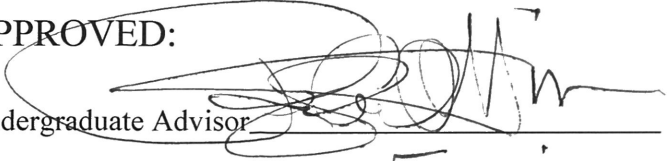


Discovering and Unleashing the Creative Brain

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*Discovering and
Unleashing
the
Creative Brain*

by

Patrick James

Stacy & Fennel

This paper is dedicated to

Rodney Culber Hill

A fine Christian man, an inspiration and mentor,
whom without, I would know that many less dirty jokes,
and be minus a B.E.D.

Discovering and Unleashing the Creative Brain.

Patrick James (Rodney Hill), Environmental Design, Texas A&M University

Each of us, in our own way, was at one time driven by the urge to define our personal identities. Who can say that they have never had the need to discover themselves or their place in this the world. Why are we here? Who am I? Who can I be and how will I get there?

The search for these answers is a never-ending quest that begins at the earliest stages of our lives. We unwittingly find ourselves involved in a step-by-step process of growth and learning from the day that we are born. Initially unrefined, our first signs of learned behavior revolve around the basic necessities of life, yet quickly grow until a sort of mastery is acquired, and then continue to bloom.

Throughout this process of continual growth, we become more and more in tune with our feelings and our basic internal nature. It is between this internal nature and the creative process that a powerful dialogue is born. The act of discovering and defining one's true internal nature lends itself intensely to the creative act. A person who is labeled as creative, typically has an intuitive access to the various facets of his or her own personality, as well as access to the varied aspects of their surroundings. This enables them to pull from countless experiences and events, apply meaning to them and then to use them effectively. This is learning; which consequently lies at the heart of the creative process - roughly defined as the ability to combine old ideas in

novel and fresh ways or to discard obsolete concepts in order to embrace new and better ones.

It is most unfortunate that our society, many of our families and even our schools fail to properly foster a creative attitude. The values of these particular institutions, more often than not, collide with and sometimes ostracize originality and individualism. In some instances, going as far as ridiculing and punishing these traits. One never realizes that it is all too easy to stand off in the corner, away from the center ring and debase others for their uniqueness, when in fact those people should be commended for the showcasing of their creative impulses and shining individualism.

So why is creativity important to each of us and what effect does it have on our lives? Since the beginning of time, creativity has been at the center of all mankind's actions. It has enabled him to cope, reproduce, adapt and eventually become what we presently are. Especially today as we enter an era where the knowledge of the human race is expanding exponentially, it is most profitable for us to use creativity to help achieve our goals. Creativity's importance lies in the fact that it is a vital asset for anyone who teaches, learns, discovers, seeks to replace obsolete talents, sets cultural trends or simply just wants to find their place in their universe.

I hope to affirm the need for creativity in our lives by defining it as a necessary part of the inner workings of

our minds. By looking at the actual creative process and what happens both biologically and psychologically, it may be possible to ascertain ways in which we can use this incredible power to harness the more turbulent facets of our existence.

This is certainly not groundbreaking research. As far as uncovering a new psychological dictum, I have done very little in that area. What I have done, however is collected a great amount of research and data that previously lay scattered across an enormous number of volumes and placed it into one source. Primarily, I have answered a question that has plagued me since the onset of my collegiate career. I have discovered the reasons for why I do the things that I do. I have uncovered the reasons that explain my thought processes and why they happen, where they come from and who put them there. I have learned hundreds of ways in which I can enhance my creative life and most importantly, I have been given the opportunity to compile an entire years worth of understanding, growth and learning into a document that may help others make the same discoveries of themselves.

In regards to how this paper is written, it is divided into three sections. The first section deals with the functions of the brain, attempting to explain how the structure of the brain effects various facets of our lives. This section also delves into a brief history of the research on the brain and presents a physical road map of

our minds. It is important that this information be read first so that an understanding of the way our minds work precludes the next half of the paper. This section took off on its own as my research ensued. The powers of our mind and the structure of the brain are fascinating subjects and offer an insight as to why we act, dream, think, believe and function the way we do

The second part of this paper is concerned with the powers of the creative mind and vividly outlines the creative process. I have made an attempt to clarify this information with personal accounts from some of the most creative and talented people throughout our history.

The last section is primarily devoted to various ways, methods and procedures in which we can enhance the force of creativity within our own lives. By discussing conceptual blocks and creative problem-solving methods, we can learn how to convert a force, though latent in many of us, is a potent tool in conquering the problems that we face, every day of our lives.

Patrick James

Part 1

*Discovering
the
Creative Brain*

My first realization of the influence of the brain, upon the functions and processes of creativity and the incredible power of the three pounds of unceremoniously folded tissue in our heads, came upon the reading of a National Geographic article. The power of the brain unfurled before me as the shiny two-page photo spreads did the same. Infinitely more complex than any machine ever invented, the brain is the essence of our being. It regulates our bodies, retains knowledge collected through lifetimes and is capable of portraying itself as a mysterious entity with a uniqueness that is usually associated only with a fingerprint. The brain is the reason we think, breathe, and live and without it we could not create.

Countless theories concerning the function of the brain have permeated scientific research since the advent of that same institution. Aristotle popularized the idea that the roles of the heart and the brain were reversed. His hypothesis stated that the brain served to regulate basic autonomic processes of the body while the heart was the center of all thought and emotion. A rather incorrect assumption, it was widely believed up until recent decades due to the unavailability of technology and the opportunity required to study the human brain. For the past 2000 years mankind has operated under superstition and unexplainable theories when regarding the human brain. Even now, it remains the most deceptive part of our anatomy.

Even with the technology of today, it is not surprising that we know so little of the human brain. The sheer magnitude of its size is overwhelming. Considering that it is comprised of billions of individual cells, neurons and other electrically controlled connections, it is no wonder that it remains so unrevealing and shrouded in mystery. Imagine having to locate an individual person out of the entire human population and then thoroughly interrogate him, even though he speaks a different language. As impossible as that task sounds, that is what is currently happening in both the fields of neurology and psychoanalysis. It is only now that we are fortunate enough, due to the introduction of modern equipment and new ideas, to be able to see inside some of these very same cells and connections and examine the brain while still in working order.

The brain is the center of mankind's existence, his emotion, his desires and his control. It seems only just that it is also an active agent in the force called creativity. To fully comprehend the process of creativity, an understanding of basic functions and operations of the human brain must be first established.

A History of Brain Research

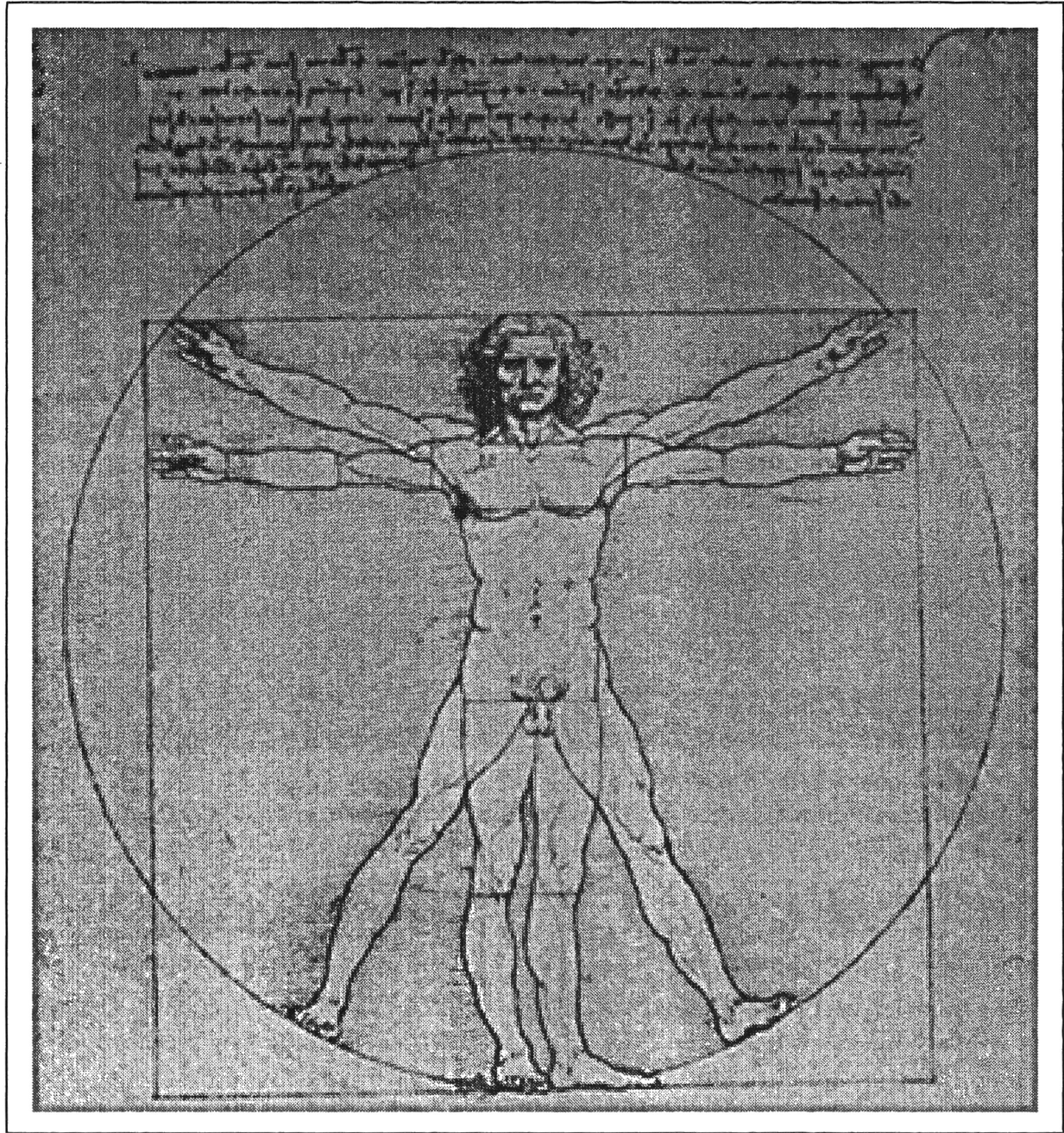
Many of the Ancient civilizations on Earth knew relatively little about the function of the brain. The Egyptians were commonly known for valuing other organs such as the heart, kidneys and liver far more than the brain. In their preservation process of mummifying their dead, the brain was ritually pulled from the head, through the nose, and discarded while other organs were preserved and entombed with the body to be used in it's next life. The fact that the brain was not often included signifies it's importance to this ancient culture. The Chinese believed that the heart was the source of all mankind's intelligence and emotion and controlled the central nervous system. Beliefs of brain and heart dominance were debated back and forth over the next millennium.

Some of the earliest known reflections of the brain that were of significant stature, date back 2,500 years to the time of the Ancient Greeks. One of the predecessors to modern medicine, Hippocrates, stated that there could exist, within the brain, a duality. The idea of a duality within the brain is most important in substantiating many of the succeeding theories of the brain made after Hippocrates'. His theory was the first to suggest that the brain could be divided up into two specialized regions. It is this conjecture that may have led to today's popular notions of the theory that divides the brain into the left and right hemispheres. Hippocrates' ideas were documented in his research of

an epileptic patient. He noted that the patient would exhibit behavior as if there were two minds inhabiting one brain. Also known for his theory on the primacy of the brain, Hippocrates states:

“Some people say that the heart is the organ with which we think and that it feels pain and anxiety. But it is not so. Men ought to know that from the brain, and from the brain only, arise our pleasures, joys, laughter, and tears. Through it, in particular, we think, see, hear, and distinguish the ugly from the beautiful, the bad from the good, the pleasant from the unpleasant. To consciousness the brain is a messenger.”¹

The ideas of many of the early Greek philosophers were considered and pondered over the next few centuries. Aristotle contradicted his predecessors by professing that the brain was in some way associated with the heart and was primarily used to cool the blood. Plato believed that the brain was constructed of a wax-like material and that experiences and memories were impressed onto it. Ironically, one theory that could have advanced the study of the brain rather significantly was brought about by Herophilus. He proposed that a human's mental abilities were defined by the folds in the brain's surface. This theory, though unfortunately



Leonardo da Vinci is noted for his profound studies of human anatomy.

disregarded and forgotten through time, actually held some significance.

For nearly two millennia, very little progress was made in the area of brain research save for a few milestones such as Leonardo da Vinci's profound studies of anatomy and Galen's dissections of the brain. It was widely believed that should one violate the brain then they would violate the soul, an idea that was extremely detrimental to the further exploration of the brain. Not until the middle of the eighteenth century was the importance of the brain in mental functioning made clear. It was at this time that scientific curiosity overcame superstition. The brain was then completely mapped as best as possible and was recognized as an organ that operated under thousands upon thousands of electrical impulses. Following that discovery, a surge in the study of the brain ensued and some of the most important findings in brain research came to bear.

