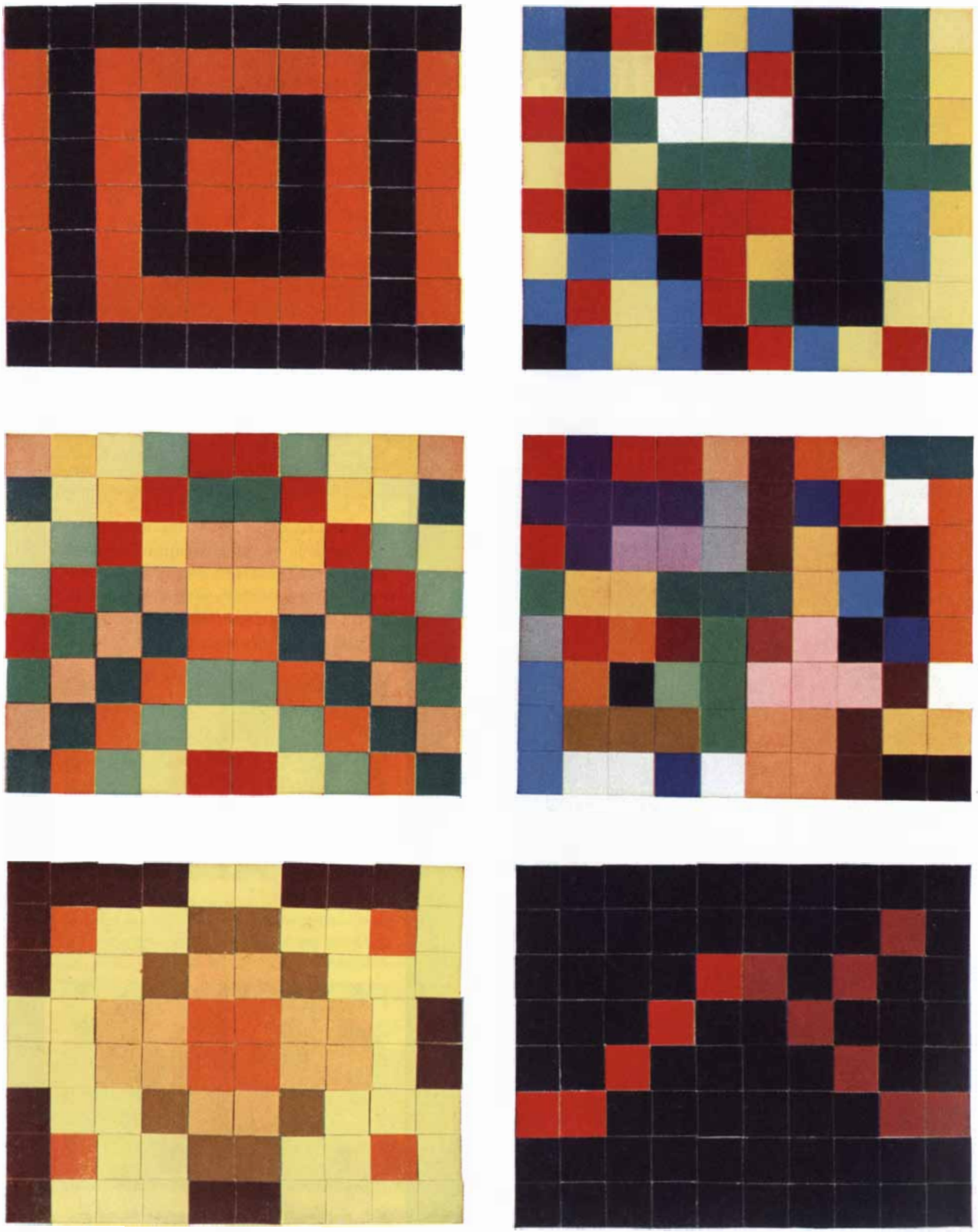


MOSAICS WERE CONSTRUCTED by subjects in a study of creative individuals undertaken by the Institute of Personality Assessment and Research of the University of California. Each of the relatively regular mosaics at left was made by a student who was chosen at random. Each of the more imaginative mosaics at right was made by an individual who was judged highly creative by his peers.

