When his girlfriend began hinting that she would like to have a child with him, he became panicked and horrified. Only the invariability of the present condition guaranteed for him security. In childhood, the Trinity of God, his dead father, and Jesus had done the same. In his normal life, the result was an increase in his work mania, and impotence with his new wife, his former girlfriend. Mr. B. accumulated a large fortune, but he could not do anything with it because he didn't allow himself to have anything.

At this point, if we ask ourselves how this tragic story comes out, in the background of the structural characteristics of the myth of "fencing in fear," then we must come to the conclusion that it is not the absence of the mythical structure that Mr. B. keeps away from his life. Rather it is really the hypertrophy—or if you will, the perversion (as the negative of neurosis) of the mythical—that hinders him the most. His life appears to be a classical myth, an unhistorical repetition of the same. His very powerful father figure, who lacks any historical substance, hindered spreading into room for life. The polarity of

genders determines all of life, but cannot be joined together into an integrated shape because women have a fatelike power at their disposal. Psychotherapy becomes a religiously excessive cult, a vicarious satisfaction for an unlived life.

How is the problem of overmythologizing all of life's functions, in the case of Mr. B., solved? The historical dimension returns when he makes inquiries, and turns out that his father, who "fell on the fields of honor," actually was a supervisor of the concentration camp Dachau and was shot in 1945 by the liberating Americans.

The all-encompassing defense mechanism of repression breaks down. Only through the protection of religious and symbolic ideas can the question be formed, Can the father in heaven be human? It becomes clear how his mother, as keeper of the holy grail of the father complex, hinders and avoids grieving over dead men. In doing so, she avoids the debate and disassociation from the father. The question of the historical father that exists behind the mythical father threatens to break down the entire construction of Mr. B.'s ideas about life. The question is answered through a hard and bitter struggle with his therapist. Suddenly he discovers the weaknesses behind the idealization of communication with him as his mirror. A surge of ambivalent feelings occurs. On the one hand, as the therapist, I am seen as a repulsive liar who wants to soil his holy sacrosanct father. On the other hand, he wants to kiss my feet, and with tears in his eyes asks for a blessing with the sign of the cross, which will allow the expiation of guilt. He looks upon it as a repulsive temptation, replacing the motto "work makes free" with the motto "love makes free." Slowly room can be made through "reconciliatory work" between the different personality interests. In a dream he experiences himself as a truck that travels through a very wide piece of desert and finally comes to a golden city with shining towers, which is only reserved for trucks laden with guilt.

SOME POLITICAL OBSERVATIONS

No doubt the power which the myth is able to exercise in our case history example is based on the repression of the historical truth about the father. The inability to manage a grieving period, which Alexander and Margarethe Mitscherlich (1968) discovered in Germany's postwar history, means for an entire generation the avoidance of a confrontation with the actual perpetuated guilt, and the repression of the fear of one's own appalling possibilities. These are then passed on to the next generation, not only from the perspective of the children of the victims, but also from the children of the perpetrators.

Yet the moral indignation by which the whole world avoided the event reinforces the emotional mechanism of the outer projection. It continues further on a world scale and finds its eloquent expression in the internalization of a truly manufactured thing: the nuclear bomb. It is also in the just as bureaucratically

planned and manufactured apocalypse of "war games." In contrast, the events of Fall 1989, which led to the collapse of a new mythological and political system erected in East Germany on the foundations of the suppressed Nazi mythology, may be called a resymbolization. What the participants in the Prayers for Peace in the Nicolai Church in Leipzig discovered was the fact that, if there is a free space in which sorrow and inner pain can be expressed and transformed into words, it may lead to a rediscovery of a creative use of traditional symbolism.

People who gathered in the church at that time were offered the possibility of lament. In an anonymous *Book of Lament* they could write down their personal and public mischief, and these were connected to the traditional form of litany and liturgy. In this context an old expression of mourning, like the poetry of the psalms, was connected to new meaning. This led to the rediscovery of the power of the symbol of the candle. Armed with nothing but candles, the people could develop the courage to leave the church and go out into the streets in demonstration. The candles were something to hold on to, to preserve the flames, and they were even used to build a wall (of candles) around the buildings of the hated enemies of state authority. This prevented the use of physical violence and aggression, and stimulated the creative invention of often even very humorous slogans, which were then picked up by the masses. According to Freud, humor is the inner triumph of the ego over the inconvenient compulsions of outer circumstances.

