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BLOCKS TO CREATIVITY

A psychiatrist talks about the technical life, the problems of technical people, and those neurotic mechanisms which rob us of our creative potential

by Lawrence S. Kubie

IN BRIEF: *In science and engineering, creativity makes extraordinary demands on the human personality. The technical man must be as imaginative and free in fancy as the poet or the artist, but he must also possess the capability of tightly organized thought. Many people never enjoy the fruits of their creative potential. Others achieve success, only to become blocked in their middle years. Why do such things occur? Because the creative process in each of us is vulnerable to distortion and inhibition by the neurotic process. The author says that until we find new ways to educate we shall continue to accentuate these neurotic distortions and hence to inhibit creativity.*

—D.A.

■ The attempt to be creative in any field makes extraordinary demands on the human personality. In science and engineering, creativity demands a flexibility which may be greater than that of almost any other occupation to which man can dedicate himself. The scientist and the engineer must first of all maintain mastery of an enormous body of rapidly growing data yet, at the same time, must be as freely imaginative as the poet, the artist, or the musician. He must also possess the capacity to anchor his imaginative flights to reality, to test the degree to which they are consonant with reality, and finally to project them into the future for new uses. Few other occupations demand so much.

I do not deplore the fact that creativity in science makes this demand on us, but only that we do not recognize its implications for the education of the scientist. I deplore the fact that we do so little to help him attain—as a student, and then as a matured scientist—that degree of emotional stability and freedom which is essential if he is to use his intellectual endowments in the most creative and constructive way possible. I am unhappy at our complacency with a primitive educational process which re-enforces many of the concealed but universal neurotic ingredients in human nature.

This concern leads to two questions: What is it in the educational process which limits and inhibits creativity? And what can be done to change the educational process so as to lessen its damping action on potential creativity? Even before discussing this, however, we must be clear about the nature of the creative process and its inherent vulnerabilities. This can best be approached through a few examples.

There are scientists and engineers who produce brilliantly as students, and even through their graduate years of study, but then collapse. There are gifted investigators who turn out one or two creative achievements early in their careers, but thereafter are never productive again. Others seem to acquire creative freedom only slowly and relatively late in life, and therefore fail ever to win security, tenure, or recognition. Other are consistently and repeatedly successful and productive, but notwithstanding become increasingly despondent and dissatisfied. Some young scientists become blocked after marriage, while for others the reverse is true. Many creative minds go through long periods in which they are barren. For some, these prove to be enriching periods of lying fallow. For others, they are years from which their creative talents never recover. For Mark Twain and for Beethoven such periods were catastrophic.

An early work block may impede a young man's development for years or may destroy him, so that he may never be able to return to his profession. Later in a scientific career, it can turn a promising future into a wasteland. A still later work block may stop a mature scientist so completely that he may have to save himself from scientific oblivion, and his family from want, by turning to teaching, administration, work for a foundation, or even a college presidency.

The outstanding figure in a certain field became scientifically sterile after he had become a full professor and department head. This sterility so embittered him that, although he was a passionately dedicated teacher, he could never allow any student to become creative, to publish, or even to escape from him without a fight. Furthermore, he recommended for im-

portant posts only those who were shaped in his own image and were similarly sterile.

How do such work blocks arise? We know from clinical studies of creative individuals from the sciences, the arts, and engineering, that there is no single cause, just as there is no single cause for fever. But we also know that the creative process in each of us is vulnerable to distortion and inhibition by the neurotic process, re-enforced by neurotogenic ingredients in the educational process.

The neurotic process

What then is meant by the neurotic process? I will not contrast a hypothetical neurotic *man* with an equally hypothetical normal *man*. I will try instead to characterize the neurotic process by pointing out the essential difference between a normal and neurotic *act*. It is important to keep this circumscribed purpose in mind. We must first understand what constitutes the essential disorder of a single act before attempting to characterize a total personality as sick or well.

