The Genius of Everyman (2)

LEARNING CREATIVITY

The realization that thinking abilities—both 'rational' and 'creative'—can be learned may help change attitudes toward the purpose of education

BY JOHN H. DOUGLAS

Second article of a two-part series. The first article showed how recent research has challenged old notions about creative genius; this one focuses on how results of that research can be applied to helping each of us become more creative.

Probably the quickest way to grasp intuitively the difference between solving a problem using straightforward logic and solving one that requires "creative" thought is to examine your own mental processes as you address the following puzzle:

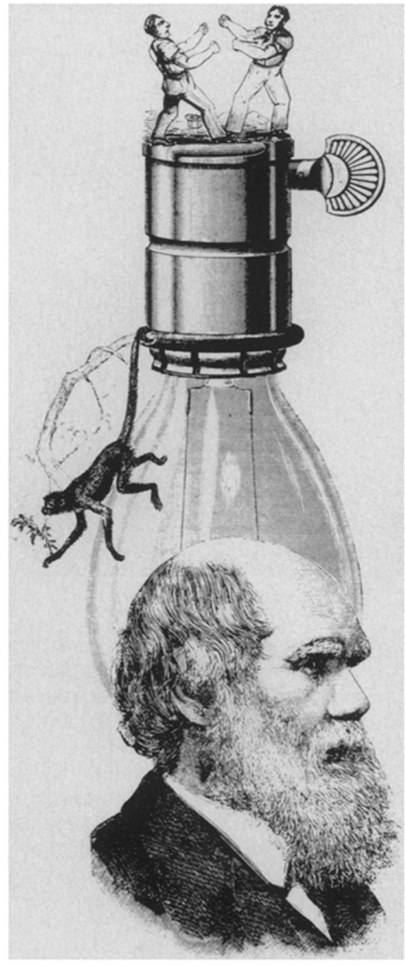
A father and son are driving in their car and have a terrible accident. The father is killed immediately and the son is rushed to the emergency room. The surgeon at the hospital looks at the boy and says, "I can't operate. This is my son." How is this possible?

Conventional logic is blocked. The mind conjures up images of a step-father surgeon and the memory recalls those terrible stories of mistaken identity. But only by breaking away from this whole line of thinking and by considering fundamentally different assumptions may one suddenly be struck by the disconcertingly simple answer to the puzzle: The mother is the surgeon.

This process of stepping back from prevailing assumptions and searching for unfamiliar solutions to a problem accounts for many of the greatest achievements in art and science. One approach to learning how to encourage the creativity in each of us begins by studying the flashes of imagination in highly creative people. In hindsight, many of the most "ingenius" discoveries display an embarrassing simplicity. As biologist Thomas Huxley exclaimed after reading Charles Darwin's explanation of evolution: "How extremely stupid not to have thought of that!"

How the theory of evolution developed offers a good lesson in creative problem solving in science. The idea that animal species were related had been around for many years, but the *mechanism* of evolution—natural selection of the fittest individuals—had gone unnoticed. Both Darwin and naturalist Alfred Wallace apparently arrived at this "solution" to the evolution puzzle by the same route: Each had stepped back from the immediate observation of nature and each was suddenly struck by the relevance of the ideas of Thomas Malthus, who had described the struggle for existence in a human population explosion.

A similar process of creative problem solving can be seen in the arts. During the Renaissance, for example, painters spent a lot of time trying to find the best way to arrange three people in a picture. Leonardo da Vinci achieved an elegant and unusual solution in his *Virgin and Child with St. Anne.* Rather than repeating the customary arrangement of putting the Child in the lap of the Virgin, he took the almost shocking step of sitting the Virgin in St. Anne's lap and having her bend over toward the Child. Leonardo thus managed to achieve a geometric simplicity of arrangement (the figures form a pyramid), contrasted to the complexity of implied motion and personal relationships.



Creative problem solving in science: Darwin connected the idea of struggle among men with survival among animals to offer a mechanism for evolution.

Leonardo's solution also illustrates the importance of another frequently discussed aspect of creativity—the role of the subconscious. Freud interpreted the painting as an expression of Leonardo's unconscious memory of his mother and stepmother (he was born out of wedlock). Art historian Kenneth Clark adds that this interpretation helps explain why St. Anne and the Virgin—actually mother and daughter—are pictured as being about the same age. The fusion, in memory, of two mothers is pictorially revealed in "the strange intermingling of their forms and their remote, mysterious smiles."