CONCLUSION

It is the suggestion of this chapter that the difference between a deeply unconscious mythology and the conscious use of creative symbols in masses is the same as that of the difference between symbol and symptom in individuals. I would like to illustrate this by a concluding case vignette, in which I myself am the case.

After the collapse of the Nazi ideology, which significantly influenced my growing up in Germany, I developed a symptom that, in spite of two psychoanalyses, could not be resolved. I always sensed the impulse to vomit when I noticed the flags in American churches, and in fact I had to surrender to that impulse several times. During the rise of the solidarity movement in Poland, I joined an open-air Mass where, on both sides of the altar, flags of the *solidarnocz* were held up by young girls. All of a sudden I remembered the long-suppressed fact that, as a little boy I had been selected to carry the flag myself. Through waves of shame came back to my memory the feelings I had had at that time, when we sang: "The flag is more than death." Only the process of this feeling becoming conscious had the power to resolve my symptom of vomiting and gave me back the possibility to join in the joyful expression of hope in the symbol of the flag, which for such a long time had been repressed by a demonic

content. It may be that the creative power of religious symbols is hindered in its development as long as we do not discover the "Hitler within ourselves," as suggested by the psychohistorian Lloyd de Mause (1982).

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Part IV
General Overview

13

Conclusions Concerning Creativity and Affect

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One of the most interesting aspects of this volume is its diversity. The contributors discussed everything from art to economics. New theories were proposed, old theories evaluated and extended, and empirical findings offered. Some focused on individuals, and some on groups. Some looked to health, others to psychopathology. Even with this diversity, there were numerous themes and areas of agreement. Not surprisingly, most authors said something about specific affective states, and there was some agreement about the most relevant emotional states and tendencies. There was also some consensus about environmental influences, biological features, unconscious processes, intrinsic motivation, and atypical personalities.

In the present chapter we attempt to integrate the various viewpoints, structures, and theories by exploring themes and those areas of agreement. We also connect the themes to the existing creativity literature, and identify important unanswered questions. We will first mention some of the specific affective states that the contributors tied to creativity. This book focuses on creativity and affect, and the first question is simply, Which affective states are important?

SPECIFIC AFFECTIVE STATES

In Chapter 1, Shaw noted from his heuristic study that there were many themes associated with the creative process in science. Several of these had major affective components: getting stuck (anger, fear, sadness, shame), emotional reactions to illumination and body sensations ("walking on air," "good feelings in the stomach and chest," euphoria), rejection, validation, external pressure, and failure (depression, anxiety, self-deprecation). Schuldberg (Chapter 4) identified *giddiness* and *horror.* The former was defined as "the emotional acceleration and pleasure involved in the playful, relaxed, or driven phase," and is thus not unlike the anxiety, tension, and sensitivity identified by Runco (Chapter 5). Several of the states identified by Shaw parallel Csikszentmihalyi's (1990) description of *flow,* a state thought to be involved in creative performance. Similarly, the sensitivity described by Runco has been noted numerous times in the creativity literature (e.g., Albert, 1983; Richards, 1990; Wallace, 1991).

There may be some question about the stability of the specific affective states described in this book. This is an especially critical question if we assume causality, with creative behavior dependent on specific states. Perhaps the important affective states reflect an individual's long-term behavioral tendencies, in which case the individual probably has long-term creative potential. However, the actual stability of affective states is no doubt even more questionable than the stability of personality traits (see Rubin, 1982). It is probably most reasonable to concede that the states mentioned herein are relatively unstable. They would no doubt be influenced by specific situations, as in a trait-situation interaction, or a mood influenced by a particular experience. The present volume contains several descriptions of the impact of experience and environment.

EXPERIENCE AND ENVIRONMENT

Various environmental factors influence creativity and affect. Some of these can be functionally defined as contingencies and incentives, or more specifically as reinforcers and punishers.

Becker (Chapter 8) used economic terms, including *benefit* and *demand,* but these are quite consistent with theories of incentives (see Rubenson & Runco, 1992). Becker also argued that social interactions, and in particular harmony, can keep individuals from being creative. This certainly is true in some situations, and is consistent with evidence of the nonconformity of creative individuals (see Albert, 1983). The primary question about contingencies and incentives concerns the potential undermining effect. Recall here Runco's argument about appraisals and intrinsic motivation. In his view, the concept of intrinsic motivation has little explanatory power. Runco argued that intrinsic

motivation results from a cognitive precondition, and the appraisal of a problem or opportunity. Amabile (1990) and Hennessey (1989, in press) seem to favor the view that contingencies can undermine interest and creativity. More will be said about this later.