At the start of the nineteenth century, German physiologist and anatomist, Franz Gall, noticed similar symptoms and disabilities amongst patients who had endured damage to identical parts of the head. This discovery led to the advancement of the idea that different parts of the brain were responsible for particular functions of the body. Through painstaking research, Gall devised a system of mapping out the brain's surface and assigning various identities to each area. This science became known as phrenology and was widely

used as a tool for diagnosis in the nineteenth century. It was based on the study of the bumps on one's skull and reportedly led to analysis of the patient's mental faculties.

Whether or not it really was a viable diagnostic is besides the point. The actual value of this, Hippocrates' idea of a duality within the brain and many other scientific discoveries throughout history is that they served as a foundation from which later discoveries could be made. Most notably, the current theories on the organization of our brains.

Theories On the Organization of the Brain

There are many theories that attempt to define the makeup of the human brain. From Plato's belief that our heads are filled with wax to current theories that populate scientific discussion, there has been an incredible amount of attempts to define what actually is contained within our skulls. There are actually several ways in which researchers view the brain today. Two of the most popular and widely used are the Triune Brain Theory and the Left Brain/Right Brain Theory.

The Triune Brain Theory

Although not the premise that I will base this paper on, the discussion of an alternate view is important. Some of the attributes of this particular viewpoint can be applied to the left/right theory of brain organization so it will benefit us to subject ourselves to a cursory examination of it as well.

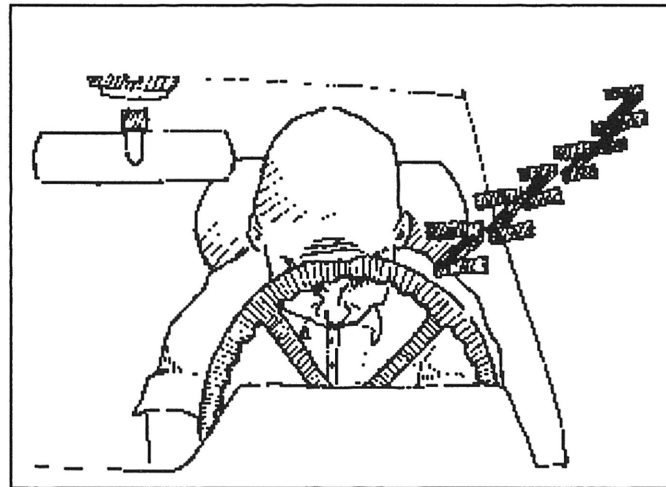
This theory was proposed by Dr. Paul MacLean, head of the Laboratory for Brain Evolution and Behavior at the National Institute for Mental Health. According to him, the brain is in actuality three succeedingly more developed brains that encircle one another. The inner most brain being the most primitive and responsible for instinctual behavior, followed by the second and third layer that progressively grow more advanced and free-willed. The second layer is referred to as the limbic or mammalian brain and is primarily in charge of emotion and motivation. We share this portion of our brain with lower mammals such as rats, rabbits dogs. The limbic system measures rewards vs. punishment and control various autonomic reflexes such as breathing, sleeping and the beating of our hearts. The third and outer layer of the brain is the neocortex, commonly referred to as the cortex. This is what separates mankind from other animals. High mammals such as dolphins and chimpanzees also have a developed cortex, though not nearly as large as that of man. Though only a quarter of the brain's entire volume, the cortex contains 75 percent of the brain's ten billion neurons. It's responsibilities

include learning, adapting and reacting with our environment. Definitely a valid argument when considering the composition of the brain, the Triune Brain Theory unfortunately does not lend itself to the understanding of the functioning of the brain as well as this next theory does.

The Left Brain/Right Brain Theory

A few elements of this projection of the human brain can be associated with some characteristics of the Triune Brain Theory, but it possesses some essential differences to it as well. Basically, scientists who subscribe to this hypothesis believe that the brain is comprised of the neocortex, the limbic system and the vast network of highways that serve as connections to various parts of the brain. However, the basic difference that sets it apart from the Triune Brain Theory is that the cortex and the limbic system are each split into two fully functional hemispheres, otherwise known as the left and right brain.

The cortex is sometimes referred to as the gray matter, because of the high density of blood vessels that give it a grayish cast. The cortex is largely responsible for the processing of visual and auditory information as well as for the control of muscles and our sense of touch. Various mental processes are also carried out in this



Sol just kept telling himself he was just getting a closer look at the speedometer.

portion of the brain such as reasoning and decision making.

Completely encircled by the outer layer of the brain, the limbic system is strategically situated between the body and the cortex. Charged with control over our emotions and the autonomic nervous system, the limbic system often intercepts and controls rational thought that comes from the cortex. It is capable of overwhelming logical reasoning with such emotions as hatred, sex, love, hunger, lethargy and rage.

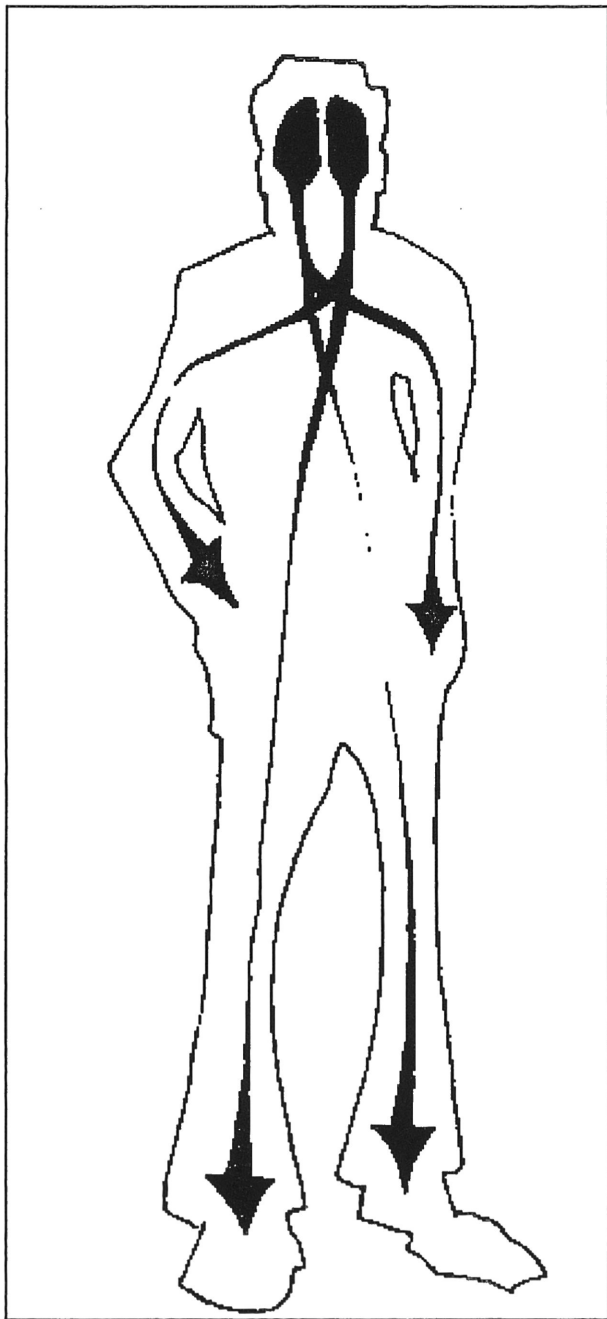
Think how many times you have let emotion get the better of you, or done things that you would never had done had you not been in love, mad, or ecstatic. Take for example the case of an enraged and avenging lover who jealously throws aside all laws of right and wrong that have been encrypted into mind as logical thought. Blinded by emotion, he disregards reason as his actions stem from rage and passion. The consequences only come to bear, after the fact, when the limbic system releases it's hold on the body and passes the reigns back to the cortex.

Or perhaps consider the solitary driver on Interstate-10, as he rolls on through the mundane scenery of a pitch black night. Exhausted from driving, he finds his eyelids growing heavier and heavier as he sporadically jerks away from the borders of consciousness. Anyone in their right mind knows of the deadly consequences of falling asleep at the wheel, yet

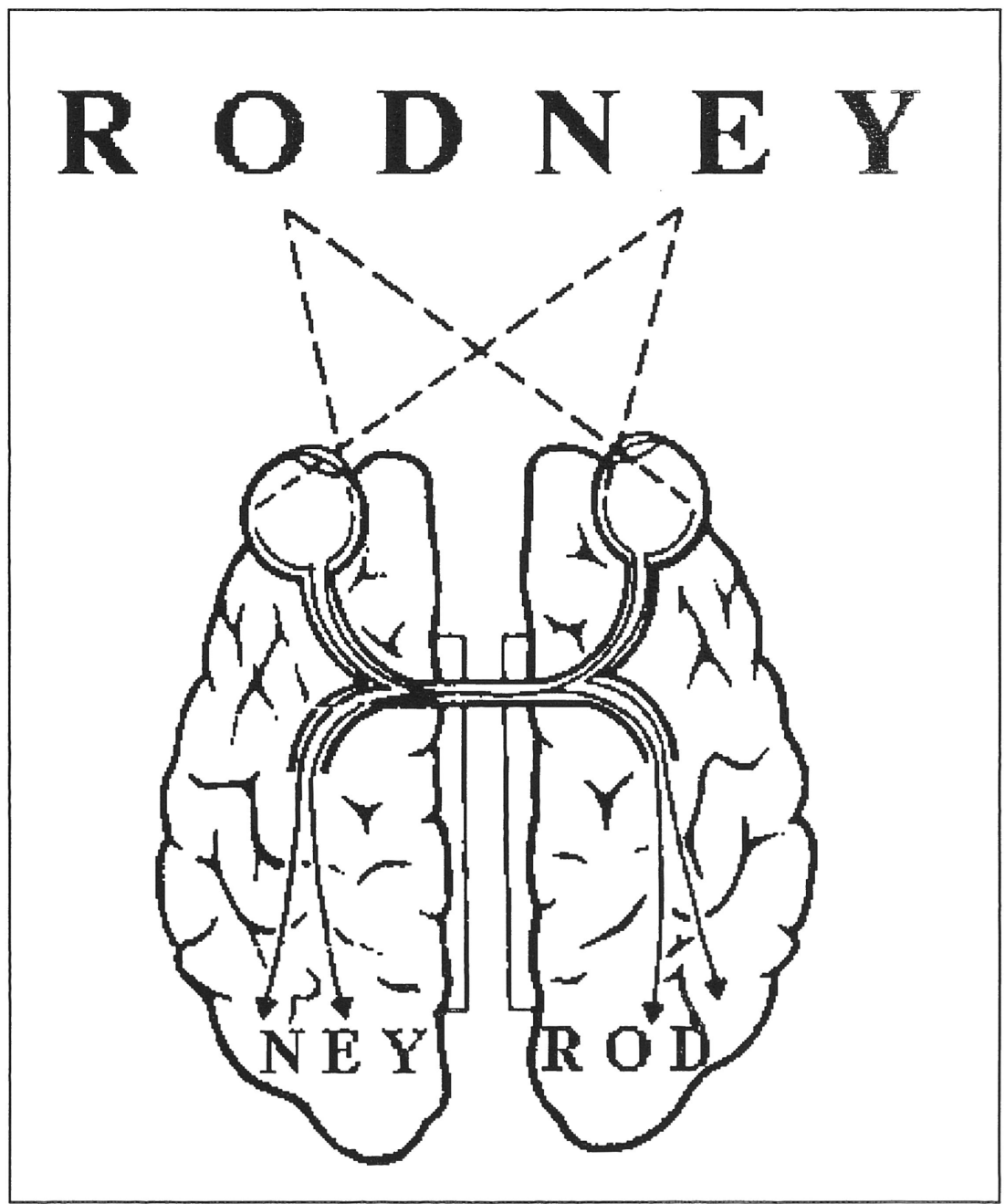
the urge is so strong that it is almost rationalized. This battle between the two parts of the brain is a perfect example of how the limbic system can exert it's control over other portions of the brain.

As well as controlling our emotions, the limbic system is essential to our learning process. It performs a variety of functions that include the comparison of current sensation with past experience, transferring information from short to long-term memory and the assignment of memories to specific areas of the brain that they are most closely associated with.

The fact that the brain is divided into two hemispheres is not a groundbreaking discovery. In virtually all members of the animal kingdom, the division is visible to the naked eye once the skull is removed. Disregarding the rest of the animal kingdom and focusing on humans, we can see that each side of the brain has developed specialized tasks and methods to operate. In some instances, the left brain is more suitably attired to perform various functions while the right brain remains idle, or vice versa. One of the most puzzling differences in the function of the two hemispheres is that they control opposite sides of the body. The right side of the body receives orders from and sends information to the left side of the brain while the left side of our body sends it signals to and is controlled by the right side of our brain. The reasons for this crossover of control and response is unclear. It offers no particular advantage to



The Crossover effect in the human body.