By studying achievements such as these and by examining the biographies of highly creative people, researchers have been able to piece together a surprisingly consistent model of the creative process for both the arts and the sciences. Many different formulations of the model have been devised, with varying numbers of steps, but most are elaborations of a four-stage profile of the creative process developed in the 1920s by Graham Wallas:

- *Preparation.* This stage includes all of formal education and any particular research a person has done on a problem.
- *Incubation.* The "stepping back" from previous assumptions and even from active effort. Many creative people report they get their best ideas while on vacation or just after getting up in the morning.
- *Illumination.* The flash of insight itself, as when Archimedes shouted "Eureka!" Unlike a logical solution of many sequential steps, a creative answer to a problem often arrives suddenly, when one finally sees a more nearly complete vision of the task.
- *Verification.* The return to logic for evaluating, criticizing and elaborating a solution.

Although this model was derived empirically, based on reports of creative incidents, subsequent research has begun to reveal the mental processes that cause an act of creation to take this form. Discovery that the brain's right hemisphere specializes in pattern recognition and so-called "divergent" thinking seems to offer a physiological explanation for the "Eureka!" phenomenon: After the left hemisphere has analyzed a problem logically into its components, the right hemisphere may suddenly recognize a hidden pattern—just as a familiar face is suddenly picked out of a crowd.

The role of the subconscious is also gaining new recognition, for the mind is obviously doing *something* about a problem during the period of incubation. Here, as in a dream, half-formed ideas appear as symbols, manipulated according to the rules of emotion rather than logic. Here also, "mental blocks" are raised that blind the conscious mind to emotionally unacceptable possibilities. An idea that is eventually recognized by the conscious mind as a solution to a long-standing problem may even originate in the troubled pantomime of a nightmare: The concept that many organic compounds are formed of rings, rather than open molecules, supposedly originated from a dream of a snake swallowing its tail.

As the veil of obscurity has slowly been lifted from the process of creation, several schemes have been devised to help an individual learn how to be more creative. Some of these have concentrated on "forcing" incubation, others on removing mental "blocks," and still others have attempted to tap the subconscious directly. Unfortunately, the schism that has strongly divided professionals in the field in their views on the theory of creative ability has also prevented formation of a consensus on the effectiveness of various methods for enhancing creativity.

In the early 1950s, when psychologists were just beginning the current phase of activity in creativity research, an advertising executive, Alex F. Osborn, was starting what might be called the "creativity movement." Building on J. P. Guilford's research on "divergent" thinking, Osborn wrote and lectured about the importance of "deferred judgment" in one's attempts to be creative. Let the mind flow freely, he said, without breaking the train of thought by judging some solutions to a problem as obviously unacceptable. Such judgment can always wait until later. Osborn also pioneered the use of initially uncritical flowing of ideas among members of a group—a process he called "brainstorming."

One of the most successful commercial enterprises to come out of the creativity movement is Synectics Education Systems, whose techniques are reportedly used in thousands of classrooms and in more than 200 businesses and industries—at a total expense of more than

Leonardo's creative solution to the problem of arranging three figures.

$100 million. By making the creative process explicit, says W. J. J. Gordon of Synectics, one "changes that process from an elitist to an egalitarian activity." The particular method used in synectics (which means "joining together") is the conscious creation of metaphors to discover hidden connections between apparently unrelated parts of a problem.

Three principal kinds of analogies are used in synectics: direct, personal and symbolic. In direct analogy, one might try to invent a mechanical device similar to a human organ—the telephone was designed along the lines of the human ear. In personal analogy, one imagines oneself as an element in the problem—"If I were a particle that was approaching the speed of light. . . ." Finally, symbolic analogy involves the juxtaposition of contrasting ideas—Pasteur is said to have pursued his vaccine research by following the paradoxical notion of "safe attack."

Researchers who are skeptical about the value of teaching a general set of specifically "creative" skills are nevertheless more optimistic than they used to be about the possibilities for learning creativity within a given field. When asked about the old argument over whether creative ability is made or born, psychologist Michael Wallach of Duke University told SCIENCE NEWS "we have only begun to scratch the surface" in learning how to nurture talent. But, he cautions, "I think it is largely a matter of craft." For example, he points to the "Suzuki method" of violin instruction, which concentrates on building purely mechanical skills one by one. Critics argue that the method puts too much stress on technical proficiency, but Wallach replies that laying this sort of foundation helps prepare a person for developing "creative" expression at a later stage.

Still other researchers hope to stimulate creativity by studying the personality and environmental factors involved. This group is particularly diverse, but one key idea is mentioned again and again: the concept of "creative tension." The British psychologist Liam Hudson writes that creativity is achieved by balancing "the need to express, relate and explore, on the one hand; and on the other, to control and restrain." Seen in this light, the creative person is one who has a personality capable of accepting, and even inviting, such tension.