The importance of social experiences should be emphasized, given that they are often overlooked. At least, individuals studying affect generally focus on intrapersonal processes. Several chapters in this volume suggest that interpersonal processes are at least as relevant. As a matter of fact, social experience may be vital for some expressions of creativity. Shaw (1989), for example, described the need for *collective validation* in science, and in the present volume Runco (Chapter 5) described interpersonal tension as both stimulating problem-solving efforts and, in the long run, contributing to an individual's tolerance of conflict and disequilibration. Social experience is also implied by the work on local culture. Scharfenberg (Chapter 12), for example, tied creativity to mythology and religious symbols. He also coupled this to the distinction between subjective (affective and creative) and objective (cultural and environmental) experience. Other descriptions of the importance of culture are given by Basadur (1992), Cropley (1970), Simonton (1990), Stein (1953), and Winner (1988).

UNCONSCIOUS PROCESSES

The emphasis on experience does not detract from the view that creativity can come from within. Creativity can be highly personal. This is especially clear in the theories of unconscious processes.

Several contributors suggested that the affective components of creativity operate on a subconscious level. Scharfenberg (Chapter 12), for example, discussed rationalization and displacement as defenses against affect and Krystal and Krystal (Chapter 9) suggested that many perceptual and unconscious processes are nonlinear and thus arational. Runco (Chapter 5) adapted the idea of unconscious appraisals to describe the cognitive processing that precedes intrinsically motivated efforts.

Smith and van der Meer (Chapter 7) went into detail about the unconscious processes that involve anxiety and anticipation. They delved into the importance of focusing on the dark side of one's personality, which might contain important instincts and impulses. This affective involvement is seen to be a motive force and a means for contact between the adapted and unadapted psychic layers. They envision creative acitivity as often being generated by conflicts and contradictions within the complete self, and they concur with the view that one's worldview is constructed from below, thereby concealing us from the ultimate roots of our conscious behavior. For Smith and van der Meer, unconscious processes are fundamental. Hence, they are in harmony with the view (see Russ, 1993) that affect tolerance is a primary feature of creative individuals.

These ideas about the unconscious are of course consistent with the Freudian

view. They are also in line with the work of Kris (1952) on regression in the service of the ego, and with Poincare (1908/1952) on the preconscious selection of ideas. However, instead of being speculative and entirely abstract, much of the work on affect and unconscious processes in this volume relies on sound empirical research. Krystal and Krystal (Chapter 9), for example, drew from physiological research to describe how potentially creative affect may be stimulated by information from the thalamic hippocampal-amygdalar complex. Similarly, Hoppe (Chapter 10) and TenHouten (Chapter 11) both described how the research on split-brain subjects supports the view that the interplay between cognition and affect is necessary for creativity. They looked to handwriting samples, electrophysiological analyses, and clinical observation.

The research of TenHouten and Hoppe suggests that the present popular emphasis on left brain versus right brain thinking might be an unproductive and misleading distinction. It is clearly the interaction between the hemispheres that is of primary importance. Further, different centers for specific functions (e.g., speech) are known to be in different hemispheres for different persons. We must therefore be very cautious and not overgeneralize about the manner in which specific hemispheres control different types of thinking and feeling (see Hines, 1991; Katz, in press; Runco, Okuda, & Sakamoto, 1993).

An interesting issue arises when the unconscious is tied to intentions. Simply put, that which operates on an unconscious level may be viewed as unintentional. This was suggested by Shaw, who reinforced the view that creative thinking involves much more than just thinking in a conscious sense. The interesting thing is that there is some debate in the creativity literature about intentionality (e.g., Gruber, 1978, 1988, 1993; Runco, 1993; Simonton, 1988a; Wolf & Larson, 1981). Wolf and Larson, for example, suggested that unintentional acts cannot be creative, and Gruber (1988) suggested that unambiguous instances of creative performance reflect an individual's *purpose*. This implies that purpose is vital for high-level creative performances. The logic behind this is easy to see: The individual might require purpose and drive in order to sustain the effort which is necessary for mastering (and eventually contributing to, or even revolutionizing) a field. Several individuals have suggested that 10,000 hours of deep involvement are necessary to master a field (e.g., Simon & Chase, 1973), and surely some drive is necessary for this investment of time. As TenHouten suggested, purpose is also an important topic in the biology of creativity. This brings us to the biological theme within this volume.