The crossover effect and how it effects our visual perception.

our perceptions and motor skills yet is apparent in all of us as well as in most mammals and some invertebrates.

This crossover was first discovered by Egyptian physicians when they noticed that people who had received damage to one side of their head would suffer paralysis on the opposing side of the body. At the beginning of this century it became apparent that damage to particular portions of the brain would result in the loss of certain functions, many times the very same abilities in different patients. It was noticed that damage to the left side of the head would result in the loss of speech, reading skills and the general decline of logical thought processes, while damage to the right hemisphere, generally didn't have any significant and physically apparent results. This led to the widespread understanding that the right hemisphere was inferior to the left and was dominated by its rival half. The left hemisphere was referred to as the major hemisphere while the right was the minor. Recent discoveries, however, have shown that the right side is just as important as the left. It has even become more difficult to discern between each side's functions because of lack of distinction in some areas.

One of the more interesting facets of the crossover of hemispheres is how it applies to our vision. The crossover of the visual system is somewhat more complex than in the rest of the body. The eyes themselves are not directly crossed, for that would result

in everything we see being a mirror image of what it really was. Rather, this is what happens; the left side of each retina is connected to the right hemisphere of the brain and the right side of each retina is connected to the left hemisphere of the brain. This results in the left visual field of each eye being routed to the right brain while the right visual field of each eye crosses over to the left hemisphere.

Let us take for example the name RODNEY. Say that this name was flashed on a screen to a patient so that their focus lay directly between the D and the N. The first three letters would be processed by the right hemisphere and the last three by the left. This gives rise to a rather interesting theory from Ned Hermann, regarding how we perceive information.

We will assume that the right hemisphere is mostly concerned with visual information processing while the left is involved with verbal. If this assumption is valid then it seems only natural, due to the crossover effect, that pictures and visual material should be situated in the left visual field while text should lie in the right visual field. With this setup, pictures will be processed more accurately in the right hemisphere and words will naturally go to the hemisphere that is associated with verbal reasoning, assuming that the reader is looking directly at the book. The ability for me to clearly communicate my ideas through this paper is improved because of the way the information is presented to the

reader's brain. By delivering certain information to the part of the brain that can process it most effectively, I can make a larger impact on whomever reads this paper.

The previous assumption regarding the assignment of specific tasks to either side of the brain is a popular belief both in the scientific community as well as amongst layman. It is commonly known that when one is engaged in an artistic endeavor, that he is "right braining it." The same goes for when a practical minded clerical worker organizes her pencils according to height and receives the name "Left brain Jane." There are stereotypes that come with both hemispheres of the brain and these are derived from the fact that each side of the brain is specialized in its function.

Specialization of Function

The difference in function between the two hemispheres has been confirmed by a variety of tests and by a variety of researchers. In the early 1970s, noted psychologist Robert Ornstein compared the relative levels of alpha waves emitted from the brain using an electroencephalographic machine (EEG). The premise behind this testing was that, when inactive, a hemisphere would emit a large amount of alpha waves indicating inactivity. When called into use the hemisphere would restrict the alpha waves emitted and that lull in alpha

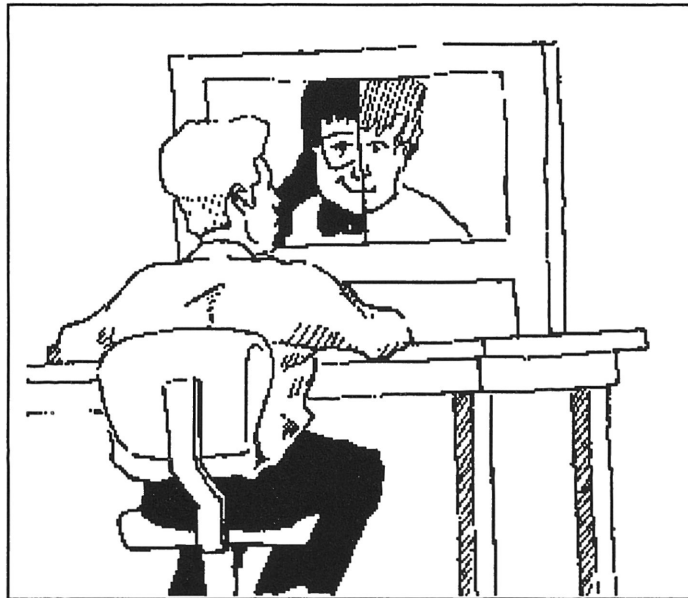
intensity could be measured using the EEG. Ornstein compared the levels of the left and right hemisphere when subjects were faced with particular problems. He found that when faced with a mathematical problem, the alpha waves would increase in the right hemisphere indicating a lull in activity, allowing the left side of the brain to handle the problem. Conversely, when the subject was given a problem in which he was to match a series of colored patterns the alpha waves of the right hemisphere dropped significantly while the intensity increased in the left, suggesting that the subject's right hemisphere was negotiating the problem.²

The power of the EEG in discerning the specialization of each side of the brain is immense. Being able to measure the brain activity when a subject is engaged in a specific problem is a powerful tool in discovering each hemisphere's specialization. Studies using the EEG have suggested that the right hemisphere is better at the recognition of patterns and faces, the appreciation of music, the perception of depth and volume and possesses a bias towards the more artistic side of creativity. The left hemisphere is more suited for logical reasoning, step-by-step problem solving, mathematics, reading and analysis.

Another contrast of function is how the two hemispheres process information. Generally, it appears that the left hemisphere is more proficient at serial processing while the right is better at parallel processing.

Serial processing is where elements are separated and processed one piece after the other as opposed to parallel processing where all the elements are synthesized and evaluated as a whole. Take for example the figure on the left. Which would it take you longer to do? Determine if two of the letters were the same or if two of the shapes were identical. To decide whether all the letters are similar would be a serial task and would probably be attacked by the left brain. The left hemisphere would analyze each letter, one at a time, and then proceed to the next one, going from one to the other in a linear fashion until a decision had been reached. This method would take the most time because each number must be processed before a decision is made. On the other hand, when evaluating the shapes, the time taken would not be effected by the number of comparisons. More than likely, since the right hemisphere is associated with visual tasks, it would take in the group as a whole and produce an outcome in that manner. When questioned on the manner in which the subjects viewed the information, participants to this experiment replied that they had jumped from number to number before giving an answer and had been able to look at the shapes as a group rather than individual objects. This study supports the contention that the left is working in serial mode and the right in parallel and that the brain is indeed seperated into two distinctive hemispheres.

Mankind's obsession with the idea of a dual brain can be traced back to days of Hippocrates and for centuries scientists have tried to uncover it's true function and reasons for being. One such scientist is Nobel Prize winner, Doctor Roger W. Sperry. His research centered around epileptic patients who had undergone a surgical procedure in which their corpus callosum was severed. The corpus callosum is sometimes referred to as the bridge between the two hemispheres and serves as the main highway for the transfer of electrical impulses from side to side. It is through this thick band of nerve fibers that the two hemispheres communicate. This severing of the corpus callosum was recommended to patients with severe epilepsy who could no longer control their seizures. The reasoning behind this was that if the two brains could not communicate than the seizure would be confined to one side of the brain while the other could take over and function as normal. This seemed to be a valid treatment for epilepsy and at first glance the patient suffered no side effects or disturbances in behavior. Further study on animals however led Roger Sperry to perform a series of tests on these patients. It was during these test that Sperry uncovered some odd phenomenon. If a patient was given something to hold in his right hand without being able to see it, he was able to say what it was, since the information was going to the left side of the brain, the verbal side. But if the same object was placed in his



Dr. Sperry's Tachistoscope experiments.

left hand, then he could not say what it was. Although later he could point to it with his left hand showing that his right hemisphere had remembered it.

Another interesting experiment was also performed using a special slide projector called a tachistoscope. With this instrument two different pictures could be flashed on to the screen split by a line straight down the middle. Typically, the picture would be comprised of two different people, i.e. the right side of person A's face and the left side of person B's. The first step in this experiment was allowing the subject to identify person A and person B. Complete pictures of both A and B were both shown and assigned names, for instance Sam and Carol, respectively. After the subject had identified both people, the picture with the right side of Sam's face and the left side of Carol's face was shown. When asked to say who he had just seen, the subject identified Carol. Conversely, when the subject was asked to point out who he had just seen from a group of pictures, he pointed to Sam. Each side of the brain had learned a different piece of information and was unable to communicate with the other what it had learned. This experiment also further proved that the right hemisphere was better at visual identification and the left was better at verbal communication. It also further clarified the distinction between hemispheres.

There are many cases of side effects and behavior disorders with patients who had their corpus callosum

severed. The most unfortunate being the loss of communication between the two hemispheres. In many of the cases, one side of the brain would almost belligerently work against the other. For instance, a woman was having trouble selecting outfits in the morning because as her left hand buttoned up her blouse, her right hand undid it. Apparently each side had a different preference as to what she should wear. In another case, one man began scolding his wife at a party. He became physically abusive and began hitting her with one hand only. The other was trying it's best to restrain the abusive hand from hitting his wife. Another interesting finding was that in most subjects, the right hand still had the ability to write, yet lost the ability to draw pictures. On the other hand (get it?), the left hand could not write at all, but still was able to draw simple geometric forms

Specialization of function is a very efficient and beneficial biological process. It virtually doubles our mental capacity. Information can be processed by two different methods and then compared and integrated. Much like any social organization, it is often better to get as many opinions as possible before making the ultimate decision. This distributes the workload and maximizes efficiency in every situation. Who would have thought that our brain was a microcosm of society?

Brain Dominance

The question of brain dominance is easily answered by those of Western culture. We generally give a higher priority to those faculties that are associated with the left brain. We place a greater emphasis on reading, rational thought and analytical thinking while ignoring creative processes, spatial relationships and intuitive reasoning.

This mode of thinking tends to produce lawyers, doctors and accountants that often choose their career paths because of an assurance of financial stability. For these people, the highest material rewards are available and the paths to achieve them are well laid out. The path of the artist, musician and undiscovered writer, however is riddled with obstacles. These paths even have their own stereotypes that tag along wherever they go. How many times have we compared the lifestyle of the struggling actor and the starving artist to that of the college student, poor, living off scraps and desperate to make that one break? Our society does not support a large number of artists, for we consider that to be a luxury. Only after we are properly situated may we indulge in such endeavors that stimulate our creative lives.

For most of us, this preference for the left brain lifestyle goes back to our early education. One of the

travesties of both public and some private educations is that they revolve around teaching the three R's - reading, 'riting, and 'rithmetic - all left hemisphere functions. Granted, these are important skills to learn and we could not live without them, but it is important to remember that while we are focusing on these attributes, we are ignoring the skills associated with the right hemisphere. Of course, there are art classes, music and drama, but unfortunately these are usually delegated as rewards or used as incentives to make children finish the math homework and are yanked away as a privilege at the first sign of recalcitrance.

Along with society's tendency for analytical thinking and serial processing, this type of education has led to the dominance of the left hemisphere in Western culture. A disparaging side effect of these beliefs has been that both children and adults that are naturally right brained have been ostracized by society. Creative children are sometimes classified as subnormal or possibly retarded. They are put into special groups apart from the "normal" children and often suffer from the effects. Indeed, that is exactly what happened to me as a young child. My parents had successfully taught me to read before entering public schooling. At the time of my entrance into a primary school in Beaumont, TX, I had a sufficient enough grasp on reading to handle my way through books that were generally reserved for third-grade level reading. Naturally, I was bored with the

exercises that were reiterations of what I already knew, and no doubt, I probably focused my attention on subjects other than schoolwork, say misbehaving, perhaps. My parents receive a call one day, asking for a parent/teacher conference in which they were told that I could not read and my comprehension level was dangerously low. This was the diagnosis for the kid who couldn't ride in a car, sit in a room and to this day sit on the toilet without having his face in a book.

And if we look at the later life of Antoni Gaudi, we see a perfect example of ostracism from society. Gaudi was an architect, who was so possessed with the idea of design and creation that he disregarded all other facets of life, for instance, hygiene. Possibly wrong in his own belief, nevertheless, Gaudi was considered to be insane. Completely outcast by his architectural brethren and family, Gaudi was often found sleeping in the gutters, clutching drawings and sketches of his designs. Ironically, Gaudi's work is a remarkable milestone in the road of great architecture. Some of his work still exists today and one of his masterplans is currently in the process of being constructed.

Frued is quoted as saying the following about how we view the delusions of those we consider "different":

"The hysteric is undoubtedly a poet, though he represents his phantasies essentially by mimicry, without considering

whether other people understand them or not. The ceremonials and prohibitions of obsessional patients force us to conclude that they have created a private religion for themselves; and even the delusions of the paranoid show us an unwelcome external similarity and inner relationship to the systems of our philosophers. We cannot get away from the impression that patients are making, in an asocial manner, the same attempts at a solution of their conflicts and an appeasement of their urgent desires which, when carried out in a manner acceptable to a large number of persons, are called poetry, religion, and philosophy."³

There is a way to provide a complete education in both hemispheres and that is to nurture both analytical thinking in the left brain as well as the visual thinking in the right. If only one side is being educated then it is the student that is losing. Much like the benefits that specialization of function gives us, learning in both hemispheres is definitely an advantage. Any other way, and one side of the brain becomes underdeveloped. This results in education being a dry and dull experience and forces the student to seek other methods to occupy time rather than learning.