The Psychology of Imagination

Creativity has recently become the subject of formal study by psychologists. An account of one such study, which set out to ascertain the characteristics of creative individuals

by Frank Barron

By his imagination man makes new universes which are "nearer to the heart's desire." The sorcery and charm of imagination, and the power it gives to the individual to transform his world into a new world of order and delight, makes it one of the most treasured of all human capacities. Indeed, when we imagine divinity, we impute to it the power to have imagined *us,* and by an act of will to have created us. Ever since man became conscious of himself, imagination has had in it something of mystery and magic, and has seemed a process which cannot be completely understood.

Against this background of a somehow desirable and proper mystery which surrounds the creative act, it is perhaps a bit brash to undertake a scientific study of imagination and originality. The psychological research institute of which I am a member, however, has done just that, and for the past eight years we have been concerned to discover what kinds of individual possess in high degree the powers of constructive imagination and original thought.

If the undertaking seems brash, the techniques of study are modest enough, and in eight years of work we cannot claim to have greatly diminished the mystery. The best that can be said is that certain uniformities do seem to characterize highly original scientists and artists, and that these uniformities have suggested speculations which may provide the basis for further empirical investigations.

In this article I shall describe a study (for which I have been primarily responsible) of the characteristics of a large number of individuals in a group including painters, writers, physicians, physicists, biologists, economists and anthropologists. This is only one of several projects now under way at the Institute of Personality Assessment and Research of the University of California. The other projects are a study of distinguished American architects (carried on by Donald W. MacKinnon, director of the Institute), an investigation of conformity pressures and the response of creative individuals to demands for conformity (the work of Richard S. Crutchfield, associate director), a study of research scientists and engineers (headed by Harrison G. Gough) and a study of creative mathematicians, both men and women (under the direction of Ravenna Helson).

The way in which the common human need for order is related to the constructive possibilities and fruitful chal-

SUBJECT MAKES A MOSAIC at the Institute of Personality Research and Assessment. In the background another subject takes a different test. Between the two subjects is Barron.