Every thing which a human being can do can be either sick or well, neurotic or normal. Whether it is feeling, thinking, eating, sleeping, drinking, fighting, killing, hating, loving, grieving, exulting, working, playing, painting, planning, inventing—it can be one or the other. Further, the category to which an act belongs does not depend upon conformity to any cultural norm, nor to whether the act or feeling or thought is intrinsically sensible or foolish, useful or valueless, constructive or destructive. The measure of health is dependent upon none of these criteria. The measure of health is flexibility, the freedom to learn through experience, the freedom to change with changing internal and external circumstances, to be influenced by reasonable argument or by the appeal to emotions and especially the freedom to cease when sated.

The essence of normality is flexibility in all of these vital ways. The essence of illness is the freezing of behavior into unaltering, repetitive, and insatiable patterns. We see examples of such frozen behavior in all creative fields. In painting, we see it in men of worldwide reputations, men who after passing through some inner convulsion of the spirit start on a new "period," dominated perhaps by a new color, or by new subject matter, or a new way of applying the paint, or a new way of stressing outlines, or a new way of distorting proportions, each such innovation soon becoming as rigid as the work of the earlier periods.

Patterns of scientific creativity provide examples of comparable distortions. There is the man whose anxieties compel him always to rush, always to be ahead of time, whose work must always be done long before it is necessary. In his hurry, such a man can barely stop to reflect, to read, to digest, to lie fallow. His opposite number gets to the train only as it is pulling out of the station and can never think about a problem until he is under last-moment pressure. He cannot lie fallow either. In both, the neurotic patterns of behavior exercise distorting influences on the processes of study, of imaginative rumination, of creative experimentation. It cripples the capacity to assemble new data or to arrange old data in new patterns. I think of three scientists of high potential in three different fields whose creative capabilities were distorted by destructive compulsions always and only to criticize. One of the unique honors of science is the humility and honesty with which it tries constantly to correct its own errors. Healthy criticism—of self and of others—is good. But these three men misspent their lives creating nothing, because obsessional mechanisms, driven by unconscious hate and envy, took over the intrinsically useful function of criticism. They did nothing but criticize: today themselves, tomorrow others. The seesaw never ceased.

Another example was a brilliant pharmacologist who tried to establish a hypothesis about drugs and drug action: but his very hypothesis was chosen unwittingly under the influence of concealed neurotic mechanisms, and when he set out to prove it, these same neurotic influences determined the design of his experiments and the techniques he employed. The work on water metabolism of another scientist was skewed by his years of struggle with bed wetting in childhood, and the humiliations to which a scornful father had exposed him.

Neurotic distortions

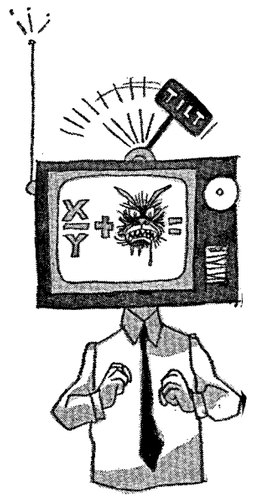
What do such observations say to the old cliché, that one must be sick to be creative? Some psychotherapists hold this view, as do many laymen; yet this culturally noxious assumption is devoid of truth. No culture known to us has succeeded in bringing up children and adults free from concealed neurotic mechanisms. Therefore we have never known creative folk in science or the arts who were exempt. The creative capacity of a few has surmounted this obstacle. But it is a fallacious non sequitur to conclude that without the obstacle they could not have been creative.

The creative potential in each of us is *not* dependent upon nor is it derived from the neurotic potential. But the creative process can be distorted by neurotic mechanisms. These arise in early childhood, not out of exceptional circumstances, but out of simple and ubiquitous human experiences. With age, the conflict between the two processes usually is intensified by later stresses, one of which we euphemistically call "education." And when any man succeeds in being creative, he does this *in spite* of this neurotogenic conflict. Indeed, the conflict between his creative process and his neurotic process causes his actual creative productivity

to fall far short of his potential productivity. That fragment of his potential creativity which survives the impact of the neurotic process is distorted in content and becomes rigid and stereotyped.