If we look at some of the great minds in our history, there is a trend for multi-dominance within the brain. Such geniuses as Leonardo da Vinci, Albert Einstein, and August Kekule were all balanced perfectly between the two modes of thinking.

One of the clearest examples of an equally balanced brain is the mind of Albert Einstein. He was capable of thinking in both hemispheres and often used the two sides in conjunction to establish his ideas. It is widely known that Albert Einstein used visual imagery to come up with his theory of relativity. His theory was born not in a laboratory, but in a grassy field when he was lying down, enjoying the sun and daydreaming, while imagining what it would be like to ride on one of the light beams that was coming through his half-closed eyelids, when the idea hit him. This idea would later become the foundation for the theory of relativity. It was not discovered with a painstaking step by step process that is usually associated with scientific research, but with creative and intuitive insight.

August Kekule is described as having conceived of the benzene ring while relaxing by the fire. On the brink of unconsciousness, August began to dream about a snake eating his own tail. This metaphor provided him with insight he needed to unravel the molecular structure of the benzene molecule. Even though August Kekule was a chemist and most likely strongly dominated by his left brain, he was able to intuitively discover the answer

to his problem, by using the visualization capabilities of his right brain.

Leonardo da Vinci was just as much an artist as he was a scientific researcher. His studies on the dissections of the human body served to help establish the science of anatomy at the same time sketches from his notebooks were being framed and mounted on museum walls. Leonardo's ideas on engineering and visual-spatial relationships were not fully appreciated for centuries, but have been the foundation for research that is ongoing to this day. His sculptures and paintings have served as guidelines for future artists for centuries as well. One is hard pressed as to whether to classify him as an artist or as a scientist. A truly creative individual, Leonardo da Vinci obviously was able to fully saturate both hemispheres with enough knowledge to fully nurture a well balanced brain.

Stereotypes, Attitudes and Behavior Patterns Associated with the Brain Hemispheres

There are, have been and always will be a great number of stereotypes, attitudes and behavior patterns that can be traced back to one's brain preference. The stereotypes go back much further than we would think. For centuries man has made reference to the two sides of the body and analogically compared them to various

facets of our lives. The right hand, for instance, has always been associated with the good, the just, with health, and joy. The left hand is generally associated with the chaotic, the evil, the profane, with sickness and debilitation. Right symbolizes light, the sun, masculinity and adaptability. Left symbolizes darkness, night, femininity and passivity. Christ sat at the right hand of God and the good thief was crucified on the cross to the right of Jesus. Someone who is deemed important to one's existence is dubbed "a right hand man." In Arabic culture, it is common to eat with the right hand and use the left in place of toilet paper. Thieves caught stealing are punished by chopping off the right hand, forever humiliating them by forcing them to use their left hand for all situations. These stereotypes can be traced through our history and applied to the ideas of brain dominance. It is possible that after centuries and centuries of poor treatment and disdain, the left side of the body gave way to the more revered side controlled by the left hemisphere, hence our cultures' favor for the right. This may be the reason why our culture is dominated with left-brain thinkers and those who wish to live the life of the artistic right hemisphere are expelled from society as fools, dreamers and crackpots.

With this knowledge of the human brain in mind, let us continue on our journey in discovering the creative brain by examining what happens to the creative individual while in the midst of the creative process.

Part II

*The Creative
Process*

There are countless questions that come to mind when considering the contributions of and the need for creativity. How is it that some minds are able to produce achievements in various fields that stagger us with their ingenuity and originality? How does the mind so thoroughly satisfy our problem solving needs, continually providing fresh answers to a seemingly inexhaustible supply of questions? Why do we sometimes find ourselves mentally blocked, unable to produce? How can we avoid these ruts and place ourselves in the position to benefit from our creative nature?

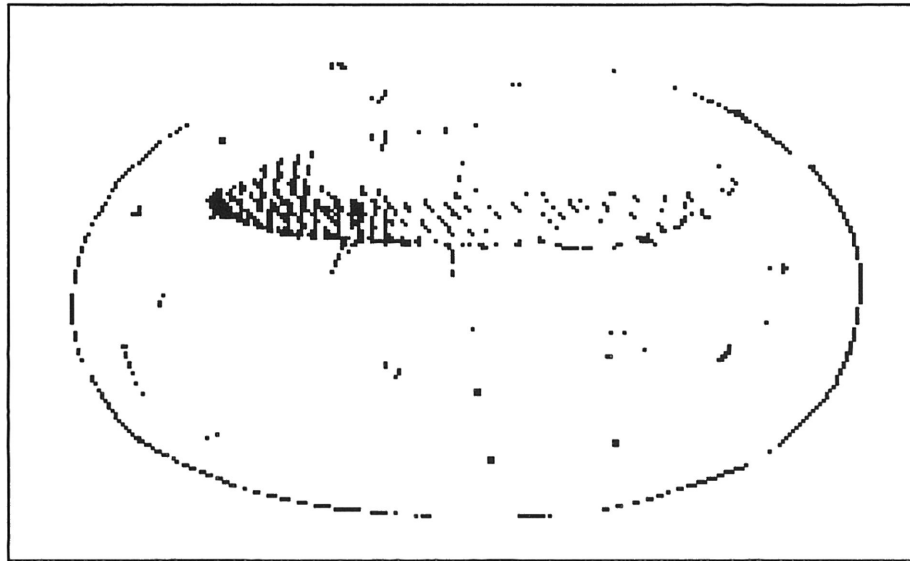
These answers to these questions are doorways to enhancing our lives. Be it at home, at the workplace, with our friends or our rivals, in times of great passion and periods of complete and utter boredom, the uses of creativity permeate our existence. Many times the creative act is taken for granted or possibly even overlooked and all too often people are quick to label themselves as “uncreative.” Yet the creative acts lends itself to the ordinary person just as easily as it does to those whose contributions have shaped the world. While revolutionary discoveries are being made and earth-shattering theories are stumbled upon, ordinary people are encountering problems in their daily lives that call for creative solutions. Every day, millions of people find new ways to solve everyday problems. When we add spices that the recipe doesn’t call for because we are

looking for a sauce with that extra zing. When parents weave stories to explain to their children why the thunder is loud and the sky is blue. When those very same children run aimlessly on a clear day inventing their own games and rules. When we apply new words to songs that we don’t understand, make jokes to lighten the tension at a meeting, compose music or paint at leisure.

If we assume that these actions are creative than we can assume that all people who perform these activities are creative as well. We can also go so far as to say that the impulse and driving force for creativity comes from ordinary mental processes. And not only that, we can say that the fundamental ability to be creative exists in all of us

“Everyone has the potential for creativity. Some have more artistic outlets and special talents for expressing their creativity, but even the most ‘inartistic’ person can be creative. For creativity is ‘the process of bringing something new into being.’ The ‘something new’ you create can be an idea, a plan, a rearranged living room, a new friendship, a work of art, and so on.”(unknown)

“It would appear that genius is not at all a divine and rare gift....but the destiny of



A delicious bagel made from a twelve step baking process.

everyone who has not been born a complete idiot.”¹

Creativity, even in its most base form, is a process. It is an attempt at making or changing something so as to make it a better object, idea or method. Unfortunately, we often find ourselves caught up in the recognition of the product rather than the actual process itself. Who is actually interested in the three years of research that went into making a bagel crispy on the outside and soft and chewy on the inside when it is so much easier to simply sit down and enjoy the final product without worrying ourselves over a complicated twelve step baking process? These attitudes focus on the creative product rather than the creative process. It is this empathy towards the creative process that inhibits us by allowing us to only savor the outcome. By not acknowledging the steps that went into the creation of the product, we limit chances for further creativity. If we had known the process intimately, tangent ideas may have been generated that would in some way further the development of the actual product and possibly stimulated a creative response.

The creative process itself has been historically defined as a numbered road map that, when followed, will yield a creative product. This, however, is not true. To follow the steps of the creative process as if their

were directions for building a LEGO™ fire station would be to defeat the purpose of creativity entirely. The beauty of the outline of the creative process is, much like the Constitution of the United States, it can be interpreted and applied to an infinite number of unique situations. Different problems require different approaches yet all can be conquered if confronted in the proper manner.

It is important to clarify that the creative process is not literally a step-by-step process that should be followed to the letter. One cannot plod through it as if it were a recipe, one must actively engage themselves in it, bending and twisting it to meet their needs. Each state of the process is more closely associated with a particular state of being. A better definition of it would be to describe the individual stages a person flows through as they approach a problem with a creative solution in mind.

The Stages of the Creative Process

There have been countless attempts to condense all the stages of the creative process into a simple list that would lend itself to all problems. To do this however is entirely to limiting. Nonetheless, for the purposes of this paper, I'm doing it anyway.

One of the first descriptions of the creative process broke it down into three simple stages: saturation, incubation, and illumination. Saturation is the stage in which information, facts and raw data are gathered and come together to become the building blocks for new ideas. One usually immerses themselves in the multiple facets of the problem, seeking to define it.

Incubation, largely an unconscious act happening when one retreats momentarily from the problem at hand, involves rearranging the raw data from the saturation phase and finding new combinations. It is important that the problem be put on the backburner for this stage and to let it occur without conscious effort. This allows us to escape from interfering ideas and rules that would normally act as a detriment to the creative process. It has been said that the incubation phase weakens the memory blocks that keep us from arriving at the solution to our problems. Rudyard Kipling said that the key to gaining access to the unconscious mind, “his “inner helper” as he called it, was not to think consciously of it but “to drift.” Kipling personifies the phase of incubation as a “personal Daemon.” His instructions to disengage the conscious mind and simply “drift” are his attempt at shifting into the incubation mode of the creative process:

“Let us now consider the Personal Daemon.....Most men, and some most likely,

keep him under an alias which varies with their literary or scientific attainments. Mine came to me early when I sat bewildered among other notions, and said: “Take this and no other.” I obeyed, and was rewarded....

After this I learned to lean upon him and recognize the sign of his approach. If ever I held back, Ananias fashion, anything of myself (even though I had to throw it out afterwards) I paid for it by missing what I then knew the tale lacked....

My Daemon was with me in the Jungle books, Kim, and both Puck books, and good care I took to walk delicately, lest he should withdraw. I know that he did not, because when those books were finished they said to themselves with, almost, the water hammer click of a tap turned off....*Note here.* When your Daemon is in charge, do not try to think consciously. Drift, wait, and obey.”²

Illumination is the point at which the solution is realized. It is the stage when the unconscious mind returns with an answer after a brief sabbatical into the recesses of the mind. August Kekule relates this story of the illumination phase and how he conceived of the benzene molecule:

“I turned my chair to the fire and dozed. Again the atoms were gambolling before my eyes. This time the smaller groups kept modestly in the background. My mental eye, rendered more acute by repeated visions of this kind, could now distinguish larger structures, of manifold conformation; long rows, sometimes more closely fitted together; all twining and twisting in snakelike motion. But look! What was that? One of the snakes had seized hold of its own tail, and the form whirled mockingly before my eyes. As if by a flash of lightning I awoke..... Let us learn to dream, gentlemen.”³

The presence of the third stage is most obvious in our daily lives. Think of a humorous discovery, say the punchline of a joke and we say “ha!” Or perhaps, when we discover a new principle, fact or idea; we moan, “aaahhh.” On a more personal level, imagine the moment of excited bliss we experience upon uncovering a long awaited answer; “AHA!” This fundamental notion of “aha” is the culmination of a subconscious thought process that results in a pleasing effect.

If I were to say that one-half of eleven was one, the immediate response would be one of disbelief. Of course, given time to reflect on the statement one might experience an “aha,” or a moment of inspiration. This

sensation is the very same one Sir Isaac Newton felt when the law of gravity struck him on the head via an apple. One-half of the number 11 is one when taken literally, not mathematically.

Many creators describe illumination as a “flash of lightning,” that often produces the solution to our problems in a flash, out of nowhere. Often experiencing a state of heightened awareness during this stage, the creator may feel as if ideas and inspirations are running through him like a stream.

This illumination experience is the result of the connection of elements within our minds that were not previously attached. This new connection often just happens and seems to be beyond our control. Some may believe that we must simply sit and wait for this to happen, but that is simply not true. There are ways and methods in which this inspiration can be achieved but we will discuss those later. Illumination is an exciting moment filled with passion and usually leads us to a final stage of the creative process, verification.

