F.D. Barrett
President
Management Concepts Limited

creativity techniques: yesterday, today, and tomorrow

In our rapidly changing and competitive world, businesses must increasingly seek innovative ideas. Thus creative-thinking methodologies have proliferated in the last few decades. A number of these techniques—from the more familiar brainstorming and attribute listing to the newer synectics, bionics, morphology, and deliberate dreaming—are explored with a view to helping a company select those that may be most useful for its purposes.

he explosion of new knowledge since World War II has left no field untouched—certainly not the field of creative problem solving. The growth in number and in quality of creative-thinking methods has been rapid, exciting, and impressive. And these methods have come at just the right time, for creative innovation is plainly the *sine qua non* of business survival in this hyperaccelerated age.

Presently available techniques include brainstorming, attribute listing, synectics, bionics, morphology, and deliberate dreaming.

The number and the variety of the new creativity methods produce a curious conundrum: We must use them, no question about it; but how can we grab hold of them all, sort them out, and select those we want? A brief review of the historical emergence of each successive technique may provide a

0036-0805/78/0016-0025$01.00/0

start. It may also be helpful to examine a few of the newer techniques just surfacing and to speculate on what the future may contain.

Early research

While human concern with Creation is as old as Genesis, creativity techniques are a relatively recent innovation, and the study of the creative-thinking processes themselves began only in this century. As late as 1948 Professor Rupert McLaurin of MIT, in a novel doctoral seminar on "The Economics of Invention and Innovation," expressed dissatisfaction with the failure of psychologists to tell us much about imagination and creative thinking. The only book available in 1948 on the psychology of creative thinking was *The Art of Thought*, by Graham Wallas, and it had been published in 1926. Yet as Professor McLaurin never ceased to point out, the creative-thinking process was the wellspring of all invention.

In *The Art of Thought*, Wallas was able to reveal certain important oddities about the creative-thinking process. He discovered that creative thinking had four significant stages: preparation, incubation, illumination, and verification. Most creative ideas, he found, were preceded by a long and laborious thought struggle at the conscious level. But creative ideas rarely arrived when the mind was thus knowingly engaged with a problem. Instead, they "popped out" from the unconscious at the most unexpected moments–at times, in fact, when one was not thinking about the subject at all. These occurrences he called "moments of illumination."

Wallas inferred that for illumination to occur, there must be a preceding period of *unconscious* thinking. During unconscious thought periods, he suggested, the mind was incubating the idea–readying it for birth, as it were. Indeed Wallas reconfirmed the Freudian thesis that creativity is a battle fought in the deeper and darker recesses of the unconscious psyche. The incubation thesis supported maxims that inventive laymen had always practiced when confounded by a problem: "Put it on the back burner" or "sleep on it."

Young's method

In 1940, Wallas' four stages were cast into an operationally useful format in the first book ever published on creative methods. The book, *A Technique for Producing Ideas*, by James Webb Young (a brilliant advertising executive and vice-president of the J. Walter Thompson Company), was the precursor of many other such books. Young's book is still in print today and is as valuable as ever. Besides publishing this book, Young taught his Wallasian creative thinking methods to business executives at the University of Chicago.

To students of creative thinking, the following facts were slowly becoming clear:

1. The ordinary human has an in-born capability for discovery, creativity, and invention.
2. In the generation of creative ideas, both unconscious and conscious processes work hand in hand.
3. Some of the stages in creative thinking are definitely describable.
4. Methods could be developed to teach people how to turn on creativity.

Brainstorming

In 1953 another structured technique for creativity appeared on the scene. Alex Osborne (an advertising executive, like Young) had invented "brainstorming," and he now described it in the book *Applied Imagination*. Brainstorming made Osborne a celebrity, and the term became a popular new word in our language.

Osborne's invention emerged from his many years of interest in the creative process. He recognized that "our thinking mind is twofold: (1) a judicial mind, which analyzes, compares, and chooses; (2) a creative mind, which visualizes, foresees, and generates ideas." As he also pointed out, the two minds operate in opposition. Indeed, the judicial mind can all too easily inhibit, or even destroy, the productivity of the creative mind.