Frank Barron of the University of California, who performed some of the key experimental work on the personalities of creative people, summarizes his results this way: "The creative individual not only respects the irrational in himself, but courts it as the most promising source of novelty in his own thought. . . . The creative person is both more primitive and more cultured, more destructive and more constructive, crazier and saner, than the average person." It follows that the creative environment is one that encourages this dichotomy through "freedom of expression and movement, lack of fear of dissent and contradiction, a willingness to break with custom, a spirit of play as well as of dedication to work, [and] purpose on a grand scale."

Finally, a small group of researchers is looking for ways to tap the subconscious fountainhead of creativity directly, through meditation, hypnosis, dreams, drugs and biofeedback. Not surprisingly, this work is the least advanced and the most controversial. Meditation, for example, is seen by some researchers as a way of helping the incubation process and heightening sensitivity. Others point out that instructors of Transcendental Meditation score poorly on creativity tests. Some say mental processes can be speeded up in a hypnotic trance. Others reply that there is really no such thing as a hypnotic trance. Some point to the Senoi people of Malaysia as models for controlling dreams as an aid to creativity and mental health. Others argue that dreams have only coincidental relationship to waking creativity.

At least the consideration of such once "far out" topics has finally gained a certain respectability. Several major universities now have centers for creativity research, which runs the gamut from collecting data on the personalities of successful architects to measuring the alpha waves of students taking creativity tests. Many more schools have initiated various sorts of training programs in creativity.

At least one school, the State University College at Buffalo, N.Y., offers a masters degree in creative studies. In a lengthy interview with SCIENCE NEWS, the director of this program, Sidney J. Parnes, offered a broad perspective on recent developments in the creativity movement.

In one sense, the movement seems to have come full circle. For a while there was so much emphasis on identifying and encouraging mental abilities independent

. . . Creativity

of traditionally defined IQ that creativity was in danger of being equated narrowly with "divergent" thinking. Parnes strongly disagrees with that restrictive formulation. "Critics charge that we're teaching people to be idea happy," he says. "In fact, we're trying to strike a balance. . . . Both cognition and divergent thinking are enhanced." Parnes quotes one colleague who has gone so far as to declare: "There is no such thing as 'creative' thinking—only effective thinking. It's just so rare that we call it creative."

Reflecting this philosophy, Parnes and his co-workers have prepared for their two-year creativity course a textbook, *Guide to Creative Action*, that is an eclectic combination of research results, mental exercises and not a little salesmanship. "We don't teach creativity so much as help a person appreciate his own creative process," Parnes admits disarmingly. Always strike a balance: "The heart of the creative process is making *new* and *relevant* connections"—implying a need for both divergent and convergent thinking.

Such an approach, he says, not only takes ideas from the two warring factions of creativity theorists but serves as a link between the even more profoundly divided schools of humanist and behaviorist psychology. The goals and much of the language of the creativity movement are similar to those of the humanist psychologists, but the basic technique of "programming for openness" was taken from behaviorism.

(Behaviorists view the human as a set of conditioned responses that, theoretically, at least, should be programmable by changing the environment. Humanists emphasize the person as a unique individual, and say that for controlling complex behaviors like creativity, conditioned responses techniques are inadequate. An unnecessarily personal animosity between some of the psychologists involved has largely prevented the sort of synthesis of these two views that Parnes claims to have made.)

If one accepts Parnes's assertion that creativity training—in the broadest sense—increases students' achievement in real life (including better grades), then one immediately needs to examine the corollary that *both* divergent thinking ability and IQ are being increased. A leading proponent of the idea that traditionally defined intelligence can also be significantly improved is psychologist Arthur Whimbey, author of the book *Intelligence Can be Taught*. "Differences among adults in intelligence are based on a pattern of learned information-processing skills," he says. "These skills may begin to develop in early childhood if encouraged by the appropriate home or school environment, but they can also be taught directly to adults. . . . A healthy person of low IQ shows certain deficien-

cies in advanced problem solving, but these deficiencies differ in kind from those found among persons with true neurological pathology."

Hard data on the effectiveness of IQ training are still incomplete, but an intriguing intuitive argument for the existence of a large, untapped potential is offered by Kenneth S. Goodman, Director of Reading Miscue Research at Wayne State University. Parents are sometimes told their child is not smart enough to learn how to read—yet the child usually knows how to talk. This achievement, Goodman says, already shows the presence of enough mental ability to master a complex task, that of learning a language. He concludes: "I think we have to ask seriously why, if children learn to talk *without* our help, they don't learn to read *with* our help." (He also offers some pungent comments about the way reading is taught in today's schools.)

A few university programs now consciously try to help their students learn to think better, in the "balanced" sense Parnes talks about. The largest national programs, however, continue to place emphasis on early childhood training, where considerable success has recently been reported (SN: 3/5/77, p. 151). In one of the most spectacular and best documented of these programs, the so-called Milwaukee Project, the IQ of seemingly retarded children reared in the city's worst slums was increased by an average of 33 points (SN: 7/10/76, p. 21).