For a more complete creative process and one that ends in closure, we add the final stage of verification. The need for acceptance from our peers and the desire to validate our discoveries is seen in the verification stage. During this phase, tests are run to verify the validity of the solutions that came about during the illumination phase and these ideas are prepared for presentation in order to achieve acceptance. Charles Darwin’s attempt

to validate his theory of evolution is a prime example of the verification stage of the creative process. His monumental insight that the modified offspring of all dominant creatures would adapt to nature was followed by a lifetime of sorting through journals, sifting and organizing evidence to present his theory in a solid manner. It is at this time of presentation that the product may be regarded, by those who are hearing the idea for the first time, as “obvious” and “trite.” A popular response would be “Why didn’t I think of that?” One is reminded of John Milton:

**“So easy it seemed / Once found, which yet
unfound most would have thought /
impossible!”**

Another realization that is important to the onset and continuance of the creative process is knowing that the phases of the process do not necessarily occur in a systematic or an orderly manner. It is only at certain points that a particular stage may seem more apparent than other. Very often, one may find themselves drifting back and forth between incubation and saturation. As new information makes itself readily available, the problem itself may be redefined. This results in having to rethink possible solutions and once again allowing it to simmer in the incubation phase. As we have heard before, it is very difficult to merely follow the steps of

the creative process as if they were an instruction book. It is far more helpful to know them for what they are and be proficient in recognizing them as they occur. Knowing when to retreat from a problem and busy yourself with something other than pounding out a solution is an important realization.

It is not unheard of for the creative individual’s initial outline of their problem to undergo significant changes as they search for a solution. This thesis is a living testament to that. This paper has evolved drastically from what it originally was meant to be, as I am sure many others have in the past. I first saw this thesis as an opportunity to complete some projects I had in mind that were oriented with architecture. But after the initial period of research, I became interested in the actual psychology of both the brain and the creative process. What started out as a chance to take my architectural design education to another plane evolved into a written account that, for the most part, has nothing to do with what I initially set out to accomplish. The reason for this was that the information input stream changed during the saturation phase of this paper. Even the original title of my paper, “Creativity and it’s Place in Design Media,” has undergone several facelifts as my objectives changed.

There are some other feelings and attributes that are common to all attempts at creative problem-solving and they apply to any individual tackling virtually any

problem. At the beginning of the creative process, the individual will feel as if they are in a state of discontent. This state of disequilibrium is typically what leads them to indulge in the creative process. They will usually arrive in this state by questioning the norm or simply looking to make something better. More often than not, the creative individual will have been highly involved with the field or area in which their problems lie. This not only satisfies the saturation phase of the creative process, but also allows the creative individual to pull from a large library of resources and personal experience in order to solve the problem.

Sometimes, the flow of the creative process may be interrupted by such feelings as fatigue, boredom, inadequacy, insufficient motivation, anxiety or depression. These feelings may arise from an inability to communicate, a momentary lack of motivation, or a lack of correct information. It is important to not be totally discouraged by this lull in the creative act, for work actually continues, only now on a subconscious level. The problem will incubate on a subconscious plane until a significant answer is found. This solution will then be brought to a conscious level where it will inspire the creative individual to embark on a new path, or take a new viewpoint in order to reach their goals. The feeling one receives upon realizing the answer is called *inspiration* and is often compared with a sudden rush of exhilaration.

One trait that becomes visible as the creative individual works his way through the creative process is their ability to tolerate ambiguity. This means that he has the ability to exist in a state where he does not comprehend all that he perceives or feels. This characteristic is a primary asset to the creative individual yet is very disconcerting to some. It will sometimes make people anxious for something solid, a concrete basis for them to play off of. They will either retreat from this ambiguity or find the closest way out of it, often resulting in poor decisions and solutions that do not fully meet their initial requirements. The creative individual, on the other hand, can find solace in this lack of structure and use this time as a tool to gather as much information as possible, apply it properly and derive a valid solution.

During this stage in which ambiguity reigns supreme, the creative individual must develop an intense personal relationship with their inner self and their environment. This discovery of the inner self is amplified when an individual can properly balance their lives between the left and right brain modes of thinking. If one hemisphere is too rigid in its acceptance of new ideas, it may well impede the progress of the other and possibly sidetrack the entire process. This battle between the hemispheres is a formidable opponent to creativity and is described in the following excerpt from Freud's writings. The following passage stresses the significance

of the interaction of the inner workings of the brain. This is a response to a friend who had complained of his lack of creative power:

“The reason for your complaint lies it seems to me in the constraint in which your intellect imposes upon your imagination. Here I will make an observation and illustrate it with an allegory. Apparently it is not good - and indeed it hinders the creative work of the mind - if the intellect examines too closely the ideas already pouring into it as it were gates. Regarded in isolation and idea may be quite insignificant, and venturesome in the extreme, but it may acquire importance from an idea which follows it; perhaps in a certain collocation with other ideas, which may seem equally absurd, it may be capable of furnishing a very serviceable link. The intellect cannot judge all these ideas unless it can retain them until it has considered them in connection with these other ideas. In the case of the creative mind, it seems to me, the intellect has withdrawn its watchers from the gates, and the new ideas rush in pell-mell, and only then does it review and inspect the multitude. You worthy critics, or whatever you may call yourselves, are ashamed or

afraid of the momentary or passing madness which is found in all creators, the longer or shorter duration of which distinguishes the thinking artist from the dreamer. Hence your complaints of unfruitfulness, for you reject too soon and discriminate too severely.”⁴

Finally, depending on the motivation of the individual, the outcome of the creative process will result in a novel product of some significance. It may be an idea, a new product or a revolutionary method. Regardless, it will be an step forward in the way we either perceive or do things. Not only that, it will serve as a foundation for which other ideas may rest, thus stimulating further creativity.

All that we have just talked up about is leading up to the next chapter. In it we will deal with what we can do to enhance our creative lives. What steps can we take in order for us to achieve our maximum creative potential? What blocks our creativity and how can we step over them? What techniques can we use to stimulate creative thinking as an individual and as a group?

Part III

Unleashing the Creative Brain

Creative thinking is a fragile process, especially in the early stages. In the first few stages, we find ourselves extremely susceptible to a wide variety of mental walls that inhibit free thinking. These mental obstacles are called conceptual blocks. Being able to conquer these conceptual blocks is what separates the creative individual from most other problem-solvers.

The most definitive answer to the question, “How can we be more creative?”, is that we must learn to take these seemingly insurmountable mental walls and hurdle them with the power of our minds. Destroying these mental blocks allows us to use the full capacity of our brains to tackle the problems that confront us.

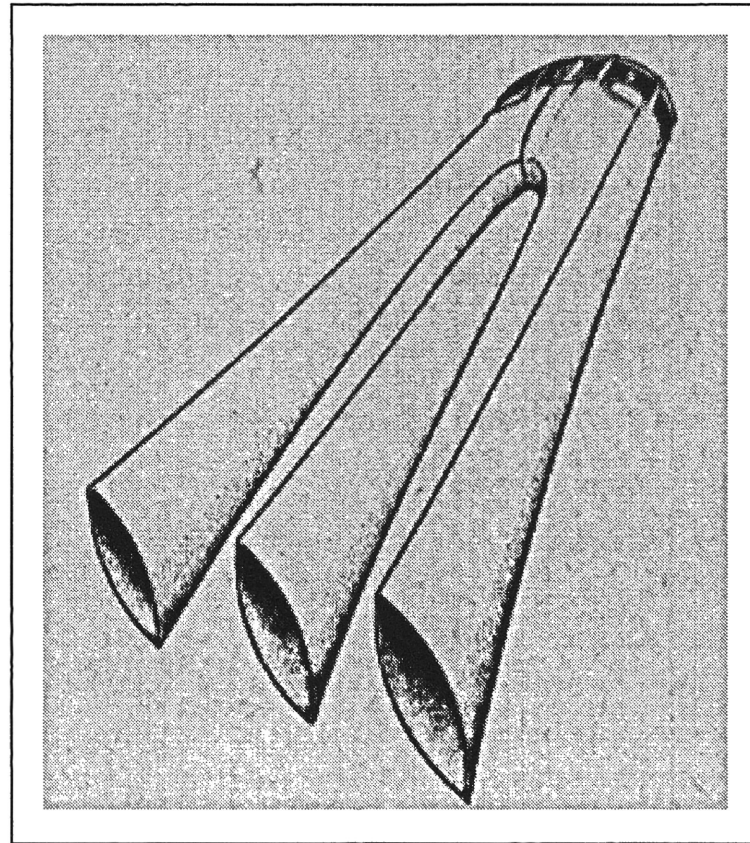
Unfortunately, conceptual blocks are something that everyone has. They may differ from person to person, but we are all linked by the fact that, in some way, we submit to these mental obstacles. Many times we are not even aware that they exist, rather we think that is just the way things should be. But they are there, present in our everyday lives, forcing us to think one way while beckoning us to act in another.

In order for the creative process to effect our decisions we must first enter the preliminary stage of creative problem solving, gathering the information. Most closely associated with the saturation phase of the creative process, this stage is primarily concerned with pulling in as much knowledge as possible, whether it be directly or indirectly related to the problem at hand. The

amount of information attained is directly proportional to the number of new combinations generated. Thus, in the saturation phase, it is important to envelop oneself in as much information as possible in order to produce a novel result. The first rule in making oneself “more creative,” is to increase the amount and variety of information available. This could mean stepping in to the shoes of someone who is faced with the problem daily i.e., a role change, or altering your outlook on a particular issue so as to see both sides of it. Either way, examples such as these will add to your storehouse of knowledge from which you could define a viable solution.

Merely having the information, however, is not enough to set the creative process in motion. Granted, knowledge lays the foundation for the combination of old ideas into new ones, one cannot continue without acting on that information. In order to act on it, we must be free of the conceptual blocks that inhibit us. If we remain under the restraint of these conceptual blocks that tie us down then we will fail to properly perceive the problem and most likely fail to conceive a solution.

The best way to rid our selves of these troublesome barriers is to know them for what they are. If we can identify a conceptual block, then we can identify a way to either bust right through it or simply walk around it. Perhaps, the best way to overcome an obstacle is to simply paint a picture of it.



An example of what stereotyping can do to how we perceive objects.

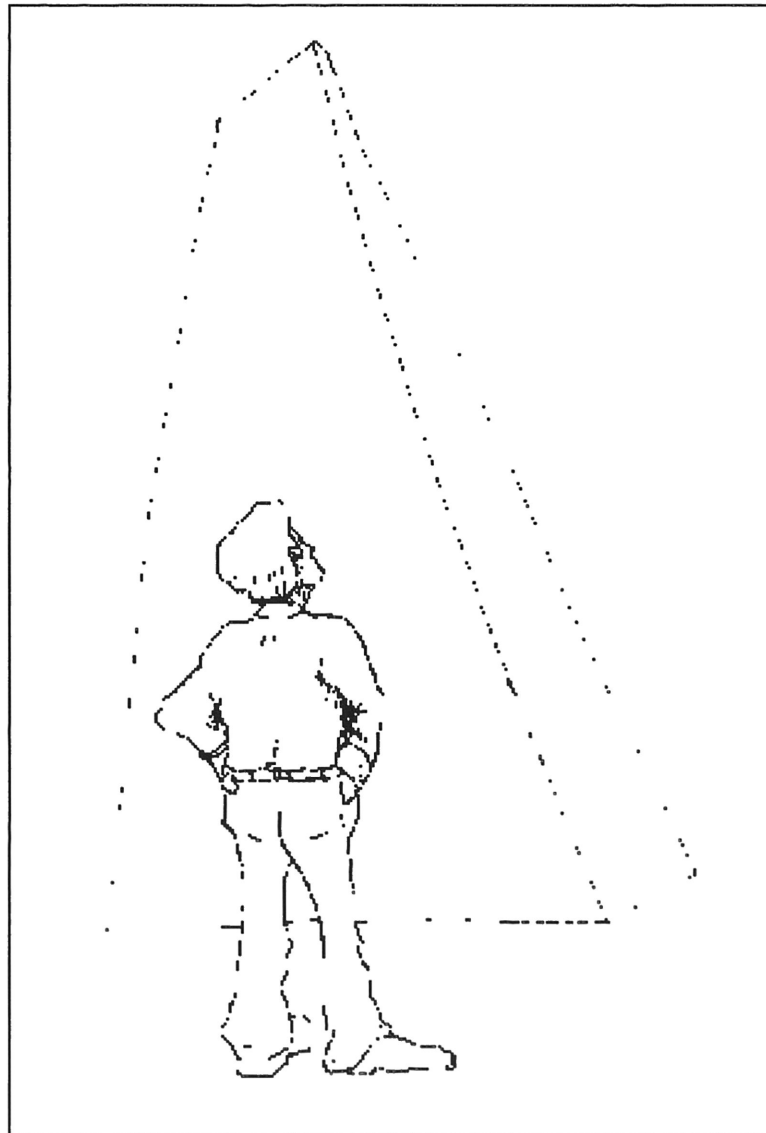
Conceptual Blocks

Borrowing mainly from James L. Adams, *Conceptual Blockbusting, A Guide to Better Ideas*, I will attempt to define and offer examples of as many conceptual blocks as possible. These examples are not universal and do not necessarily lend themselves to every individual, but they are linked by one simple fact. They all seek to limit us in how we perceive information. If we define creativity as the combination of old ideas and thoughts in order to produce a new and novel product, idea or method than it would suit us to have as many old ideas as possible, with as many variations on those old ideas as could be found. Conceptual blocks limit the amount and variety of information that we receive when confronting a problem. By conquering them we will have the best chance at making ourselves “more creative.”