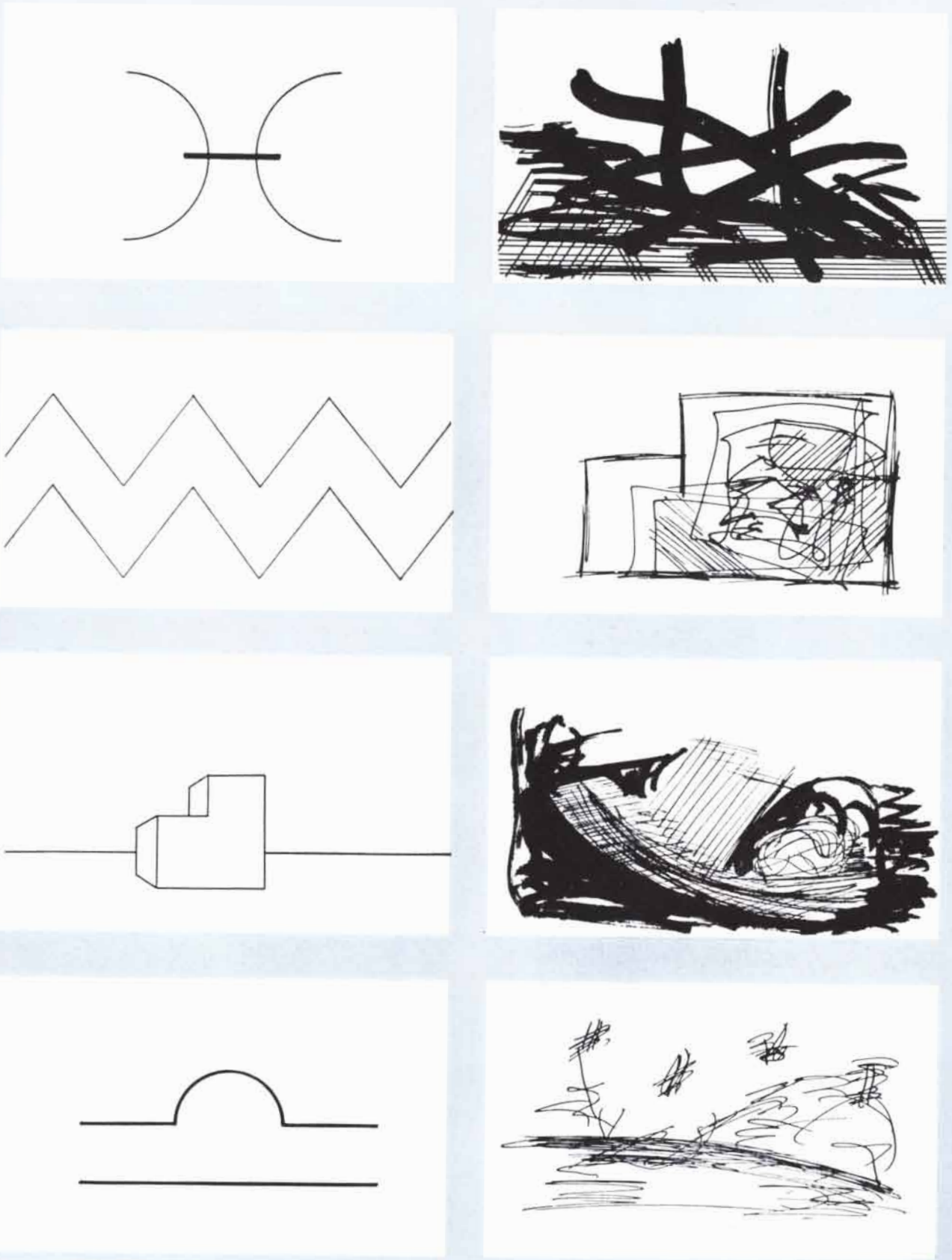


FIGURE PREFERENCE TEST required that subjects express a preference, or lack of preference, for abstract line drawings on cards. Subjects chosen at random tended to prefer drawings such as the four at left; creative subjects, drawings such as the four at right. The drawings are from the Welsh Figure Preference Test, published by the Consulting Psychologists Press of Palo Alto, Calif.

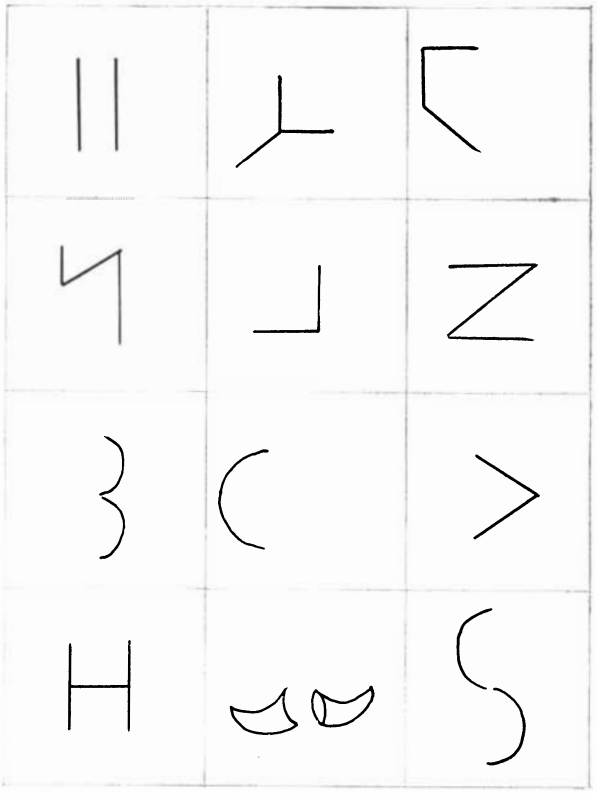
lenge which may be found in apparent disorder provided the focus for an early series of our experimental studies at the Institute. One dictionary definition of disorder links it to such terms as "confusion, neglect of rule, irregularity, disarrangement, tumult and disease." There is little doubt that most people dislike being confronted with disorder. In individuals who turn out original work in science or in art, however, a reversal of the usual attitude may be observed.