The communications machine

Yet there are many complex reasons why the creative person clings to the myth that his neurosis is the source of his creative capacity. Instead of feeling proudly that his creativity is that in him which is unique, he makes light of his extraordinary gift in favor of the rigid, banal, undistinguishing component of his nature: i.e., his concealed neurosis.



The man who is trapped: His preconscious processes cannot function freely, because unconscious processes are dominating his activity. Without realizing it, he will use his special competence and knowledge to express the conflicts of his own spirit. The man may perform creatively, but he does so in spite of these neurotic mechanisms. If he could free himself, he would increase his creative productivity significantly.

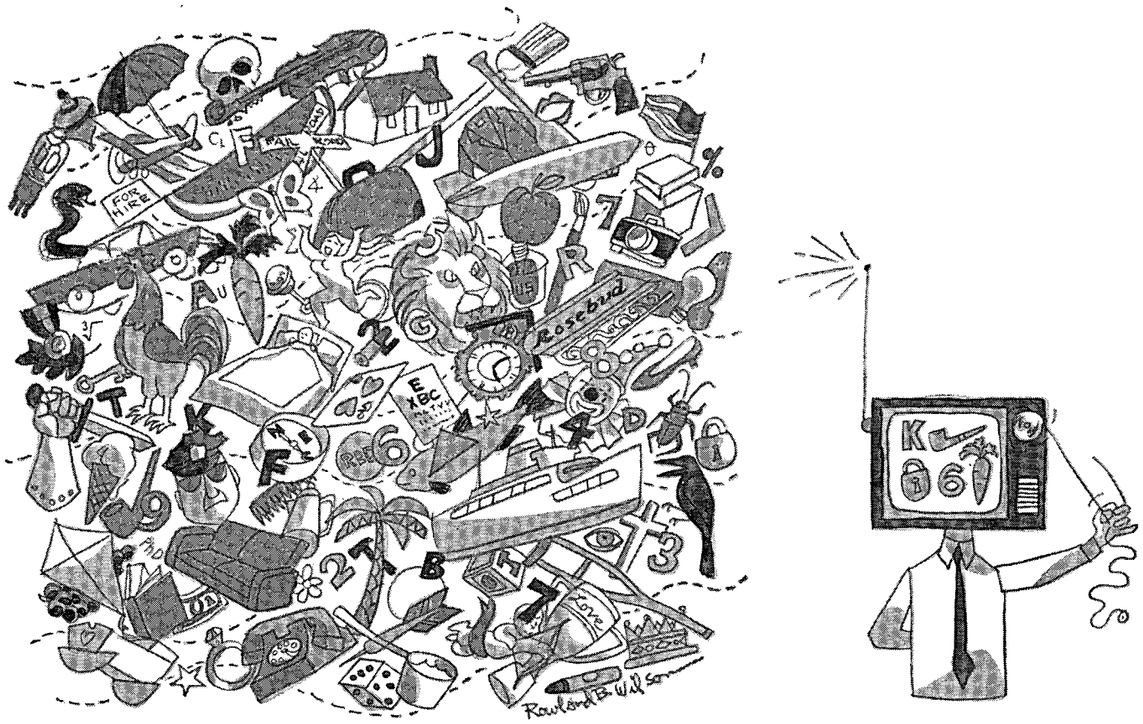
I said earlier that the essence of neurotic illness is the freezing of behavior into unalterable and insatiable patterns. This happens whenever a configuration of psychological processes predetermines the automatic repetition of behavior. How this occurs is a complex story.