Osborne's brainstorming technique solved this problem by dividing creative work into two stages: an idea-generating phase, in which judgment is suspended and analysis of ideas is prohibited; and an idea-evaluation phase, which follows later. During the idea-evaluation phase, the judicial mind is permitted to evaluate the outpourings of the idea-generating phase.

To this day, Osborne's brainstorming technique remains among the most widely used of all the methods.

Attribute listing

In the 1950s, at about the same time as Osborne developed brainstorming, Robert P. Crawford, a professor of journalism, invented another technique that he called "attribute listing." He described it in a book titled *The Techniques of Creative Thinking*. Crawford derived his technique from a fascinating fact concerning human ideation: "An idea is nothing more nor less than a new combination of old elements." As Crawford saw it, the creative mind engages in synthesis; the judicial mind engages in analysis.

Many illustrations support Crawford's conviction that creativity is synthesis. For example, the idea for the steam locomotive came when the

steam engine, which already existed, was joined on to a cart that rode on flanged wheels over rails. Such carts had been used for centuries in mining. Even that astonishing vehicle the hovercraft was created from elements already existing.

Crawford identified one of the ways in which such new combinations are born: "Creation generally consists in the shifting of attributes from one thing to another. In other words, we give the thing with which we are working some new quality or characteristic or attribute heretofore applied to something else." His technique of attribute listing describes how to go about making such marriages happen.

The extraordinary thing about idea synthesis is that the new combination, despite using existing elements, can produce such innovations as the drive-in theatre or the mag-lev train. The separate elements combine synergistically to produce a new whole different from the sum of its parts.

Lessons learned

The last 40 years have served to make one fact about creative thinking crystal clear: Creativity is not merely a procedure. It is a way of thinking that requires one to be in an unusual state of mind.

Techniques will not produce ideas; but they do have a demonstrated and impressive power to gyrate the mind into the odd new orbits required for creativity. Techniques help bend thought in new directions. They help shake the judicial mind out of its familiar rut. They help stir up dim thoughts and perceptions lying deep in the unconscious brain. They help liberate imagination. They emancipate intuition. They help creative thought to stream ahead toward surprising encounters with new possibilities.

Various descriptions, theories, words, and explanations have been put forward in an attempt, so far only partially successful, to describe the nature of the creative thinking process and account for its results. One approach describes it as "free association," during which the mind is released and allowed to wander in random ways, connecting up thoughts, facts, and ideas erratically, with little regard for order, logic, or sense. At the magic moment, so to speak, the right connections happen in the mind, and the new idea or insight takes shape.

The psychologist Guilford characterizes the creative thought process as "divergent." He sees it as moving away and expanding outward from the obvious, the traditional, and the established. The divergent thought moves outward and expands; it explores, entertains, and discovers an increasing number of solutions. In contrast, Guilford points out that ordinary, every-

day problem-solving thought is "convergent." It starts from the facts, applies rigorous logic, and closes in on one definitive answer.

To the English neuropsychologist Edward de Bono, creative thinking is "lateral thinking." He contrasts it with another kind of thinking, which he says is "vertical." Vertical thought digs deeply and directly into the problem. It accepts things as they appear. It penetrates them narrowly. Lateral thinking, on the other hand, moves away from problems. It circles them. It approaches them sideways or even backwards. It takes nothing for granted. It looks beyond appearances. It erratically but persistently searches for fresh insights and novel solutions.

Still other observers believe creative thought has a remarkable similarity to dreaming, for it makes much use of visual imagery, and it may surrealistically distort these images. Creative thought can make excursions that carry it into dimensions of the bizarre, the absurd, the fantastic. It may produce amazingly inventive embroideries and odd fictions. It seems to revel in fantasy, wish fulfillment, irrationality, irrelevance, and impossibility. Yet eventually, by taking such strange dreamlike routes, it may make discoveries and produce results of an entirely practical or serious nature.

Another aspect of the creative-thought process is "bisociation," so-named by novelist-philosopher Arthur Koestler. Bisociation leads to that sudden flash of insight known as the "eureka connection." Bisociation occurs when the mind is pursuing one logic but suddenly experiences the lightning realization that the solution really lies at the intersection between this logic and another, quite different logic. Creative insight occurs when the mind jumps off its trolley, so to speak. To experience bisociation, take the following problem: "Change IX into six by adding one line." One logic says that IX is the roman numeral nine. But another logic says it is the last two letters in the word "six." When the mind meets the intersection to these two logics, the answer occurs: Add the (curved) line "s." Eureka!