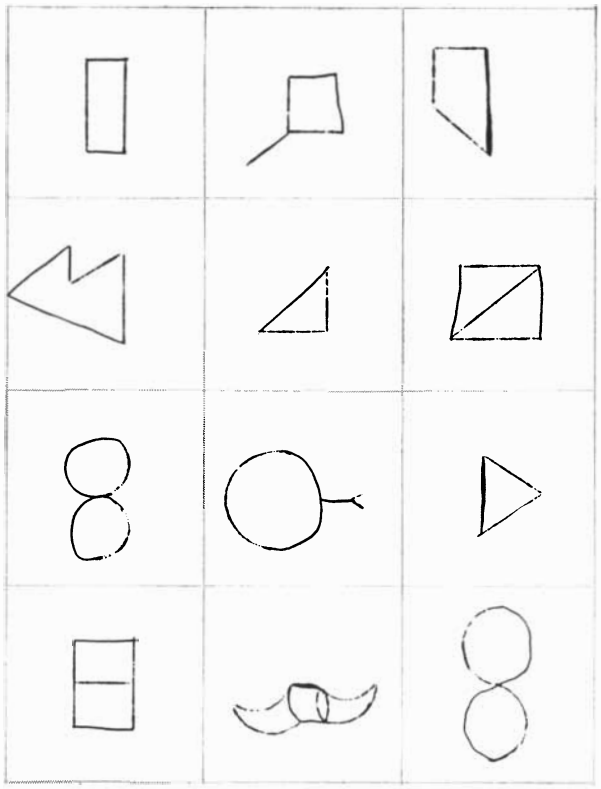
My own initial observation of this reversal occurred in a study of esthetic preferences and esthetic expression in individuals whose relative degree of originality could be estimated. The materials used in studying preferences included abstract line drawings, colored reproductions of several hundred famous paintings, architectural designs, and cartoons. In the study of expression we confronted the subject with incomplete drawings which he was to complete as he liked, written images from which he was to construct a poetic metaphor, inkblots of ambiguous form which he was to interpret, colored pasteboard squares from which he could assemble a mosaic of his own design, and stage properties from which he was to create a scene on a miniature stage.

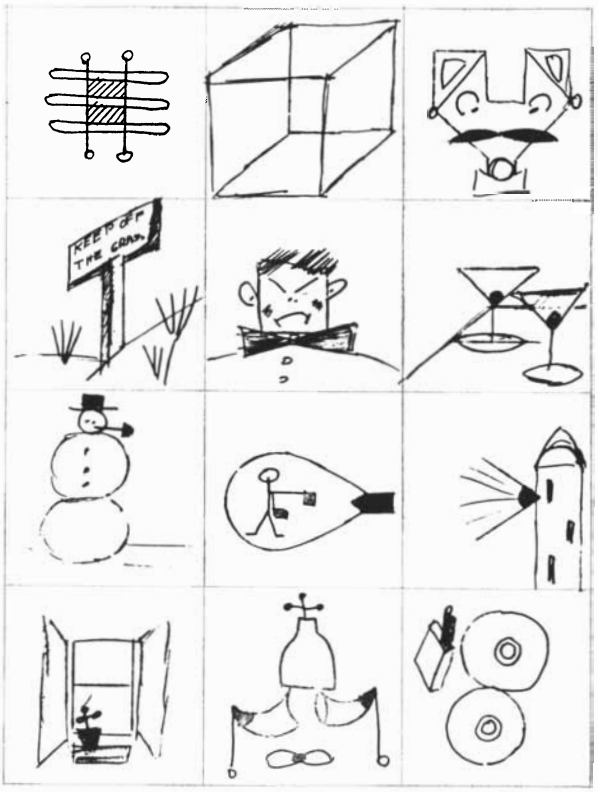
The degree of creativeness of the individuals was estimated on the basis of opinions ventured by their colleagues or by experts in their medium of expression. These estimates we related to their preferences and performance as indicated by our tests. Our purpose was to determine how creative people respond to order and disorder, and whether their response differs from that of others.