There is evidence that our psychological processes represent the interaction of concurrent systems. We call them conscious, preconscious, and unconscious. About their continuous interplay we know that man behaves with greatest flexibility and freedom, i.e., most normally, when the preponderant influence is exercised by an alliance of his conscious and preconscious processes. And we know that he operates in the shadow of illness whenever unconscious determinants are dominant. These may strike you as convenient theories rather than as factual, yet they rest firmly on a large array of experimental and clinical data.

In recent years our concepts of the interplay between conscious, preconscious, and unconscious processes in human psychology have changed in a direction which will lead to more precise clinical and experimental work. We now look upon the brain not as a device to do work but as a communications machine to transmit information. At the core of this process is a continuous stream of subliminal, i.e., "preconscious," activity which goes on both during sleep and when we are awake and is carried on without conscious symbolic imagery. Analogous to a computer, it processes "bits" of information by scanning, ordering, selecting and rejecting, arranging in sequences, by juxtapositions and separations on the basis of chronology, by condensations on the basis of similarity, dissimilarity and contrasts, proximity and distance, and finally summating and coding.

This preconscious processing of data proceeds at an extraordinarily rapid rate and with great freedom, as it assembles and disassembles many diverse patterns. The process is both analogic and digital. Let me repeat that none of this preparation of data is conscious, yet this is what implements the processes of thought.

Furthermore, the stream is fed by a continuous bombardment of messages which are signalled from changes in every aspect of the body's functions. It is fed also by an incessant bombardment of signals from changes in the outer world which reach us through our distance receptors. Therefore, we can divide this input into that which comes from the surface of the body—i.e., the bones, muscles, joints, tendons, skin, and apertures—the input from the internal organs, and the input from a distance. Like the central processing itself, the major part of this incessant bombardment is subliminal. Our highly developed symbolic processes *sample* this entire stream of preconscious activity, i.e., the input, the internal processing, and the output. This *sampling* process is conscious; and it is this conscious sampling of the stream of preconscious input, preconscious central processing, and preconscious output which is always miscalled "thinking." This process of conscious symbolic sampling has an important function in mentation; but it is not thinking. Rather, its function is to relate the samples of the preconscious stream to reality, to test them, to ruminate about them, and to communicate them to others. In turn, all of this is fed back into the preconscious stream itself, where it exercises a continuous cybernetic influence. Note again,



The man who is free: His brain is functioning as a communications machine, processing bits of information by scanning, ordering, selecting, etc. This is preconscious processing and it proceeds at extraordinary speed. The symbols shown on the screen represent a sampling of this preconscious activity. Here, our man is relating this sample to reality: His preconscious provides him with myriad bits; he samples these (a conscious activity), tests them, then back they go into the preconscious.

that learning, thinking, and creating are all preconscious, while this process of sampling, ruminating, testing, and communicating is conscious.

How then do unconscious processes enter this picture? They arise out of distortions of the relationship of conscious symbols to their roots. The symbol itself is never unconscious; it is the link between the symbol and what it is supposed to represent which becomes distorted, displaced, unconscious. This distortion in turn feeds back many secondary disturbances and is an essential ingredient (perhaps *the* essential ingredient) in the neurotic distortion of human nature.

There are many ways of formulating these relationships; but this seems to me to be the one which is most relevant to the problems which confront us here, i.e., the problems of learning and, above all, *the problem of how to protect the freedom of preconscious processing in learning, in education in general, and in creativity.* The freedom which is sought here is freedom from the destructive effects of an "educational" input overload; freedom from excessive anchoring to literal, pedestrian, conscious realities; and freedom from neurotic distortions. This is the great challenge which scientific education (and indeed all education) has never faced in the past but must face now.

Both conscious and unconscious processes are fixed and rigid. The conscious symbol is anchored to literal reality. The symbol whose relationships have become unknown is bound even more rigidly to an unknown. The symbol here is to its hidden root as a delegate who has been sent to a conference table to "negotiate" but with secret orders never to modify his position. We see this stereotyping influence in the works of creative people in many fields —the man who paints the same painting over and over again; the poet who writes and rewrites the same poem; the scientist who grinds the same scientific ax. It is this which leaves its personal signature and accounts for the man who produces only one play, one book, one piece of first-rate scientific work. This is the price we pay whenever unconscious processes hold the upper hand.