In the last analysis then, the insights gained from creativity research and the successes of the creativity movement have far-reaching implications in both psychology and education. A serious attempt is finally being made to shed new light on an important area of human endeavor long obscured by myth and snobbery. Also, those most intimately involved in the effort have freely borrowed lessons and techniques from branches of psychology that have too long been considered mutually exclusive.

The most devastating effects of this work with creativity are likely to be felt by the education establishment. Even if only a part of the promise of being able to increase creative capacity is eventually fulfilled, an uproar is likely to follow over alleged suppression of the creative drive by traditional schools. Indeed, if IQ research eventually shows that millions of children have simply been labeled incurably "dumb" instead of being *taught* how to think, society itself will have a heavy burden of guilt to bear.

Nevertheless, the news from creativity work is basically hopeful, for the average person and for humanity. It tells of untapped individual potential and points toward new methods for self-improvement. Survival in an increasingly technical age may eventually depend on society's ability to marshal this genius of everyman. □

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BLACK'S MEDICAL DICTIONARY—William A. R. Thomson, M.D.—B&N, 1977, 31 ed., 950 p., 2 color plates, 444 illus., $15. Authoritative and practical reference, revised.

BUTTERFLIES—Jo Brewer—Abrams, 1976, 9x11, 176 p., 240 color and b&w photographs by Kjell B. Sandved, $18.50. Scientifically accurate text and exceptional close-ups document the natural history of butterflies, their metamorphosis, wings, compound eye, mimicry, as well as their history in the arts of man.

CHROMOSOMES: From Simple to Complex—Paul A. Roberts, Ed.—Ore St U Pr, 1977, 96 p., photographs, diagrams, paper, $6. Proceedings of the 35th Annual Biology Colloquium which brought together scientists involved with new insights into the nature of chromatin.

ENERGY DELTA: Supply vs. Demand—George W. Morgenthaler and Aaron N. Silver, Eds.—AAS (UNIVELT), 1976, 590 p., diagrams, tables, paper, $40. Proceedings of Energy Symposium of the 140th Annual Meeting of the AAAS.

FOOD IN CHINESE CULTURE: Anthropological and Historical Perspectives—K. C. Chang, Ed.—Yale U Pr, 1977, 429 p., illus., $20. A fascinating, scholarly descriptive history of food habits in China, ancient to modern. Covers foodstuffs, their cultivation, kitchens, meals, feasts, rituals, food shops and inns; deals with facts both trivial (first use of chopsticks) and profound (adoption of the American food plants, maize and sweet potato).

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GRZIMEK'S ENCYCLOPEDIA OF EVOLUTION—Bernhard Grzimek, Ed-in-Chief—Van Nos Reinhold, 1977, 560 p., 500 color plates, drawings, tables, $39.50. Copiously illustrated work describes in detail the theory of evolution, the geological and phylogenetic factors that have influenced the development of all animal species, including man.

EVOLUTION AND ECOLOGY: Essays on Social Transformation—Julian H. Steward; Jane C. Steward and Robert F. Murphy, Eds.—U of Ill Pr, 1977, 412 p., $12.95. Covers the full range of Julian Steward's ideas and theories—cultural ecology, multilinear evolution, the study of regions and societies.

EXPERIMENTS IN ASTRONOMY FOR AMATEURS—Richard Knox—St Martin, 1977, 206 p., diagrams, $8.95. Stressing experimentation and participation, book suggests much practical work, experiments and exercises, using simple devices that the amateur can make, and none which require an expensive astronomical telescope.

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RITES OF PASSAGE: Adolescence in America, 1790 to the Present—Joseph F. Kett—Basic Bks, 1977, 327 p., illus., $16.20. Sociological study describes the world of the young before society defined it in clinical terms, the 19th-century origins of the concept of "adolescence," and analyzes the social and political functions of urban youth, both past and present.

SEX AND THE AMERICAN TEENAGER: The Problems of Adolescent Sexuality and How to Cope With Them in Today's Changing World—Murray M. Kappelman, M.D.—Reader's Digest Pr (Crowell), 1977, 292 p., $8.95. Neither moralistic nor permissive, addressed mainly to the parents of teenagers.

TEN FACES OF THE UNIVERSE—Fred Hoyle—W. H. Freeman, 1977, 216 p., photographs, diagrams, tables, $10.95; paper, $6.95. Astronomer deals from ten points of view with our universe: God's, the physicist's, the mathematician's, the astrophysicist's, the expanding universe, the origin of the universe, nobody's, the geophysicist's, the biologist's, everyman's.

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