One of the most interesting characteristics of the imaginative mind (in contrast to the factual mind) at work is its great use of metaphors, similes, and symbols. It is as if in order to understand one thing better it pictures it as another thing. The use of metaphorical thinking in everyday life, as an aid to better understanding, is more common than we perhaps recognize: a "peaches-and-cream complexion," "strong as a rock," "straight as a die," and so on. Creative thinking also seeks out similarities—ones previously not recognized, yet capable of spawning new design insights.

Finally, it appears that a remarkable childlike state of mind often accompanies creative thinking. Students of transactional analysis identify it with the so-

called child ego state, which they contrast with parent and adult ego states. Some psychoanalysts have spoken of creativity as a process in which the adult regresses to childhood. Certainly anyone watching a brainstorming group in action could immediately conclude, "Here is a group of adults acting like children." It may well be true that to enter into the Kingdom of Creativity we must become "as little children."

Synectics

In 1960 "synectics," another technique, emerged on the scene when J.J. Gordon of Cambridge, Massachusetts, published a book by that name that received instant and widespread attention because of its originality. "Synectics" is particularly notable for its ability to get every facet of creative thinking going simultaneously. It therefore has unusual power to produce originality.

One special feature of synectics is its frequent use of analogy and metaphor. Also, synectics can carry the mind through the various stages of creative thought from beginning to end. A single synectics trip through these stages is called an "excursion."

Synectics achieves a truly altered state of mind (or consciousness). It changes one's ordinary perception of things. It enables new thoughts to arise and genuine breakthroughs to be made. Synectics stresses the need to see the world much differently than one ordinarily does when one is in the prosaic, everyday mood that characterizes normal consciousness. It strives to escape from the confines of convention and the staleness of orthodox solutions. Synectics encourages daring speculation and boundary-breaking rumination. It urges us to be bold enough to entertain the bizarre and court the absurd. In synectics sessions, social reinforcement is deliberately used to encourage expansion in thoughts and adventure in ideas.

Skill in synectics requires substantial training and practice. Although this applies to all creative-thinking methods, it is especially true of synectics. The book *The Practice of Creativity*, by George Prince, current president of Synectics Inc., clarifies how this most intricate and profound of all the methodologies functions.

Bionics

Another important new tool to emerge in 1960 was "bionics," a term coined by Major Jack E. Steels of the U.S. Air Force. The definitive book *Bionics*, by Dr. Lucien Gerardin, was published in 1968. Bionics reminds us that the world of living organisms already contains myriad inventions, produced by millions of years of natural experimentation and evolution, from which we can learn.

Bionics asserts that man, by observing some of the ingenious inventions of nature, can imaginatively imitate them. For example, the primitive hunter probably invented nets after having first observed the spider's web. He then probably conjured up his traps by emulating the design of the fly-catching plant. The 1515 notebooks of Leonardo da Vinci showed designs for a flying machine that copied the wing structure of the bat. And our more recent military camouflage was inspired by the cunning protective coloring and deceptively concealing shapes of certain animals.

The use of bionics often requires a sophisticated knowledge of such concepts as systems theory, modeling, cybernetics, and information theory. Bionics is thus one of the more recondite techniques. A bionically produced invention is the low-turbulence submarine surface, which uses the dual-skin principle observed in the dolphin. The dolphin not only has a normal outer skin but also has a thicker inner spongy skin. The inner skin alters shape in response to changing water pressures at different speeds. Another bionically produced invention is a boat hull with an artificial turbulence-reducing mucus, similar to the natural mucus of fish.

At MCL we have reduced bionics to its bare bones in a modified version we call "bioheuristics." ("Heuristics" means "aiding in discovery and invention.") Bioheuristics is easily applied to such nontechnological problems as inventing new employee communication systems, developing new teaching concepts, or designing new packages.

Morphology

Another method to acquire visibility in the sixties was "morphology," a technique invented by Professor Fritz Zwicky, an astrophysicist at California State Polytechnic University. Morphology became well-known with the publication of Zwicky's book *Discovery, Invention, Research* in 1966; but he had written about it as early as 1947.