The freedom of preconscious functions

How then do creative processes operate between these two rigid systems? This depends upon the freedom of preconscious functions.

This is the implement of all thinking, particularly of creative thought. Preconsciously we process many things at a time. By processes of free associations, we take ideas and approximate realities apart and make swift condensations of their multiple allegorical and emotional import. Preconscious processes make free use of analogy and allegory, superimposing dissimilar ingredients into new perceptual and conceptual patterns, thus reshuffling experience to achieve that extraordinary degree of condensation without which creativity in any field would be impossible.

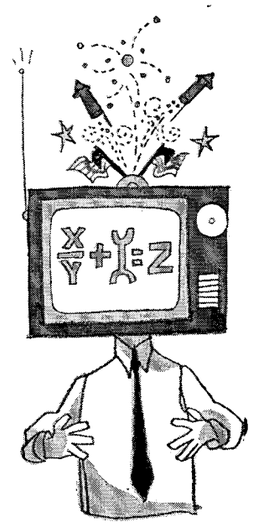
Creativity and the free flow

We must remember always that all three processes act concurrently. Whatever we do, whatever we say, whatever we think—whether we are sick or well—everything is a composite resultant of all three processes. This is true when we dream, when we are creative, or when we are preoccupied with the banal events and affairs of life. The differences are in the relative roles of these components. When a scientist is studying atomic energy or a biological process, when an engineer designs a bridge or a spacecraft, when a classicist studies an ancient language, each deals with his subject on all three levels at once.

On the conscious level, he deals with his subject in terms of communicable literal ideas and approximate realities. On the preconscious level, he deals with swift condensations of their multiple allegorical and emotional import, both direct and indirect. On the unconscious level, without realizing it, he uses his special competence and knowledge to express the conflict-laden, confused, and hidden levels of his own spirit; and to the extent to which unconscious processes dominate his activity, he will use the language of his specialty as the vehicle for the outward projection of his internal struggles. We saw this in the examples cited earlier: The men who did nothing but criticize; the pharmacologist whose hypotheses were chosen under neurotic influences; the scientist whose work on water-metabolism was distorted by childhood problems with enuresis. In each of these the distortions were happening without their knowledge, precisely because unconscious processes had taken over. Each man's creative thinking was being subverted to serve his unconscious needs.

Not only are the products of the preconscious thought stream vulnerable to distortion from unconscious levels, the stream itself must be protected from the same influences, because creativity depends upon its free flow. Let me cite a few examples to re-enforce this point: There is the famous reverie by Kekulé of the six snakes in a ring, each swallowing the tail of the one ahead, an image which illuminated for him the structure of the benezene ring. There is Otto Loewe's account of the derivation of the whole neurohumoral concept from a dream. There is Poincaré's solution of a mathematical problem during a state of reverie on a bus.

Such experiences indicate that new syntheses occur when preconscious processes can operate without the restrictions of conscious processes and without interference from unconscious determinants. I deliberately plan



The man with an idea: Here he has thought (in the preconscious) and has tested the new formulation (on the conscious level). If his formulation passes the test of reality, he may then communicate it (also on conscious level).

my work to capitalize on it. I usually work on a problem until I am tired late in the evening. The moment my head touches the pillow I fall asleep with the problem still unsolved. Frequently I will awaken two or three hours later —sometimes to find myself in the middle of the very sentence on which I was hung up as I went to sleep—but my head now filled with a rushing tumult of ideas and phrases, a new assembly of the material. I have learned by sad experience that I will have forgotten most of this by the next morning unless I dictate or write a note about it *at once.*

The demands of research

Creativity in technical fields puts many special demands on the individual. In the exploratory phase, i.e., while gathering data, one's observations should be free from preconceptions and preferential biases—and, above all, free from any drive prematurely to systematize the data or to formulate hypotheses prematurely. The work of this exploratory phase requires a free, imaginative, flexible, uncommitted attitude of fact gathering i.e., the attitude in which preconscious functions predominate.