BIOLOGY

Just as the impact of social experiences on affect is often overlooked, so too is the biological component of creativity often deemphasized. When it is recognized, it is typically inferred, as in behavioral genetic research (Albert & Runco,

1989; Domino, Walsh, Reznikoff, & Honeyman, 1976). Of course, part of the problem is methodological. It is very difficult to study the biological manifestations of creativity. Furthermore, there is a certain optimism among those doing the research, and an emphasis on the more controllable experiential factors. We were very pleased that the contributions in the present volume seem to recognize an interplay between biological processes and experience.

The biological research in the present volume included commissurotomy or so-called split-brain patients. Hoppe, for example, demonstrated how commissurotomy patients tend to be deficient in the affect and interhemisheric communication that may be necessary for creativity. He also brought up the issue of *symbolization,* claiming that the commissurotomy patient "is deprived of symbollexia and the access to symbolization and imagery of the right hemisphere."

TenHouten focused on the handwriting of split-brain patients. His findings are quite consistent with those of Hoppe, for the handwriting seemed to lack "emotional release," "the expression of feeling," and "intentionality" (cf. Hoppe & Kyle, 1990). TenHouten is probably correct that the lack of intentionality is critical. Creative efforts are indeed purposeful (cf. Albert, 1988; Gruber, 1978, 1988; Simonton, 1988a), although there is the controversy mentioned above.

Richards (Chapter 2) brought up the possibility that there is a genetic basis for bipolar mood disorders. This idea is based on her observations of family histories. It is especially important given her evidence that creativity may be tied to mood swings. Runco's review of developmental tension also suggests that creativity may run in families, although his evidence supports the environmental continuity of families more than genetic contributions. Elsewhere, Domino et al. (1976), Martindale and Armstrong (1974), and Albert and Runco (1989) discussed the biological component of creativity. Domino et al. (1976), for example, studied the creativity of twins, and Albert and Runco (1989) suggested that the moderate parent–child correlations of creative performances were indicative of both biological and experiential factors. Martindale (1977–1978; Martindale & Armstrong, 1974) described EEGs and their association with creative thinking.

INSTRINSIC MOTIVATION

Several contributors noted the importance of intrinsic motivation. In fact, intrinsic motivation has been recognized for some time (MacKinnon, 1983/1960). More recent work on intrinsic motivation, including some sound experimental work, was presented by Amabile (1990), Hennessey (1989), and Milgram (1993). Amabile and Hennessey both presented empirical evidence that extrinsic motivation can inhibit creative efforts. Of course, this is not to say that

extrinsic motivation is always detrimental. Realistically, both intrinsic and extrinsic motivation are involved in actual creative performances (Rubenson & Runco, 1992).

As mentioned above, in the present volume Runco proposed the controversial view that intrinsic motivation is actually preceded and caused by a cognitive (rather than affective) condition. In this view, individuals are motivated because they encounter or uncover a gap or intriguing issue. Intrinsic motivation is implied by TenHouten's (Chapter 11) focus on intentionality, and it is explicit in Heinzen's (Chapter 6) analysis of proactive and reactive creativity. Heinzen's work is significant because it integrates personal motivations with situational demands. Heinzen distinguished between the two types of creativity, and also separated internal creative/affective experience from the affective components of external circumstances. When the external situation is positive in terms of affect, it produces responses that are predictable, and these include intrinsic motivation. However, negatively affective external structures drive creativity via components such as extrinsic motivation. Heinzen's work clearly supports what was said above concerning the importance of social experience.