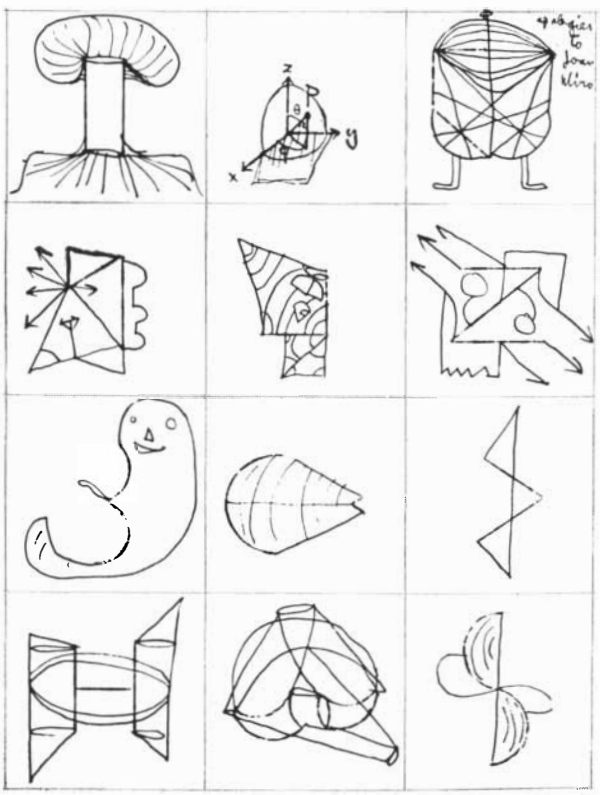
To take one example, the abstract line drawings were made in black ink on three-by-five-inch white cards, and they were varied primarily in terms of the degree to which they were drawn according to a geometric principle visible at a glance. The simplest forms were the straight line, the circle, the square and the triangle. Complex polygons presented a somewhat less obvious principle of construction, and arrangements of curves a still less obvious principle. At the other pole from the simple geometrical figures were drawings which appeared to be childish scrawls or totally unarranged scribbles. When we asked the subjects to describe these figures, they applied such words as regular, neat, clean, orderly and static to the simple geometric figures, and such words as irregular, messy, whimsical, dynamic, disorderly and chaotic to figures at the other extreme.

The first group of subjects studied









DRAWING-COMPLETION TEST, devised by Kate Franck, required that subjects elaborate on the simple figures at top left. At top right is a typical response of a subject chosen at random. At bottom left and bottom right are the responses of creative individuals.

with these drawings, which are part of the Welsh Figure Preference Test, were some 80 painters from New York, San Francisco, New Orleans, Chicago and Minneapolis. The painters showed a marked preference for drawings which were complex, asymmetrical and, in their terms, vital or dynamic. They also displayed considerable tolerance for drawings which most people would consider chaotic. In general they expressed what can only be called aversion for the figures which were simple and obviously symmetrical.

We then presented the same drawings to doctoral candidates in some dozen teaching departments, primarily in the faculty of science, at the University of California. The candidates had been separated into two groups, the more original and the less original, on the basis of faculty ratings. We were somewhat surprised to discover that the more original scientists expressed preferences very similar to those of artists.

In preference for paintings, too, the more original subjects were inclined to like best the apparently unbalanced. Impressionism, cubism, abstract expressionism—these were the schools of painting whose products they preferred. What they seemed to like was the work of art which accented some usually unobserved aspect of nature, or which attempted a radical reconstruction of the common-sense world of reality.

The same tendencies were apparent in the tests which require active expression rather than mere preference—the completion of line drawings and the construction of mosaics. Original individuals were disposed to introduce asymmetry and complexity into their drawings and mosaics.

Behind this inclination to like and to construct what is not too simply ordered there appears to be a very strong need to achieve the most difficult and far-reaching ordering. When confronted, for instance, with the Rorschach inkblot test, original individuals insist to a most uncommon degree upon giving an interpretation of the blot which takes account of all details in one comprehensive, synthesizing image. Since some of these blots are quite messy, this disposition to synthesize points up the challenge of disorder. It also illustrates the creative response to disorder, which is to find an elegant new order more satisfying than any that could be evoked by a simpler configuration.

Another psychological trait which is commonly associated with originality of thought is independence of judg-

COMMON RESPONSES

1. SMUDGES
2. DARK CLOUDS

UNCOMMON RESPONSES

1. MAGNETIZED IRON FILINGS
2. A SMALL BOY AND HIS MOTHER HURRYING ALONG ON A DARK WINDY DAY, TRYING TO GET HOME BEFORE IT RAINS

COMMON RESPONSES

1. AN APE
2. MODERN PAINTING OF A GORILLA

UNCOMMON RESPONSES

1. A BABOON LOOKING AT ITSELF IN A HAND MIRROR
2. RODIN'S "THE THINKER" SHOUTING EUREKA

COMMON RESPONSES

1. AN AFRICAN VOODOO DANCER
2. A CACTUS PLANT

UNCOMMON RESPONSES

1. MEXICAN IN SOMBRERO RUNNING UP A LONG HILL TO ESCAPE FROM RAIN CLOUDS
2. A WORD WRITTEN IN CHINESE

INKBLOT TEST required that subjects describe what they could perceive in formless blots. Sample "common responses" were given by subjects chosen at random; "uncommon responses," by creative subjects. This version of the Rorschach test was devised by Barron.

ment. This trait has been studied experimentally by Solomon Asch at Swarthmore College [see "Opinions and Social Pressure," by Solomon Asch; SCIENTIFIC AMERICAN, November, 1955]. Both in Asch's subjects and in those who took part in a modified version of the Asch experiment in our own studies, a clear relationship has been established between independence of judgment and originality.