The dominant concept in morphology is relationship. Morphology is a method for discerning previously unseen relationships and for fabricating new ones. The key aim in morphology is to discover and invent new structural interrelations by carrying out the most exhaustive, comprehensive, and total search possible.

As Zwicky remarked, "This method enables us to make discoveries and inventions in a systematic way, and it is a sure guide in the exploration of the basic interrelations among all conceivable families of objects and of the physical, chemical, and biological phenomena that govern their actions and interactions." The procedures for using morphology are quite simple. This task is done at a conscious, logical, and rational level. Yet the ability of morphology

to throw up numerous new ideas, possibilities, discoveries, and potential inventions is quite extraordinary.

Zwicky has himself used morphology to make a number of original breakthroughs in the science of astrophysics and is also the holder of a number of morphologically produced patents in jet propulsion and aerospace. The International Society for Morphology was formed some decades ago to provide a forum in which morphologists in different disciplines (law, science, business, architecture, and so forth) could share experiences in invention and develop their skills in the creative use of morphology.

Deliberate dreaming

Many important creative discoveries and inventions in technology or business have occurred during dreams. These include one of Elias Howe's sewing machine inventions and Watt's invention for making lead shot.

Can dreams be used for creative thinking purposes? The answer is clearly yes. Indeed, a powerful creative-thinking strategy that surfaced recently is "deliberate dreaming," a term we ourselves coined. Deliberate dreaming proponents rightly claim that we can go to sleep with the intention to dream up a solution to a particular problem and actually have the dream happen. Deliberate dreaming is not new. Robert Louis Stevenson described in his autobiography how he used this method to produce all his literary inventions, including such famous novels as *Kidnapped* and *Treasure Island*.

The methodology for producing a deliberate dream is as follows:

1. Struggle with the problem for several days during one's waking hours.
2. Decide "tonight is the night" to have a dream about it.
3. Fall asleep while consciously thinking about the problem.
4. Be prepared in advance to "catch the dream" on paper or tape recorder instantly on waking.

By reading *Creative Dreaming*, by psychologist Dr. Patricia Garfield, managers can learn more about the method.

The future of creation

Will the traditional creative-thinking techniques, from brainstorming to synectics, be supplemented in the future by new mechanical, electronic, chemical, ecological, or sociological methods? The answer is a definite yes. Developments are already well under way.

One mechanical device, labelled the "Think-Tank," is already on the market. The Think-Tank (the registered name of the device invented around 1973

by Toronto entrepreneur Savo Bojicic) consists of a hollow plastic sphere, about nine inches in diameter, containing 13,000 words printed on small plastic chips. When the sphere is rotated, the chips tumble randomly and throw into view chance words that are used as takeoffs for a lateral thinking process. The sphere comes with an instruction booklet written by neuropsychologist Edward de Bono. For the creative, divergent thinker, Bojicic's Think-Tank serves the kind of purpose that the pocket calculator performs for the logical, convergent thinker.

An electronic creativity device now in some use is the "biofeedback monitor." Biofeedback monitors detect alpha and theta rhythms emanating from the brain. Using the monitor, the creative thinker can produce either of these two rhythms at will and thus move his mind into either alpha or theta states.

In the alpha state, one feels serene and relaxed. In the theta state one experiences a flow of visual imagery. Researcher Elmer Green at Meninger Clinic uses biofeedback to get R&D scientists into the creative theta state whereupon they engage in creative visual imagery concerning their projects. The hope is that the scientists will produce important concept and design breakthroughs while engaged in this purposeful reverie.

Direct electrical stimulation of the brain itself is another beckoning challenge. Some day a special method for electronic stimulation will be discovered that will activate creative mental activity. Such a method could conceivably be discovered within the next five years. Experimental research on the brain has already demonstrated that stimulation of different brain areas can produce such responses as pleasure, anger, hunger, visual imagery, and voices. Some epileptics carry electrodes implanted in the skull and in touch with the brain. They can activate these electrodes by push button whenever they wish to abort an incipient attack.

