basis of a premission of all this cortical frontal tissue by ideational, emotional processes that are concerned with psychosis. In other words, we could think of it in terms of pathological growth as in a hernial sac, shall we say, where it is largely cut off from contact with the normalizing process that keeps a person in relation to reality. Such a large segment of the brain itself—does not have to limit it to the frontal lobes—is concerned with the psychotic process, that obviously the response to the environment, such as may be manifested by social activity or response in the intelligence test, would be definitely impaired on a functional basis, but nevertheless impairment. That indicates a reversal process, just as you used it in connection with alcoholism. I think it is more serious than in that connection, often more lasting, or irreversible, because of the persistence of the psychotic ideational patterns after the lobotomy has been performed. I would like to say that in some instances, particularly in those cases that are characterized by persistence of severe hallucinatory experiences, the psychotic process seems to have escaped from the frontal lobe entirely.

To what other place I don't know, but the persistence of the hallucinatory psychosis after a radical frontal lobotomy or the persistence of a complete catatonic state after a radical bilateral lobectomy seems to me to indicate that there must be inclusion in this pathological process of reverberating circuits of other parts of the brain than the frontal lobe. The participation is so intense as to prevent adequate functioning of the remainder of the brain. When it cannot be reversed by any procedure, then you have deterioration of the brain.

GRUNDEAD. I am worried, just as Dr. Mettler is, about your use, rather loosely, of these various mixed-up mixtures of anatomic psychological concepts, and I don't know that I can understand that you have any mechanism, even though you are using what looks like a mechanistic term. For example, this one that you used of the psychoses escaping from the frontal region, and the other one—and Kahlis was using it, too, a good deal—this business of reverberating circuits. That is all very nice. Reverberating circuits are present in the lowest level of the spinal cord and all that you have got is an added complexity, many more of such things. You are not saying anything specific when you use the word "reverberating circuits" because every part of the brain, in the cerebellum, for example, is a marvelously reverberating circuit system. It has lots of circuits in it which are reverberating. What does that get us, or where?

WITTENBERN. To repeat the question—"What does it get us?"—with respect to a slightly different point, we use the words "loss," "deterioration," and "regression." About the only sure thing that seems to be implied in the use of these words is that at this time the patient's performance is not so good in some respect as it was at some earlier time. Then in some special circumstances we may say that a patient who never gets well is a patient who has deteriorated. But always that particular use of the word "deterioration" occurs after the fact, and it seems to me that this particular distinction is useless unless we are willing to follow this thing through and set up some kind of research whereby we endeavor ahead of time to predict those people who won't get better or recover this loss, no matter what happens to them. If you can make such predictions, you can justify your use of the word "deterioration" in the special, irrevocable sense. If you cannot predict where these irrevocable trends are, then I think you are deceiving yourself in using the word "deterioration" in an irrevocable manner.

Creativity in Psychosurgery Patients

By Joseph Zubin, Ph. D.

Our purposes are (1) to define creativity in such terms that it can be subjected to scientific observation and possible measurement, (2) to indicate techies which have been used or could be used in the study of creativity, and (3) to present the preliminary results of a study of the effects of psychosurgery on creativity as defined in this paper.

Definition

Of the many psychological functions which have been attributed to the frontal lobes, creativity is
perhaps the most baffling to investigate scientifically. It seems to exist as an all-or-none phenomenon, apparently not subject to quantification. To say "slightly creative" is apparently as much a misnomer as to say "slightly pregnant." Since our general purpose is to study changes in creativity, its alleged nonquantitative character presents considerable difficulties. In addition there is no general agreement on the earmarks of a creative achievement.

Creativity basically belongs to art rather than to science, and its intrusion in our discussions is a reminder that the line of demarcation between art and science is not as definitive as some would presume it to be. To demonstrate what he means by creativity the artist can point to products of his genius and contrast them with lesser productions. The scientist cannot satisfy himself with such global demonstrations and seeks to define the essence of creativity. As a result, the artist can make himself understood quite readily to most people while the scientist, in trying to grasp the essence of creativity, gradually lets it slip between his fingers. When he emerges with his definitions, hardly anyone, himself included, seems satisfied. Yet, without such attempts at definition, our entire conference would be useless, since there could be no precise communication possible, and no progress in understanding.

Our first problem is then to define creativity in such a way that it can be treated scientifically. While we do not believe that our definition is all inclusive of the variegated aspects of creativeness, as a working hypothesis we shall define creativity as: the capacity for utilizing one's past experience imaginatively, for the construction or development of new ideas, concepts, or products, not heretofore known to the producer, which lend enjoyment of an aesthetic, utilitarian, or other variety to himself and his fellows.

It should be noted that creativity is defined as a capacity, not as a demonstrated ability. The distinction between these two concepts is important. By capacity we mean a hypothetical potentiality that cannot be measured or observed directly, but can only be inferred from the ability which the subject exhibits in his performance. Two individuals may have the same capacity for creative work, yet their demonstrated ability may differ considerably because of differences in training, experience, health, or other factors. If the less creative of the two gains in experience, in training, or in health, the barriers to his expected creativity are eliminated and he can take his place with his peers in creative results. By separating capacity from ability in this manner, we can deal more adequately with temporary lessening of creativeness in depressions, psychoses, and similar phenomena, and with possible increase in creativeness when anguish or anxiety is lifted from a patient. Since creative ability is subject to such variation (while creative capacity is presumably invariant), it is important to investigate the factors which may influence this ability, and control or measure as many of them as we can in our investigation of the effect of psychosurgery on creativity. A knowledge of these factors may also help to explain why creative ability is sometimes apparently lowered in persons of high creative capacity and sometimes apparently raised in persons of presumably low capacity.