The first few of blocks deal with obstacles that fail to allow the problem solver to properly see the entire problem for it's face value. They either hide the information available or mask it behind a facade of extraneous material. Let us take for our first example, our tendency to stereotype.

Stereotyping

No matter how hard we may try to avoid it, we are all guilty of stereotyping. Many times we are not even aware of it, doing it habitually rather than voluntarily. The basic aspect of stereotyping that acts as a negative factor in the creative problem solving process is that it limits our perception of information. If we have already made an assumption of what an object is, than we are less likely to examine it more closely or to discover the unique qualities of that object. The comedy show called “*Who's Line is it Anyway?*”, a British improvisational show, has in it's repertoire a skit where the participants are handed an oddly shaped prop with which they are to come up with as many uses for as they can. They succeed in doing so because they see the object, not as a piece of foam shaped like a tree, but as a golf club for multiple-ball golf, or a coral reef starter kit. The avoid stereotyping and see qualities of an object that are otherwise unknown. And what about are mischievous young friend from the celebrated comic strip, “Calvin and Hobbes.” We've often laughed as we watch Calvin enter the Transmorgdifier and changes into a lizard after Hobbes accidentally misdialed the transformation. Or when Calvin climbs into his Time Machine and zooms off into a parallel universe. In both cases he is just sitting in an ordinary cardboard box, but with a little imagination and a lack of stereotyping, it can become something entirely different. A friend of mine recently made use of a CD case as a picture frame. A concept so



We all, at one time or another must confront a mental wall.

simple, I was frustrated, asking myself, “Why didn’t I think of that?” And on the television one day, I noticed somebody had taken a normal everyday object that carried with it a very large stereotype and applied it in a unique and novel way. They had taken an ordinary latex condom, hung it upside down in a wall-mounted candle holder, filled it with water, dropped a flower in it and made it into a very attractive, organic looking vase. A wonderful idea, I was inspired to the point of making one. Despite being a novel product that carries with it a great symbolic coffee table discussion attitude, it made use of something that many of us perceive usable for one thing and one thing only. No matter how you step around it, a condom carries with it a lot of imagery that can only be associated with sex. Acknowledging that imagery is stereotyping. Looking past that imagery is creativity.

These examples have been somewhat on the lighter side, but imagine what might happen when a non-stereotyping attitude is taken into the business realm. Many companies are required to update their computer systems constantly and as a result have tons of outdated equipment. Typically, these companies view all the old equipment as trash and try to pawn it off as soon as they can. But what if companies no longer had to have computer graveyards on the unoccupied sixth floor? Rather they could use the old computer cases as modular furniture and shelves, sell the spare memory chips and

circuit boards for profit, convert the screens into a wall-sized video conferencing mural, or make planters and fish tanks out leftover monitors to inspire a unique personalized feel to that cozy little cubicle. Not only would this save them money on outdated equipment, but it has a positive effect on the employee as well. The advantages of not stereotyping are clear. If we do stereotype, than we will cloud the attributes of objects with our preconceived notions of what they should be, thereby disrupting the creative process by limiting the information we perceive.

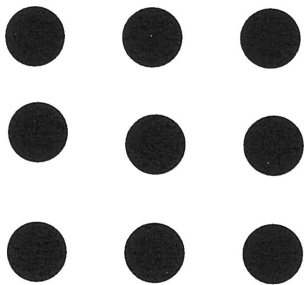
Difficulties in Problem Definition

One of the most deadly conceptual blocks, the inability to properly define the problem, often results in the pursuit of the answer in a limited and possibly wrong manner. If the problem is not defined or the creative problem solver operates under false or extraneous information than they will be handicapped from the start. On the other hand it is also possible to examine and define the problem too closely. This results in focusing all your attention so tightly on the problem at hand so that the answer remains hidden. Stepping back and looking at the problem holistically rather than in pieces will often turn out to be much more fruitful. Let’s look at some examples. These are picture-word puzzles called

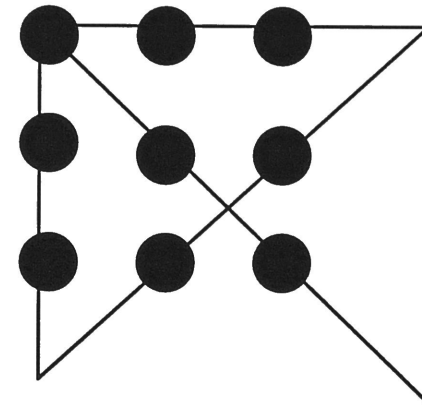
rebuses. Try and figure out the common phrase that goes along with each one, using the clues provided. If you don't figure out the answer at first, try forgetting about it and coming back later. Let it incubate. Did you notice that the clues are meant to mislead you? They are related to the problem but are unrelated to the answer. This is an example of how extraneous information can lead you down the wrong path. When facing a problem it is important to throw out such information in order to find the solution and improve your problem solving skills.

What about looking at looking at a problem too closely? What type of limits will it place on the creative problem solver? The answer is that it will force them to think in one direction and ignore other possible routes. Unfortunately, it is one of those routes that holds the answer. Here is very popular example of defining a problem too closely.(Adams)

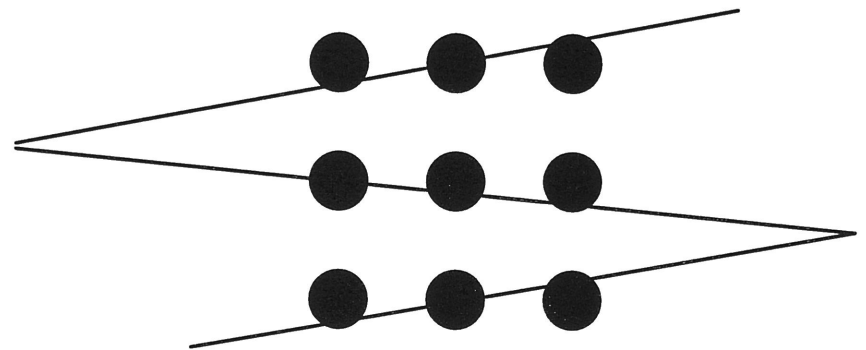
Puzzle: Draw no more than four lines (without lifting the pencil from the paper) which will cross through all nine dots.



Finding the answer to this problem is very difficult if the boundaries of the puzzle aren't broken. By examining the problem too closely, many people will not realize that it is possible to go outside the boundaries defined by the nine dots. Hence one solution:



The problem never stated that you had to travel through the center of the dots.

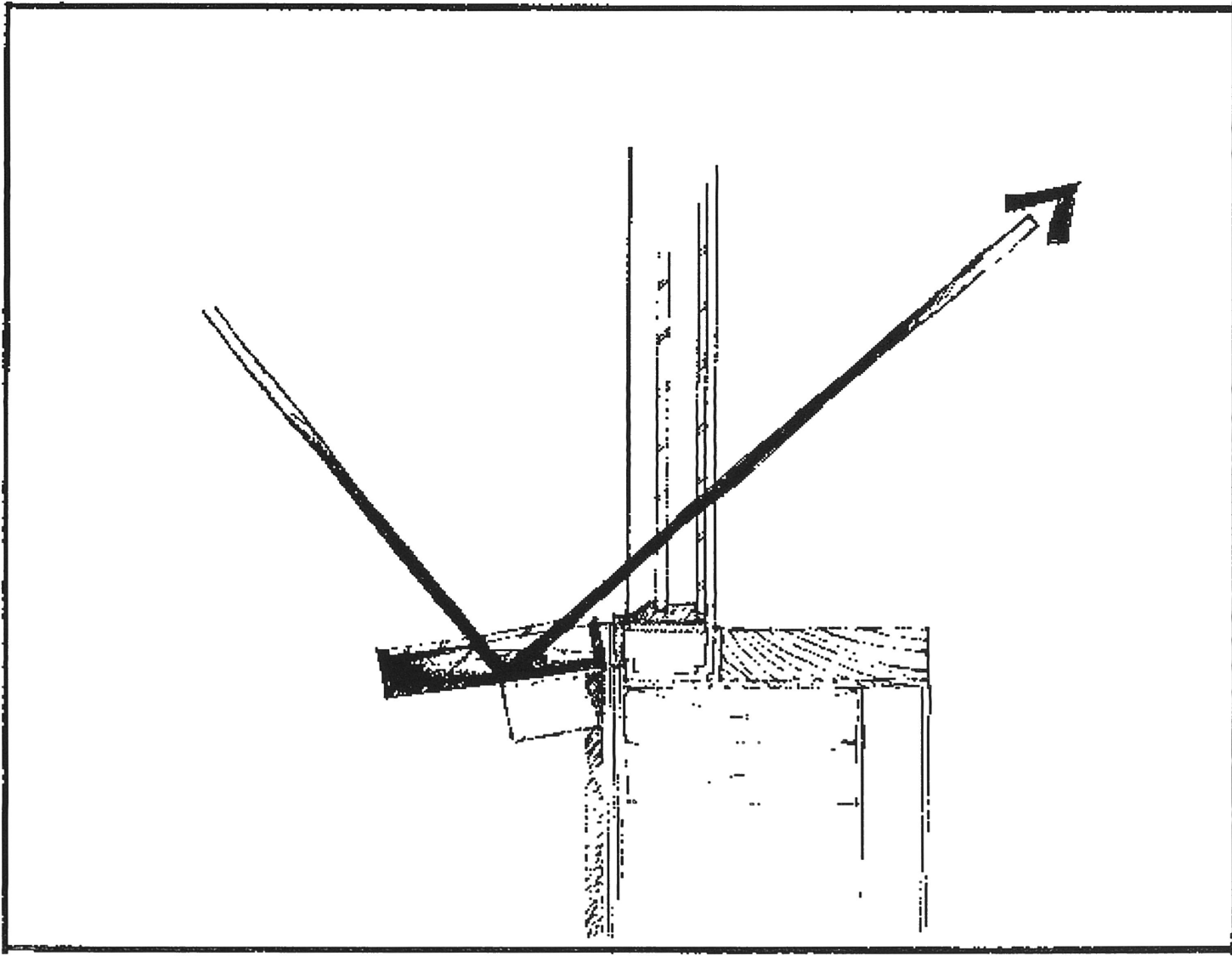


There are of course many answers to this problem, but they can only be found when you step outside the limits you define when first confronted with it. You could even get more elaborate by using a big fat marker to cover them all up, or rearranging the dots into a straight line. Countless answers are to be found, but not without questioning the definition of the problem. Again we must remove the conceptual blocks that we place on ourselves in order to achieve the creative solution. We can do this by taking the problems that we find and broadening their horizons. I had the opportunity to practice the idea of broadening the horizons of a problem statement on a group of students in a freshman level design studio. When given a design problem that stated, “Make a paper airplane,” the students made the conventional paper dart and the glider that is usually associated with paper airplanes. Later on, I challenged the group by saying, “Make something out of a piece of paper that supports itself in the air over a distance, either horizontally or vertically.” To this problem, students submitted a wide variety of solutions. One student wadded a piece of paper and threw it across the room. Another made a paper helicopter. Others fashioned objects that had no resemblance to an airplane but still managed to fly a significant distance. This exciting experiment proved that it was possible to produce a creative solution by broadening the problem statement.

The best way to expand a problem is to do just that. Expand the boundaries and perceptions of the problem. Break the problem down into the attributes that it contains and then play off them. When asked to build a doghouse, redefine the problem and build a attractive structure that will provide shelter and warmth for an animal. Saying “doghouse” only draws to mind what we all think a “doghouse” to be. Even referring to it as a “house” can be detrimental because one automatically associates it with a “peoplehouse.” Isn’t it curious that doghouses and even birdhouses are usually scaled replicas of “peoplehouses?”

Inability to See the Problem From Other Viewpoints

In the architectural profession, one is forced to concern themselves with the viewpoints of others, predominantly the client. Failure to meet the client’s needs results in a dissatisfied client or possibly not being paid for your services. Even so, in my experience, I have found that when designing a project, I will not overly concern myself with the viewpoint’s of others. For the most part, the design process is an individual undertaking so naturally, the designer’s viewpoints, prejudices and opinions are foremost. Especially when designing intuitively as opposed to practically. When a design



A light catching window sill for an Austin AIDS Hospice.

comes from within rather than from other sources it carries with it the feelings of its maker. Regardless of how it is derived, the architectural design must meet the needs of its inhabitants. As a beginning architecture student, the needs of the inhabitants were always more of an afterthought rather than a primary design criteria. As I progressed through to the latter years of the architectural program, my viewpoints changed and I became increasingly concerned with the clients needs as well as the quality of design. In one project for the renovation of an Austin based AIDS hospice, I put myself in the place of the patient and ended up with a design that focused on the needs of a bedridden and terminally ill-patient. From personal interviews with him and his family it was made readily apparent that being in a bed all day was a stressful and dreadfully boring activity. Especially in a dreary environment where sickness pervaded the air. With this in mind, I conceived of the idea of making an environment that appealed to the main senses of the patient; visual and auditory. I took the typical window sill and made a colored water box of it so as to produce a very soothing light display on the ceiling when light flowed into the room. I also circulated water through ornamental plexiglass rafters in the ceiling to produce a pleasing sound that inspired tranquillity.