Research on both brain-damaged and normal persons (using electroencephalography) has revealed that what we used to think were two cerebral hemispheres of one human brain are in fact two different brains. The predominant thought activity in the left brain is rational, analytic, logical, verbal, numerical, linear, judgmental, and realistic. The predominant thought activity in the right brain is intuitive, synthetic, diffused, pictorial, imaginative, and holistic. The right brain appears to be the source of ideas, invention, and inspiration. But it must work in close harmony with the left brain in order for products of any real value to be produced. The recognition of the right brain/left brain dichotomy has thrown much light on the fact that there are two different modes of human thought that interact in the process of creativity. The theoretical possibility exists for the invention of special electronic methods to activate the right brain directly.

In addition to mechanical and electronic aids to creativity, chemical assistance may be possible. Since time immemorial man has used such chemicals as alcohol, poppy juice, mescaline, and so on to produce altered states of consciousness. Recent decades have seen a whole host of brain-altering chemical breakthroughs. All manner and kind of chemicals are being used for such purposes as palliating schizophrenia, reducing depression, or calming anxiety. Now to cap it, the Californian drug designer Alexander Shulgin has even fabricated a drug called DOET, which makes people more open to new ideas. *Fortune*, in March 1977, noted that some Shulgin subjects report "new insights, attention to previously unnoticed aspects of a situation, perception of new problem-solving possibilities, and a marked gain in creative capacity." Will such chemicals ever render all traditional creativity techniques, from attribute listing to bionics, totally obsolete? Or will they merely add to the usefulness of these tools? Time will tell.

Yet another new approach to creativity lies in the use of environmental psychology and ecology. Creative insights are likely to occur in places far from work—in a bed, in the shower, in a car or a fishing boat, on a golf course or a mountaintop—almost anywhere but in an office, laboratory, board-room, or factory, it seems. Experiments with environmental (ecological) methods for stimulating creativity will increasingly be a part of the future. Not only will there be more experiments with existing environments (putting on scuba gear and spending 30 minutes in thought at the bottom of the pool?) but also with artificially contrived environments, using sound, color music, abnormal gravity, odor, movement, temperature, medium, or vision.

Indeed, many companies have already installed think-tank rooms in their buildings. Think-tank rooms are usually unique in design and decor. In a think-tank room one expects to find recliner chairs, bean-bags or cushions, water couches, low tables or no tables at all, warm textures, offbeat fixtures and equipment, and other elements conducive to relaxed and divergent thinking. The idea is to get away from the normal go-go, plastic, and chrome mood provided by machines, telephones, desks, and filing cabinets. Companies using such think-tank facilities include McDonald's restaurants in Minneapolis, Daon Developments in Vancouver, Northern Telecom in London, Ontario, and First Federal of Broward in Fort Lauderdale.

On top of all of this, we can expect that many new behavioral, social, organizational, and managerial techniques and strategies for creativity will be invented. These strategies will create entirely new organizational climates and new support and reward systems for creativity and innovation. They will draw upon new forms of leadership, motivation, and group interaction that will be conducive to creativity. The innovative enterprise of the

future (the only one capable of coping with future shock) will have managerial systems and organizational structures totally different from the hierarchal, technocratic, bureaucratic, emotionally sterile, paranoid, proceduralized, controlled, and constrained settings of today. The innovative enterprise will feature goal-oriented striving, adventuresome searching, animallike adaptability to shocks and changes, emotional warmth and business boldness, restiveness and imagination, and strong bottom-line realism combined with societally oriented business acumen.

To sum it up, we can expect that future creative-thinking methodologies will be quite different in nature from those of the past. As long as rapid change prevails, the demand for new, more, and better methods for generating innovative ideas will increase. And the demand will be met. □

F. D. Barrett

is president of Management Concepts Limited, a firm he set up to conduct seminars in the United States, Canada, Holland, and England. He previously was founding director of the York University Division of Executive Development and professor of management on the York Faculty of Administrative Studies. Dr. Barrett has been a teacher of management at McGill University and at MIT, where he obtained his Ph.D. in industrial economics. For 25 years he has been a consultant to many Canadian and American corporations, government departments, universities, and voluntary organizations. He was also one of the pioneers in the introduction of management by objectives in Canada. Dr. Barrett is the editor and publisher of Insights & Innovations, *a periodical dealing with the management of change.*