Asch's basic procedure has been to place an individual in radical conflict of judgment with other individuals who are understood by him to be possessed of no special information, but who are in fact confederates of the experimenter. The apparent experimental task is to match the length of a given line with one of three other lines which are not equal to one another. The confederates of the experimenter announce their judgments one at a time, and always in the same order. The individual who is not aware of the real nature of the experiment is placed so that he is one of the last to respond. On most of the trials the experimenter's confederates give answers which conform to the length of the lines, but on some trials they consistently give prearranged false answers. The uninformed subject then has a choice of giving the correct answer or contradicting the evidence of his senses and going along with the others.

Asch found a rather disconcerting readiness in his subjects to abandon the evidence of their senses and to bow to the prearranged group consensus. However, about 25 per cent of the subjects in the undergraduate groups he studied were not swayed by the false consensus, but persisted in giving the correct answer. Although Asch was not primarily interested in the personality characteristics of independent and yielding subjects, he made available to me for personality testing a group of 42 subjects who had remained independent and another 42 who had yielded consistently to the false group consensus. Among the opinions expressed significantly more often (in response to a true-false type of questionnaire) by the independent subjects were the following:

1. I like to fool around with new ideas, even if they turn out later to be a total waste of time. (True.)

2. The best theory is the one that has the best practical applications. (False.)

3. Some of my friends think that my ideas are impractical, if not a bit wild. (True.)

4. The unfinished and the imperfect often have greater appeal for me than

the completed and the polished. (True.)

5. I must admit that I would find it hard to have for a close friend a person whose manners or appearance made him somewhat repulsive, no matter how brilliant or kind he might be. (False.)

6. A person should not probe too deeply into his own and other people's feelings, but take things as they are. (False.)

7. Young people sometimes get rebellious ideas, but as they grow up they ought to get over them and settle down. (False.)

8. Perfect balance is the essence of all good composition. (False.)

These results suggested that the subjects who remained independent were more open to innovation and to the challenge presented by apparent imbalance and imperfection on the surface of things. In addition, when using a self-rating scale which included among other traits that of "originality," the more independent subjects described themselves much more frequently as original than did the yielders. (While at first this might seem immodest, it must be remembered that in the presence of a psychological questionnaire one can feel quite alone.)

In any event, the results suggested the possibility of establishing by experiment that independence of judgment is associated with originality. The relationship has been shown directly by using in conjunction with a modified version of the Asch experiment a set of psychological tests which measure originality. These tests, a number of which have been developed by J. P. Guilford and his associates at the University of Southern California, are designed to elicit novel responses and unusual solutions to problems. While the actual test questions cannot be given here, some idea of their nature may be conveyed with substitute examples. In one such test the subject is given the names of common objects (such as wheelbarrow, light bulb, piano) and asked to suggest unusual uses to which these objects may be put. In another test he is asked to suggest consequences of highly improbable events (*e.g.*, all human beings have suddenly become deaf; an unexplained genetic alteration will result in an average decrease of two feet in stature in the next

STIMULUS IMAGE	COMMON RESPONSES	UNCOMMON RESPONSES
EMPTY BOOKCASES	1. AN EMPTY MIND	1. THE VACANT EYES OF AN IDIOT
	2. A DESERTED ROOM	2. AN ABANDONED BEEHIVE
SITTING ALONE IN A DARK ROOM	1. LYING AWAKE AT NIGHT	1. ONE LETTER IN A MAILBOX
	2. A BEAR IN A CAVE	2. A COFFIN IN AN OPEN GRAVE
SOUND OF A FOGHORN	1. A BELCH	1. THE CRY OF DESPAIR OF A GREAT UNSEEN ANIMAL
	2. A FROG'S CROAK	2. A PUBLIC ADDRESS SYSTEM ANNOUNCING DISASTER

SYMBOL-EQUIVALENCE TEST requires that subjects respond to a "stimulus image" presented by experimenter. Common and uncommon responses are listed at center and right.

generation; one nation in the world has found a way to raise its average I.Q. by 50 points). Other tests include anagrams (scored for rarity of proposed solutions), inkblots (scored for unusual interpretation), pictures of dramatic situations which serve as the starting point for storytelling (rated for originality), and plot situations for which titles are to be constructed (rated for cleverness). Judging by our results so far, individuals who regularly perform in an original manner on these tests are also independent in judgment when put under pressure to conform to a group opinion which is in conflict with their own.