The inability to appreciate the viewpoints of others is a conceptual block. Having the tendency to view problems as to how they will affect you while

ignoring how they affect others is a creative obstacle. If we are able to view a problem as if we were that someone else, then it is possible that we may see new solutions or at least new elements that could lead to a new solution. More information means more combinations and more creativity.

Fear of Failure

The fear of failure is largely responsible for a great number of creative solutions that were never discovered. People who are afraid to take risk never even have the chance to be creative. Of course, sometimes it is advisable not to take the risk, but many times we won't do it just because we are afraid of the consequences. Children are capable of taking the risks that adults shy from because of their environments. It is much easier for a child to make a decision and face the consequence when the consequence is only a trivial matter that is usually forgotten by naptime. For adults, however, it is different. The consequences are much more dire. Taking that risk may result in a failed business venture, a broken marriage, or a financial loss. These are all devastating results that should be avoided at all costs.

For many would be successful artists, this fear of failure is exhibited when they resort to jobs that assure

them of financial stability. Take for example, my father. He is an incredible artist, but his talents as an artist are only surpassed by a strong left brain dominance. He has pursued a career as an engineer and since left his artistic abilities behind. They emerge every now and then, only to be overpowered by the need for order and logical thinking. I believe he could have had a lucrative career as an artist, had he allowed himself to pursue that avenue. His fear of failure even manifests itself in his view of my career goals. I plan on pursuing my artistic talents and using them to provide a living. He would rather I was in engineering, studying to become something that was sure to provide a stable income. His fear of failure is deeply rooted in the previously mentioned fact that society generally rewards those who go into left brain dominated fields and that the path laid for a musician, and artist, or a writer is much more difficult to follow.

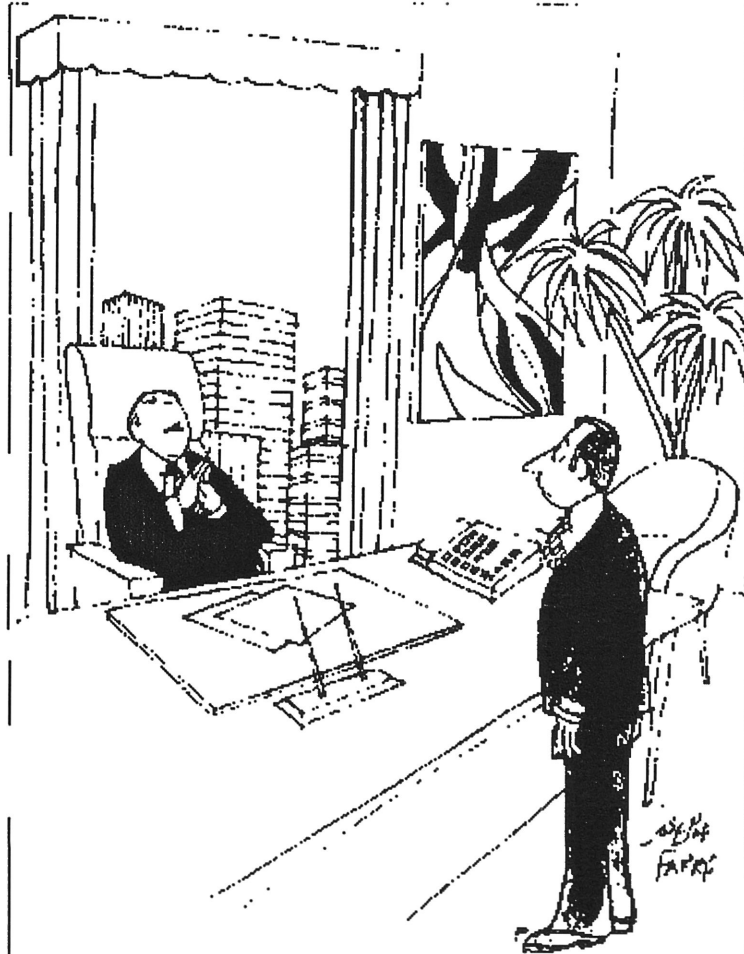
Fear of failure manifests itself in many ways. Mainly in the taking or not taking of risks. This fear is definitely realistic. We cannot operate as a society when each of us is taking risks without reservation. This results in chaos. The best way to overcome this fear of failure is to realistically weigh the outcome. Find out what the worst case scenario would be and weigh it against the more positive outcomes.

Let's use Kodak as an example for this conceptual block. Once there was a company called Kodak who

manufactured photographic materials. One day they were approached by a man who claimed he knew of a process in which he could duplicate images with an easy chemical transfer process. Kodak turned him away, not wanting to invest time and money in a venture that was sure to fail. This man turned around and founded the XEROX corporation, one of the nation's largest corporations to this day. Had Kodak taken advantage of this opportunity by weighing the consequences properly, they could have had a hand in one of the most widely used machines in industry, the photocopier.

Inability to Tolerate Ambiguity

We have already discussed this to some extent when describing the creative process. The ability to tolerate ambiguity is a desired asset in a creative problem solver. This should not be taken to the extent that, in order to be creative, one must live in chaos, but rather that the state of chaos is a necessary stage in the creative process. If problem-solving is described as "bringing order to chaos,"¹ than order is necessary. But being able to exist in a chaos oriented limbo is also important. People who cannot handle such ambiguity are labeled compulsive. They require extreme order in their lives and rarely walk outside the boundaries of that order. By restricting our lives, we restrict our experience and



"I appreciate your fresh, innovative, and perceptible thinking. Unfortunately, here we prefer stale, tried and true thinking."

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experience is where we get information. If this is true then a person's inability to tolerate ambiguity is directly linked to their creative problem-solving capabilities. Once again, it is clear of the negative effects that conceptual blocks have on our abilities to solve problems. They limit us by reducing the amount and quality of information available.

Inability to Defer Judgment

The two hemispheres of our brain operate as polar opposites when faced with a problem. The left hemisphere will attempt to organize, analyze and choose from ideas while the right will generate and visualize them. With this in mind, it can be inferred that a strongly left brain dominant mind, in the creative process, will tend to analyze ideas without allowing them to grow or to incubate. This especially apparent in the brainstorming process, a wonderful technique for stimulating creativity. When brainstorming, in a group or individually, ideas are thrown out onto the table one after another. Brainstorming is a chance to generate as many ideas as possible. Often, these ideas are played off of one another, growing continually until such a time comes when they can be reviewed. One idea inspires another and so on. It is very important that judgment be deferred during this idea generating session because

these new ideas are delicate and unfinished. Easily destroyed, when an idea is thrown out and rejected through judgment, than the entire avenue from which the idea emerged is closed. We have successfully limited ourselves again by allowing less information in to influence the creative process.

Deferring judgment is difficult, mainly because it is a natural human response, but it must be done in order for the creative process to produce a novel result. All too often, judgment is passed hastily, and potential solutions are lost. Having an open mind and setting aside your own prejudices when entering the creative process are the only weapons one has against this conceptual block.

An Aversion to Change and Adhesion to Tradition

Who hasn't heard of the statement, "If it isn't broke, don't fix it?" This belief can be a particularly damaging to the creative process. Tradition has its merits and by no means should be ignored, yet it fails to lend itself effectively to conceptualization. If one is so deeply rooted in the past that they are oblivious to change then they are limiting themselves when engaging in a creative activity.

A shining example of this attitude is Dana Carvey's character called "The grumpy old man," that

appeared on Saturday Night Live. His character, a bear of an old man, was deeply rooted in the past and began every sentence with, “Back in my day.....” and insisted on berating the way people did things today. “Back in my day, we didn’t have those fancy toothbrushes. We just let our teeth rot until they fell out of our mouths.” Although a humorous example, this type of attitude shuts too many doors that could assist the creative process. A practical example of tradition over change is the watchmaking industry in Switzerland. For a long time, Switzerland dominated the watch making industry worldwide. They believed in well-made products that established a long tradition of quality even to this day. Nonetheless, when the digital watch was introduced to the world market, Swiss watch makers viewed it as a violation of tradition. While the digital watch industry took off in America and Japan, Switzerland was left behind in the dust. Now, a Swiss made watch is a novelty rather than an industry. A far cry from the dominate force it once was.

Cultural Blocks

We receive our cultural blocks from the societies that we live in. Ingrained since birth, there are certain things that we just don’t do because they are against our individual code of ethics, decency or morality. But by

not engaging in an activity because it goes against our sense of what is proper and what is not, we are in effect blocking the creative process. Say you were given a problem in which you had to destroy something of value in order to find the solution. You would more than likely ignore that solution in lieu of not having one at all. An example from Adams’ *Conceptual Blockbusting*, proposes the problem of having to get a dollar bill out from under a precariously balanced object. The problem could be solved if the bill were ripped in half, but not only is that illegal, we generally don’t tear things of value.

In one puzzle, participants are given a group of objects and asked to perform a simple task using only those objects. The goal of the puzzle was to get a ping pong ball out of a stationary metal pipe. Subjects will often either fail to realize or simply be to embarrassed to vocalize that one solution would require urinating in the pipe. Since urination is a private act, something done behind closed doors, we rarely would think of it as a technique for solving a problem, especially in a group setting, but it does produce a viable solution.

This past Fall I attended the Texas Society of Architects Convention as a participant in their student design competition. I was on a team of eight people, four students and four former students. Of the four former students two of them were what I would call right brain dominant. The other two were very analytical in

their thinking. We were given our design problem at 8:00 AM and told to come back at 6:00 PM with our work and present the next day. The problem consisted of designing as many lines of creative furniture as we could in the short time allotted. As a group we sat down to discuss our plan of attack and the two left brain thinkers immediately dominated the discussion. They decided to create lists that outlined our project goals and to make a system of “tasks” for which the furniture was suited for. Like sheep being led to the slaughter, the rest of the group followed along. Growing increasingly frustrated, I and another student frequently interrupted with ideas that were more along the lines of a creative brainstorming session, but they were immediately shot down as the two former students continued to control the group. I was frustrated. I knew that we were not operating as a team and were completely desecrating the idea of brainstorming. There was only one idea produced and that was all that we worked with. Despite my frustration, I failed to speak my mind because I was operating under some cultural blocks. I felt the need to initially respect those older than me and I also felt that I had no place, as a student, to contest the ideas of a bonafide architect. This is where I erred. If I had spoken up and recognized myself as a creative equal, than the discussion may very well have taken a turn in a more positive direction. Unfortunately, hindsight is 20/20 and I only realize that now. We ended up giving a rather weak presentation and

watched Southwest Texas win with a presentation that personified creativity.

Prejudice Towards Intuition and Feeling

Our society invests a large part of it’s problem solving ability in reasoning and logical thinking, unwittingly ignoring intuition and feeling. Especially in male dominated business environment, it is apparent that a sense of aesthetic, emotion, and intuition are generally looked down upon. Many times, those who do tend to solve problems intuitively are doubted because of their lack of substantial proof of how they encountered the solution. In high school classes, especially in technical areas such as math and science, teachers fail students who arrive at solutions using common sense and intuition as opposed to mathematical and scientific procedures. I myself would often receive partial credit or no credit at all because I would solve problems intuitively. Even though I would derive the same answer, I would not get full credit.

This tendency to view intuition and other right brained traits as a waste of time or not efficient in problem solving is a cultural block that produces negative results when applied to the creative process. In order to produce the creative solution the creative problem solver must be able to use all the facets of

creativity in their arsenal of problem solving characteristics. A person must be able to intuitively reason their way through a problem while using both logic and feeling.

Choosing the Correct Approach

Approaching the problem correctly is one of the most important steps in creative problem-solving. Many times the solution to a problem that has plagued us for days lays hidden by the fact that we merely are approaching it in the wrong manner. Basically, we approach problems in either of two ways, by using the inherent properties of either our left or right brain. The left brain tends to approach a problem analytically and mathematically, while the right brain will try to visualize a solution holistically.

Let's remember the puzzle that stated, "One-half of eleven is one." This statement is most likely approached mathematically because of the numeric stereotype we associate with "one-half." Looking at this problem in this manner will only result in bewilderment. To see the answer, we must visualize the what the number 11 looks like and experience the "aha." sensation. Choosing the correct problem-solving method will increase your chances of finding a solution ten-fold.