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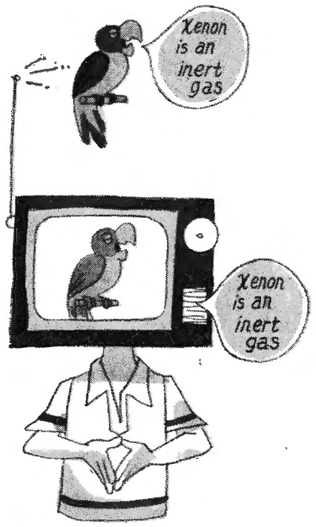

The trouble with education: We still try to educate via drill and grill, wrongly assuming this to be learning. The point is that anybody can be bludgeoned into "knowing" that xenon is inert (which it is not), but that such bludgeoning cripples the mind's creative potential by discouraging true thinking.

Later steps of scientific or technological investigation demand that this material be subjected to more rigidly organized psychological processes, which enable one to test and then to doubt, then to test and doubt again, and then to rearrange the data into new systems. This requires a personality which can doubt on a consciously self-critical level, yet which will not be caught up in obsessional indecision.

The work of the man who becomes trapped may suffer in various ways. One man cannot rest until a pseudo-solution is in his hand. Like the kleptomaniac, he may be forced by phobic and unreal anxieties to attempt to increase his feelings of certainty by falsifying data even after fully convincing evidence is already in hand. Another is afraid to find answers, his terror increasing as he approaches any solution. This forces him to postpone endlessly any definitive conclusion of his work. Or he chooses problems which will take a lifetime to solve. Or he clouds his findings in obscure terminology. Or he refrains from publication altogether.

Clearly, creativity in science and engineering demands flexibility and imaginativeness, but also tightly organized thought processes, matched by a high degree of emotional and psychological freedom. In science, the moment of apparent illumination is never the end of a search. It is always the starting point for new investigation. It provides the scientist with a beckoning goal and an incentive, without which nothing new is ever discovered.

Thus the impact of unconscious conflicts on the creative process are many. If conflicts are buried under distorting disguises they block the flow of preconscious analogic processes which are essential to scientific creativity. If, on the other hand, a scientist understands his conflicts, if they are out in the open, he can use them. They may spur him on. They become a supplement to, but not a substitute for, his fundamental biogenetic and instinctual processes. He guides them, instead of being enslaved by them. The man who lacks such insights is enslaved by his unconscious conflicts and drives. He lives on a treadmill, for he can never finish one piece of research without being seized with terror that he will never be able to complete another. He can never lie fallow, never rest. Without work he is in a torment of anxiety; and complex compulsions take over his normal creativity. "Success" always cheats him, because success never enables him to attain the unconscious goals of his activity. To him it is not the need to solve his chosen problem which drives him, but an unknown necessity. His consciously chosen goal is merely a substitute for these unconscious and unattainable goals. Therefore even when he reaches some consciously chosen goal he feels defeated. He may achieve success by many standards but can never enjoy the achievement. Unless he resolves his inner conflicts, he can never get off the treadmill. In his middle years such a man is likely to become angry and depressed. Indeed, even in spite of any degree of careeristic success, the likelihood of middle-year depressions is greater with him than with others among his peers who were less "successful." And a "nervous breakdown" in such cases is not a result of overwork, but a consequence of a life driven blindly and without sufficient insights.

The educational grind

I spoke sharply of our "primitive" educational practices. I shall make only a few tentative suggestions as to how the educational process might be changed, because I have no easy solutions. My central thesis suggests general lines of research which might lead to new methods.