Independence of judgment is linked not only to originality but also to the generalized preference for asymmetry, apparent imbalance and complexity described earlier. Subjects of the original Asch experiment were given the figure-preference test, and to a marked degree the independents preferred complex, asymmetrical figures. This makes sense, since in order to maintain his independence in the experiment the subject must come to terms with the troublesome fact that he is suddenly at odds with his fellows in a situation where, by ordinary standards of community of experience, he ought to be in agreement with them. Only a person who can live with complexity and contradiction, and who has some confidence that order lies behind what appears to be confusion, would be able to bear this kind of discord. There is a strong temptation to resolve the confusion and to end the pain of contradiction in a simple way, by denying the facts that conflict with the consensus. Order is thus achieved by a process of exclusion of evidence, and, in this instance, at the cost of correct judgment.

The relationship of creativity to psychological health and to peace of mind and body has long been argued. It was my pleasure recently to participate in a conference on the goals of psychotherapy, in which a number of extremely amiable psychoanalysts, psychiatrists and psychologists found themselves in considerable agreement about the goals of therapy, and, by implication, about the characteristics of a psychologically healthy human being. The traits most commonly mentioned as indicating a state of psychological health were: (1) accuracy of perception of reality, (2) stable body functioning and freedom from psychosomatic disorders, (3) absence of hostility and anxiety, (4) capacity for friendly and cooperative relations with other people, (5) spon-

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TEST WORD	GENERATION
COMMON SOLUTIONS	NATION
	RATE
	GENE
UNCOMMON SOLUTIONS	ONAGER
	ARGENTINE
	ERGOT

ANAGRAM TEST required that subjects find other words in a test word. They could rearrange the letters in the test word.

taneity and warmth, (6) social responsibility. An excellent combination, I said to myself. However, as I continued to listen in comfort and mild edification, I suddenly realized that my thoughts had drifted off to a description I had recently read of Robert Hooke, the brilliant 17th-century scientist whose achievements place him second only to Newton among his contemporaries, and whose prolific originality in experimentation has remained unsurpassed. Hooke suffered throughout his life from severe headaches, from indigestion so troublesome that he noted gratefully in his journals any meal that happened to agree with him, from giddiness and insomnia, and from fearful dreams during the few hours a day he was able to sleep.

Images of other figures drifted through my mind: of the apocalyptic rages of Beethoven, the savage indignation of Jonathan Swift, the terrible loneliness of van Gogh, the criminality of Rimbaud, the shameless preenings of Baudelaire, the stoical despair of Emily Brontë, the excruciating physical and spiritual pain endured by Heine. I felt distinctly uneasy; could it be that these creative people had been in need of psychotherapy?

Certainly one difference between them and the perfect product of psychotherapy and the happy life was that they did not *manage themselves* very well. I began to feel that some of the ideals we had been discussing were rather mechanical. The correct perception of reality, in the superficial sense of the term, began to lose its charm. The ideal of adaptation suggested a well-adjusted, frictionless machine, tended in genial fashion by a little mechanic known as

the strong ego, or the self-esteemed self, or the voice of reason. I had heard warmth mentioned, but not heat; spontaneity, but not passion. No one had spoken of willfulness, fierce self-assertion, hatred of an established order. These are often the stamp of the creator, and, if adaptation and maturity in human relations are the essentials of psychological health, then the creative genius is frequently not healthy.

But one cannot readily abandon the idea that to create is in some sense—perhaps in the best sense—to be healthy in mind. Yet how can the maladjustment of many great creative minds be reconciled with the assertion that they are in some respects unusually healthy?

Perhaps some light is thrown on the matter by our finding that creative individuals are more at home with complexity and apparent disorder than other people are. In the evolutionary sense, the most advanced adaptation of the human organism is the faculty of conscious attention. This faculty subsumes discrimination, memory, reflection, judgment in the service of prediction—we have come to call it the ego. We associate the ego with order; the unconscious with disorder. Turbulence and instability characterize the organization of ideas and impulses which are outside conscious attention. The creative individual, in his generalized preference for apparent disorder, turns to the dimly realized life of the unconscious, and is likely to have more than the usual amount of respect for the forces of the irrational in himself and in others.