PERSONALITY

Both Richards (Chapter 2) and Bowden (Chapter 3) focused on the association between creativity and bipolar mood disorders. These chapters are particularly important in part because of the common misconception about the "mad genius" and eccentricity of artists (see, e.g., Hammer, 1961) and other creators. Richards and Bowden pointed out that there is a range of moods and behaviors, not all of which are tied to creativity, and that the casual connection between disorder and creativity is an ambiguous one. Indeed, it may be that an individual is both creative *and* "moody" because of some third aspect of his or her personality. This third personality tendency could easily cause psychic discomfort, and this in turn could elicit a mood swing *and* creative adaptations. Clearly, in this sense the work of Richards and Bowden fits nicely with that of Schuldberg (Chapter 4), who looked to giddiness and horror in the creative process (also see Rothenberg, 1990).

Implicit in several chapters is the idea that personality alone is an inadequate explanation for both mood and creativity. Richards, for example, explicitly tied so-called traits to cognitive, motivational, affective, and behavioral factors. Similarly, Krystal and Krystal looked to *cognitive style*, in part because this recognizes the roles played by information processing and individual mannerisms. The point is that it may be unrealistic to focus specifically on personality. Like so many other human qualities, creativity is overdetermined; it reflects a complicated interaction among various cognitive and extracognitive tendencies.

The work of Krystal and Krystal is also important because it moves

associative theory in a new direction. Associative theory has been widely used in the creativity research for many years. Mednick (1962), for example, described how *serendipity, mediation,* and *similarity* all influence ideational patterns. Serendipity describes chance associations; mediation occurs when two ideas are brought together because they share features with a third; and similarity describes associations which themselves share some feature. Mednick's Remote Associates Test is still frequently used, as are examinations using Guilford's (1968) structure of intellect model, and these also rely on associative theory. In fact, Wallach and Kogan (1965), Milgram and Rabkin (1980), and Runco (1986) each tied associative theory specifically to divergent thinking, and Simonton (1988b) recently proposed a chance configuration theory which is largely associative. Simonton described "(1) the chance permutation of mental elements, (2) the formation of configurations, and (3) the communication, social acceptance, and sociocultural preservation of those configurations" (p. 6). He further described how *self-organization* acts as a motivational force, with cognitive *stability* as an internal criterion for configurations. The intrapsychic processes occurring below consciousness resemble primary process thinking (Dudek & Verreault, 1989) as well as general associative process (Mednick, 1962). The latter part of the process appears to be analogous to secondary processes (Hoppe, Chapter 11) and to the evaluative thinking described by Runco (Chapter 5).

Krystal and Krystal have added a great deal to theories of associative and ideational processes, especially by focusing on the possibility of chaos, bifurcation, nonlinear thought, and turbulence as descriptors. Their view may allow us to better understand the ideas and insights Mednick (1962) described as serendipitous, and Simonton (1988b) and Campbell (1960) described as "blind," "random," and determined by "chance."

ISSUES AND CONCLUSIONS

Several issues were raised in addition to those noted above. Bowden, for example, raised several ethical questions which are relevant to the treatment of individuals who have a bipolar disorder. These are critical questions, given the various possible directions of effect. Creativity may, for example, lead to tension and anxiety (Rothenberg, 1990), or it may help to resolve it (Richards, 1990; Runco, Chapter 5). In part for this reason, Schuldberg raised the interesting issue of psychotherapy itself as a creative process. This issue was also acknowledged by Scharfenberg, and he gave the example of his own depression and recovery. Recall here his claim that "the creative power of religious symbols is hindered in its development as long as we do not discover the 'Hitler within ourselves.'"

That creativity may be a cause rather than (or in addition to) an effect was

suggested by Becker (Chapter 8), Richards (Chapter 10), and Bowden (Chapter 3). Like Scharfenberg, Becker took the social view, and he suggested that creativity too often leads to competition, egotism, self-centeredness, and stress. Bowden and Richards discussed various possible causal possibilities, with creativity leading to affect, affect leading to creativity, or both creativity and affect elicited by sensitivity or some other aspect of the individual's thought (see also Rothenberg, 1990).

This question of causality is a vital one. In fact, quite a number of critical questions were posed in this volume, and others were implied by the various points of disagreement. These questions and issues are at least as important as the identified themes, because they can and usually do act as guides for future research. Put differently, they remind us that there is much work to do. In particular, we are concerned about specific affective topics that we have unintentionally omitted. We have had difficulty finding the omissions, and that itself is an important feature of our own prejudices. Perhaps future research will be directed specifically at the questions and issues mentioned herein, and at possible omissions. In any case, it is our hope that this book will help direct those who are interested in the further exploration of the intriguing field of creativity and affect.

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