The biggest disadvantage when considering problem solving preferences is that many people already have pre-set notions on how they like to tackle certain problems. This choice is made even more difficult by the fact that it is often made unconsciously. On top of that, we do not place a heavy emphasis on visual thinking. This lack of emphasis comes from our early educations. We are trained in school to approach problems pragmatically and with our left brain rather than visualizing a solution. Most people would confront the problem of dividing eleven mathematically, then realize that the method was futile and resort to another one.

When faced with a new problem, it is important to face it with an open mind. Also, the choice of the correct problem-solving language needs to be a conscious one as well. But, it is equally important to not devote your entire time to developing problem-solving strategies. In the above example of the Texas Society of Architects Student Design competition, my group spent the better part of eight hours planning what we wanted to do. When it came time to implement the idea, we were forced to work feverishly up until the deadline. If we had spent less time beating out a strategy, we would have had more time to work on the finer points of the design and the final product.

What Can We Do?

There are undoubtedly many more mental walls that could be defined as conceptual blocks. The above few, however, are general enough to provide a firm understanding of what a conceptual block actually is. Basically, these conceptual blocks can be classified under, “What not to do.” When it comes to “What can we do,” there are many exercises, methods and practices that we can involve ourselves with in order to enhance our creative lives.

To begin with we must avoid the conceptual blocks that we have just discussed. Their only purpose is to limit us in our creative potential, thereby making it that much more difficult for us to achieve the creative solution. If we are to be able to pull in as much information as possible from our environment and use it to synthesize a novel solution, then we cannot limit ourselves to how we perceive that information.

In summary, let us reexamine the conceptual blocks as they were defined above and state them as what we should do:

- *Avoid stereotyping*
- *Isolate the problem but remember to not look to closely at it.*

- *Try to see a problem from the viewpoint of someone else.*
- *Try to conquer the fear of failure; Don't let it inhibit creative thought.*
- *Allow yourself to exist comfortably in a state of ambiguity.*
- *Defer judgment when generating ideas.*
- *Don't accept tradition as the only means to solve problems. Look for change.*
- *Attempt to conquer cultural blocks and don't allow them to inhibit the generation of ideas.*
- *Don't always rely on practical solution. Let intuition and feeling act as a guiding force as well.*
- *Choose the correct problem-solving method.*

There are also a variety of techniques that have been developed to catalyze the generation of new ideas.

These techniques are useful in facilitating the creative process. One such technique is called brainstorming. Brainstorming stimulates the creative process by the rapid generation of idea after idea.

Brainstorming

There are two principles of brainstorming as defined by Alex Osborn, and they are supported by a few rules. The first principle deals with one of the conceptual blocks we discussed earlier; the deferment of judgment. In order to foster ideas, one must be open to as many as possible. The second principle is that quantity breeds quality. The more ideas one has in their database of information than the easier it will be to synthesize them.

Supporting these two principles are a few rules to be followed while brainstorming. The first rule being that criticism is ruled out. Basically, a reaffirmation of the deferment of judgment principle, this rule states that judgment is deferred until after a substantial amount of ideas have been generated. Since criticism only serves to limit the number of ideas generated it is important to keep an impartial mind during the idea generation phase of the creative process. If we judge an idea to be too crazy or just plain stupid, we make our storehouse of information that much smaller. If we are faced with the

immediate evaluation of our ideas then we will be more concerned about defending them as opposed to generating more.

While brainstorming, one should say whatever comes to them, no matter how unrelated to the problem at hand. By speaking freely from your mind you will become less inhibited and experience a greater flow of creative ideas. By expressing the wildest ideas possible, the internal judgment within the minds of the participants will be decreased. All too often we evaluate our ideas before they make it too our lips. We must remember to defer that judgment until later.

The brainstorming process is a rapid idea generation process that rarely experiences a lull in activity. That is why a brainstorming group needs one member to act a recorder of ideas. This ensures that the group or the individual will have continual access to ideas from which they may add too or build from.

Finally, remember to build on and combine ideas as if they were child's building blocks. Improving ideas that have already been stated is the foundation of creativity. That is why it is important to have as many ideas as possible, not matter how odd, unrelated or crazy they may seem initially. At one point, one idea may led to the generation of another which in turn could produce the creative solution.

Redefining the Problem

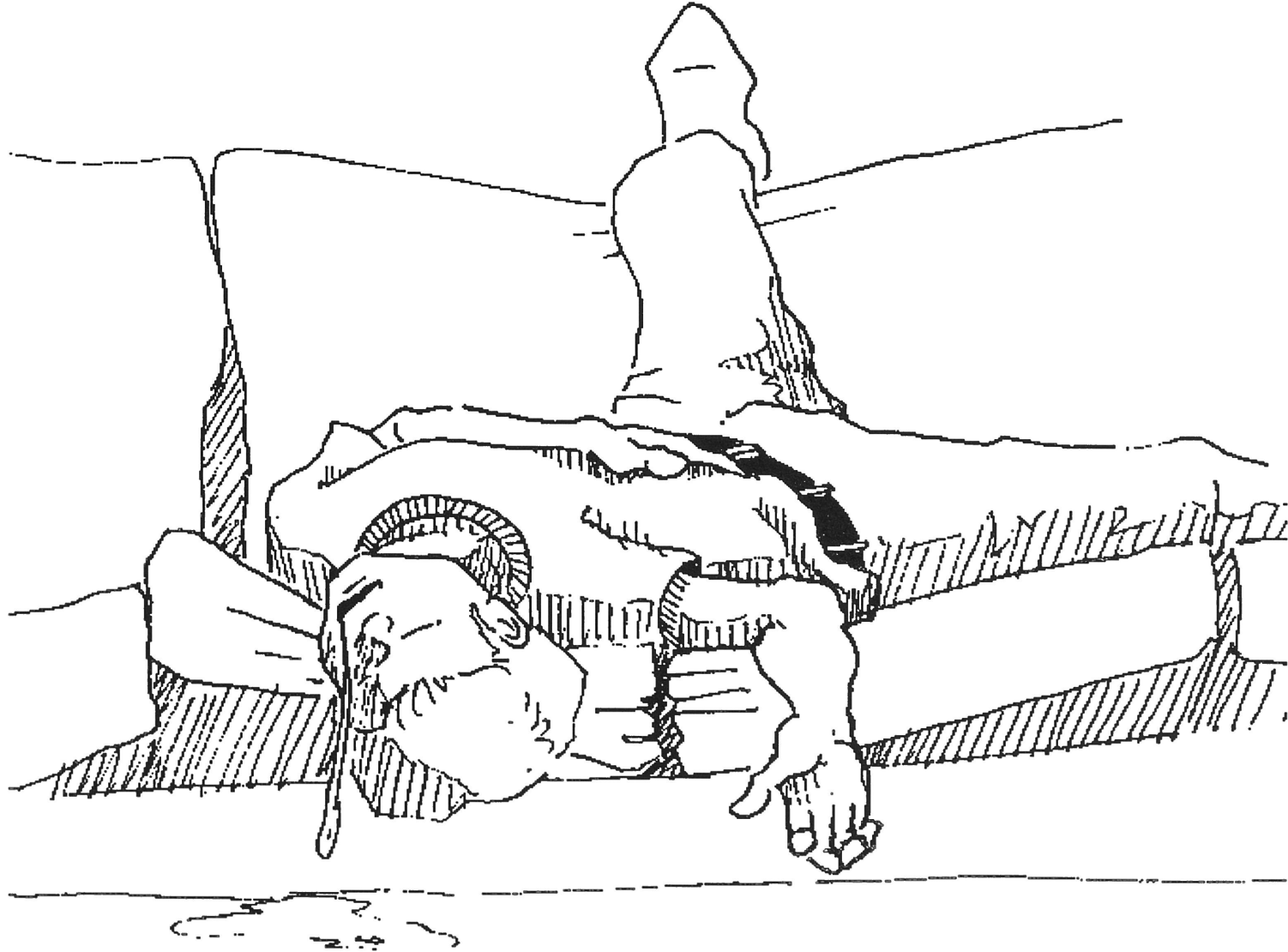
Another technique that is very helpful when faced with a seemingly insurmountable problem is to simply redefine the problem so it is solvable. By redefining the problem, we may see it in a new light and get closer to the creative solution. As we discussed earlier, problem definition was a conceptual block. The most prominent reason for this being so is that people feel it necessary to accept the initial statement of a problem as an unchangeable fact. Let's go back to the example of the nine dot puzzle where the person is asked to connect all nine dots with a line without lifting the pencil from the paper.

People initially accept that they must stay within the boundaries set by the square even though it was not stated in the problem definition. They also take for granted that they cannot adjust the boundaries of the problem. If we change the problem statement by rearranging the dots, which is a perfectly legitimate act, we can come up with a rather novel solution. Rearrange the dots into a straight line so that it only takes one line to go through them all. Many people would never even have thought to move the dots because of the fact that we tend to place limits where they don't belong.



Language play a large role in how we define problems. This is known as the Sapir-Whorf hypothesis in the behavioral sciences. It states that the language one uses during the creative problem solving process may inhibit creativity. Many people begin the creative process by asking, "Should I do that?," or "Can I do it this way?" These statements limit creativity by forcing immediate evaluation. A question can be broadened and avoid evaluation by changing it to "How can I do this or that?" Just as we would redefine the nine dot problem statement by rearranging the puzzle we may redefine a problem statement by altering the language used in it. If we are given the initial problem statement that asks us to design furniture, then we will do just that. We will come up with a variety of chairs, beds and desks. But if we were given a problem statement that asked us to design structures that would provide brief and long term respite from standing, there would probably be many more creative ideas generated.

Another method of verbally redefining the problem is to change the key verb in the problem statement. For example, develop a new way to *pedal* a bicycle. If we changed *pedal* to "provide a force by which locomotion is achieved," we would receive many more novel results because the mind is no longer



INCUBATION

restricted to thinking of a typical crank shaft and pedal that is powered by the foot.

Incubating

When the mind of the creative individual is prepared by information input, experience and concentration; when the problem has been addressed, redefined, struggled with and visualized; when all the data has been fed to the unconscious mind and still no answer has been seen, the best thing to do is to simply walk away. Separating oneself from the problem is precisely what the unconscious mind needs in order to begin solving it. Some activities that serve to distance oneself from the problem include daydreaming, sleeping, meditating, playing sports, or generally anything that either has nothing to do with the problem at hand or somehow puts you into a state of deep relaxation in which your mind is cleared and receptive to ideas.

While writing this paper, I myself would often turn to playing the guitar in order to clear my mind. When engaged in a musical activity, my mind completely shuts down, almost to the point where I can't even hold a conversation. Nevertheless, I would always return to typing this paper with renewed vigor and many times that idea that led me to take a break in the first place.

Wolfgang Amadeus Mozart wrote this passage in a letter to a friend. It reflects the values of engaging in other activities so that the unconscious brain can work on a problem:

“When I am, as it were, completely myself, entirely alone, and of good cheer - say, travelling in a carriage, or walking after a good meal, or during the night when I cannot sleep; it is on such occasions that my ideas flow best and almost abundantly. Whence and how they come, I know not; nor can I force them. Those pleasures that please me I retain in memory, and am accustomed, as I have been told, to hum them to myself. If I continue in this way, it soon occurs to me how I may turn this or that morsel to account, so as to make a good dish of it, that is to say, agreeably to the rules of counterpoint, to the peculiarities of the various instruments, etc.”²

Many famous accounts of incubation have one thing in common; that being a feeling of relaxation and separation from the frustrating effects of problem-solving. This state of relaxation is more likely to happen when the mind is in various states of being. We all experience a form of these states of being when we wake up and right before we fall asleep. Many of my ideas

have come at the borders of consciousness, as I find myself precariously balanced on the brink of deep sleep. This state of heightened awareness right before sleep is termed the hypnagogic state. Henry Wadsworth Longfellow found some of his most important verses for his works when in this hypnagogic state:

“Last evening ... I sat till twelve o’clock by my fire, smoking, when suddenly it came into my mind to write the “Ballad of the Schooner Hesperus,” which I accordingly did. Then I went to bed, but could not sleep. New thoughts were running in my mind, and I got up to add them to the ballad. I felt pleased with the ballad. It hardly cost me any effort. It did not come into my mind in lines, but in stanzas.”³

Regardless of when it happens, ideas are generated during the incubation phase of the creative process, and it is readily apparent that closing the conscious mind to a problem is advantageous in many respects.

Conclusion

In this paper we have discussed three different facets of creativity and hopefully provided insight as to how each one contributes to our creative lives. We first examined the brain so that we could fully appreciate the field from which we grow and harvest our creativity. Then we traveled through a model of the creative process so that we could understand the various states of being we experience when engaging in the search for the creative solution. And finally we discussed what steps we can take to make ourselves “more creative” by stimulating the flow of innovative ideas.

The primary goal of this paper is hopefully now, completed. My initial intent was to discover the reasons for why the creative person thinks the way he does. In the process I have not only discovered myself, but I have outlined a path through a very dark and mysterious forest, through which others may follow.

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