This respect consists in a faith that the irrational itself will generate some ordering principle if it is permitted expression and admitted to conscious scrutiny. To put the matter more strongly, I believe that the creative individual not only respects the irrational in himself, but courts it as the most promising source of novelty in his own thought. He rejects the demand of society that he should shun in himself the primitive, the uncultured, the naive, the magical, the nonsensical; that he must be a "civilized" member of the community. Creative individuals reject this demand because they want to own themselves totally, and because they perceive a shortsightedness in the claim of society that all its members should adapt themselves to a norm for a given time and place.

When an individual thinks in ways which are customarily tabooed, his fellows may regard him as mentally unbalanced. In my view this kind of imbalance is more likely to be healthy than

unhealthy. The truly creative individual stands ready to abandon old classifications and to acknowledge that life, particularly his own unique life, is rich with new possibilities. To him, disorder offers the potentiality of order.

I would propose the following statements as descriptive of creative artists, and perhaps also of creative scientists:

Creative people are especially observant, and they value accurate observation (telling themselves the truth) more than other people do.

They often express part-truths, but this they do vividly; the part they express is the generally unrecognized; by displacement of accent and apparent disproportion in statement they seek to point to the usually unobserved.

They see things as others do, but also as others do not.

They are thus independent in their cognition, and they also value clearer cognition. They will suffer great personal pain to testify correctly.

They are motivated to this value and to the exercise of this talent (independent, sharp observation) both for reasons of self-preservation and in the interest of human culture and its future.

They are born with greater brain capacity; they have more ability to hold many ideas at once, and to compare more ideas with one another—hence to make a richer synthesis.

In addition to unusual endowment in terms of cognitive ability, they are by constitution more vigorous and have available to them an exceptional fund of psychic and physical energy.

Their universe is thus more complex, and in addition they usually lead more complex lives, seeking tension in the interest of the pleasure they obtain upon its discharge.

They have more contact than most people do with the life of the unconscious—with fantasy, reverie, the world of imagination.

They have exceptionally broad and flexible awareness of themselves. The self is strongest when it can regress (admit primitive fantasies, naive ideas, tabooed impulses into consciousness and behavior), and yet return to a high degree of rationality and self-criticism. The creative person is both more primitive and more cultured, more destructive and more constructive, crazier and saner, than the average person.

When the distinction between subject (self) and object is most secure, the distinction can with most security be allowed to disappear for a time (as in mysticism and in deep love). This is based on true sympathy with the not-

self, or with the opposite of those things which comprise defensive self-definition. The strong self realizes that it can afford to allow regression, because it is secure in the knowledge that it can correct itself.

The objective freedom of the individual is at a maximum when this capacity exists, and creative potential is directly a function of freedom.

Among the creative people my colleagues and I have studied during the past years has been a group of writers of considerable distinction. We were not surprised to encounter rather spirited objections from some of the writers whom we decided to ask to make a contribution to the study. In trenchant and not particularly orderly prose, about a fifth of those who responded to our initial letter pointed out the intrinsically evil character of psychological research. The objections to such research are mainly on these counts: it is vivisection; it is an expression of the effort of organized society to encroach upon the individual and rob him of his freedom; it is presumptuous because it seeks to describe and to understand what is intrinsically a mystery. Psychological diagnosis is, moreover, a form of name-calling; it is a way of having the last word; it does not respect the individual. Finally it is the present seeking to impose itself upon the future and to perpetuate the *status quo* through techniques which will identify the potentially constructive deviant and permit a stultifying society to control him.

Since psychological research at its worst may indeed be destructive in just such ways, socially responsible psychologists have reason to sleep almost as uneasily as socially responsible physicists. This particular study has proceeded in recognition of some of the dangers which may be inherent in it, and it has been able to proceed because most of the creative writers who have been asked to participate have been willing to trust the investigators and to accept the inevitable hazards of all efforts at increasing knowledge. Both scientists and artists have something to fear when they embark upon the unknown. In his *Life of William Blake* Alexander Gilchrist records three lines from Samuel Palmer's account of a conversation with Blake about the latter's designs for Dante's *Inferno:*

"He said he began them with fear and trembling.

"I said, 'Oh, *I* have enough of fear and trembling.'

" 'Then,' said he, 'you'll do.' "