In varying degrees, individuals need help in acquiring the tools of communication—how to read and listen to words, how to speak and write them. And everyone needs to learn how to resolve unconscious needs and conflicts so that they will not distort the work of the educated eye and ear and tongue and hand. But we do not need to be taught to think. In fact thinking cannot be taught. The function of education is rather to show us how not to interfere with the thinking capacity which is inherent in the human mind.

The free creative velocity of our thinking

apparatus is continually being braked and driven off course by the play of unconscious forces and, unhappily, by conventional educational practices as well. This is because we still try to educate largely by varying degrees of over-emphasis on drill and grill, which interfere with the free play of preconscious processes both in the acquisition of new data and in the free utilization of that data.

When educators challenge us to tell them better ways, our only answer is that we can help them to undertake basic research on the educational process. This can lead to new practices which will leave our basic tools free for spontaneous use: basic research on how to impart new information without crippling the mind's creative potential.

This is a general educational problem; the fact that it has not been solved does not imply that we know nothing. We know for instance that thinking and learning are not performed consciously. Let us not minimize the importance of this fact, which challenges all traditional approaches to teaching—approaches based on the misleading assumption that we think and learn consciously.

The truth is that we learn preconsciously. The input of fragmentary perceptual data from the world around us is overwhelmingly preconscious. This constitutes an incessant subliminal bombardment which goes on when we are awake and when we are asleep. The same is true for the most highly organized material. This has been demonstrated by experiments on the learning process under hypnosis, which indicate that our conscious intake is only a small fragment of our simultaneous preconscious intake, i.e., that process of intake and recall which occurs without conscious awareness. Furthermore we know now that what the brain acquires preconsciously it also "processes" preconsciously, which is just another way of saying that all learning and thinking are preconscious rather than conscious processes.

This is not to say that our conscious processes are unimportant. They are important for sampling, checking, correcting, communicating, etc. But this is not thinking. The information we acquire consciously is never more than a weighted sample of the total input. This is one of the most basic facts of psycho-physiology; and it has relevance for all educational processes. Yet it is a fact which is largely ignored by educators. So long as conscious sampling is mistaken for thinking, education will continue to neglect the great preconscious instrument of creative learning. Though we know that all effective recording, processing, and creating occurs preconsciously, we still must learn how to use this instrument. This is the major challenge which psychiatry brings to education.

We can learn new ways of educating only in schools which are both schools *and* laboratories. Just as research is an accepted function of every teaching hospital, research facilities must be attached to all leading public and private schools. The best schools of tomorrow, those which provide the best education, will be those which carry on research every day and all the time in every detail of the educational process. I would like to see such research schools established first in some of our schools of science and engineering, because I believe that the unsolved problems of education can be studied with greater precision here than in other areas of education. Furthermore if we can solve these problems in technical education we will spark similar developments in every other kind of education.

Perhaps there should be a National Institute for Educational Research, paralleling the National Institutes of Health, with experimental schools and laboratories and funds for research. Towards that objective, for which there is an urgent need, the nation's leading schools of science and engineering now have an opportunity to provide a first step—by serving as laboratories in which this work can begin. Perhaps at the same time our technical schools can use this as an opportunity to do something about their high rates of attrition. Also it might help to solve a harder-to-measure problem, to which many engineering educators attest, namely, the fact that creativity so rarely survives the educational grind. If we succeed here, the technical schools will be the site of the discovery of new educational processes by which to protect the free use of our preconscious without crippling our creative potential.

I will conclude with an analogy. The freely gifted athlete can imitate with his body anything he sees anyone else do even once, and sometimes do it better than his experienced model. He will pick up a tennis racket, or skip rope, or put on skates, and in a moment will show natural precision and grace, better than the person whom he has been watching. He has a freedom to move and to put new movements together into new combinations. He does this with confidence, with bodily imagination, and without anxiety. He is like the naturally gifted artist who barely glances at something casually, and then with a piece of charcoal reproduces it automatically and faithfully. Then he can go further: He can take it apart into fragments and play with it, elaborating out of the initial stereotyped and literal image a new production out of the free play of his own creative fancy. There is much evidence that such effortless learning is the best, whether in graduate study or in our first days at school. We should search out methods by which to enable us to acquire our basic tools in this way. This is the challenge which psychiatry brings to technical education.

For further reading, see the reference on p. 85.

TO DIG DEEPER

Where to find more on our article subjects

AIR POLLUTION 22

Begin your foray with Chap. 1, 3, and 5 of *Air Pollution*, edited by Stern (Academic Press, 1962). Then see "The Chemistry of Urban Atmospheres" by Wayne, Vol. 3 of a series of technical reports by the Los Angeles County Air Pollution Control District. For more chemistry check *Photochemistry of Air Pollution* by Leighton (Academic Press, 1961, $11). For meteorology applied to this problem, *Atmospheric Diffusion and Air Pollution*, edited by Frenkiel and Sheppard (Academic Press, 1959, $12). Broader overviews are provided by scores of papers in "Clean Air," the technical hearings (Part 2) held before the Subcommittee on Air and Water Pollution of the U. S. Senate Committee on Public Works in June and July 1964. Also excellent is the report of the Surgeon General to Congress, June 1962, entitled "Motor Vehicles, Air Pollution, and Health." For more recent reports covering all aspects of the field ask Govt. Printing Office or the PHS' Div. of Air Pollution in Washington for lists. Heinen and others of the Chrysler Corp. have authored a series of papers for the *Soc. Auto. Engr.*; contact Chrysler directly. A thorough rundown of industry research is given in a paper by Caplan, "Causes and Control of Automotive Emissions" (*Proc. of the Auto. Div. of the Inst. of Mech. Eng.*, No. 7, 1962-1963).

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The author has written extensively on the subject of creativity. If you wish to read further on the subject of blocks to creativity, suggest you begin with *Neurotic Distortion of the Creative Process* by Kubie (Noonday 213, 1961, $2). Here you will find lucid discussion of the psychodynamics of neurosis and creativity, the interactions between the creative and neurotogenic

processes, and suggestions pertaining to education for preconscious freedom. On creativity in technical fields, suggest you see Kubie's "The Fostering of Creative Scientific Productivity," published in Spring 1962 *Daedalus* (American Academy of Arts & Sciences, 280 Newton St., Boston 46, $2). Also: "Neurotogenic Factors in Engineering Education and in Creative Productivity," published in *Current Developments in Engineering Education* (transactions of Boulder conference, Aug. 1961, write National Science Foundation). And "Research in Protecting Preconscious Functions in Education," a monograph published by Association for Supervision and Curriculum Development (1201 16 St., N.W., Washington).

For more general reading, suggest *The Psychopathology of Everyday Life* by Freud (Macmillan, $4), *Creative and Mental Growth* by Loewenfeld (MacMillan, $7), and *Practical and Theoretical Aspects of Psychoanalysis* by Kubie (Internat. U. Press, $4; and Praeger, paperback, $2).

THE PHOTOGRAPHIC PROCESS 38

Probably the most complete and up to date of the books on the theoretical aspects of photography is the soon-to-be-published third edition of *The Theory of the Photographic Process* (MacMillan, $25). The second edition (1954) was edited by Mees from material supplied by members of the Kodak Research Labs. The third edition, edited by James, is expected out this fall. *Fundamentals of Photographic Theory* by James and Higgins (Morgan & Morgan, 1960, $7.50) is a less detailed explanation that covers much of the same ground. For a more specialized treatment, see *Photographic Theory* (Focal Press, 1963, $21) edited by Hautot, a series of lectures (about half in English, others in French or German) given at a NATO summer session at the University of Liège by specialists from several countries.

To probe deeper into the ca-