Creative ability does not exist independently. It is dependent on at least four underlying abilities. These are: (1) Imaginativeness, (2) pattern of skills, (3) problem-solving ability, and (4) zeal. Imagination refers to the capacity for unfettered fantasy and free association, which permits one to utilize previous knowledge, information, and skill in the solution of novel problems. Perseveration and rigidity represent one extreme; daydreams, autisms, and flight of ideas represent the other. By skill we mean the special abilities which are required to carry out a given plan of action once the idea becomes available. By problem-solving ability we mean the kind of creative synthesis of imagination and skill which permits the execution of the novel act or the creation of the new concept. This problem-solving ability may perhaps be the most essential element in the creative process, but without the help of the other factors it can operate only in a vacuum, giving rise to Mieawberisms or casuistry. Zeal has been defined by Landis, Zubin and Mettler (1950) as ardent enthusiasm and active interest, a trait which according to some investigations is interfered with either temporarily or permanently by psychosurgery. Defined more broadly, zeal refers to the motivations, drive, tension, internal needs, and persistence required to overcome the inertia and inhibition which prevent the imagination from roaming over all the different possibilities, and the pattern of skills from executing the concepts produced by the interaction of imagina-
tion and problem-solving abilities. Alan Gregg in a humorous vein has recently defined a zealot as a person who redoubles his efforts when he has lost sight of his aim.

This by no means exhausts the factors that may operate in the creativity syndrome. One well-established concept not already mentioned is that of an "incubation period," which refers to the time elapsing between the beginning of attack on a problem and its solution. This period is lengthened by fatigue, alcohol, and lack of flexibility. In our terms, the incubation period reflects the greater zeal or, in some cases, temporary abandonment of zeal and postponement of effort which has to be exerted when certain inhibitory elements interfere with imaginativeness and problem solving. It is quite likely that the mentally ill suffer their greatest defect in these two areas, and for this reason their incubation period for problem solving may be unduly lengthened or indefinitely protracted. If their anguish or anxiety can be allayed, however, their creativity, if everything else remains unchanged, ought to be increased rather than decreased. That some patients show a burst of creativity after psychosurgery has been reported by several workers. Perhaps the allaying of anxiety and the removal of other inhibiting factors may be responsible for this phenomenon.

In addition to zeal, imaginativeness, skill, and problem solving, one suspects that there must be another factor, something still undefined which triggers off the creative effort. There are individuals who possess all the prerequisites and yet are not creative. What this "enzyme" of creativity is, and whether it simply represents a proper balance between the underlying factors, remains to be determined.

Technics for Study

Earlier studies.—Previous investigators who made frontal attacks on the problem of creativity utilized the Rorschach test as a means of determining the degree of creativity exhibited by a given individual. The special feature of the Rorschach which is supposedly related to creativity is the M (movement) response. Consequently, attempts have been made to verify this claim of the Rorschach by contrasting "creative" with noncreative people. Our psychology department has guided four such studies during the past several years. In one, the paintings of children were rated for signs of creativeness by experts and this creativity rating was related to the movement score on the Levy Movement Blots. In a second study the creative graduate students in the Department of English at Columbia University—students who had published prize-winning novels, poems, and plays—were contrasted with their less gifted but equally intelligent colleagues. In a third study a similar contrast was made in the Department of Mathematical Statistics. And in a fourth study, the artistically gifted students at Meredith College, N. C., were contrasted with their less gifted but equally intelligent sisters. In none of these studies did the movement score on either the Levy Movement Blots or the Rorschach test reveal a significant difference. It must be concluded that creativity is not reflected in the M response. Recently Anne Roe (1946) verified these findings in further studies of outstanding artists as contrasted with less gifted men. For this reason, the over-all measure of creativity which the Rorschach claimed to provide had to be discarded and a more analytic course pursued which took into consideration the four factors that underlie creativity.

Preliminary screening.—Attempts were made to obtain an objective measure of each of these factors to determine which aspect, if any, seems to be altered by psychosurgery. A preliminary survey of the patients in the Columbia-Greystone project indicated that very few had sufficiently outstanding talent to bring them within the boundaries of even the lower levels of creativity. A screening battery was developed to discover what talents or special abilities existed in the sample of patients who were to undergo psychosurgery and in their controls. The first test in this screening battery was a series of simple drawing tasks in which the patient was asked to draw on a sheet of paper the following objects: a square, house, box, ball, tree, girl, flower, hammer, brush, and plate. This is essentially a simple test of graphic expression which permits an assessment of such simple factors as space cutting, line quality, organization, as well as of bizarre qualities which a patient may exhibit. These tasks, simple enough so that even the least endowed patients could perform them, may therefore represent the simplest level of special ability or talent. This test is designated as the graphic expression test.

In order to tap the quality of imagination, several cards of the TAT series were administered and a simple series of questions were designated.
as the “Three Things Test.” This test consisted of asking the patient to name three examples of each of the following categories: (1) Impossible things, events, or acts; (2) most wonderful things; (3) most frightening things; (4) things you wouldn’t want to happen to you; (5) most exciting things; and (6) the three best things. This constituted the minimal screening battery. In addition, the majority of the patients were given the Levy Movement Blots and the Color Test which attempt to gauge certain personality aspects of behavior allegedly related to creativity.

In selected cases, global tests of creativity were given. An adaption of the Wartegg test (Horn-Hellersberger) provides the subject with a few key lines which he is to integrate into a complete drawing. It seems especially promising since it taps the ability to integrate imagination with concrete stimuli provided by the key lines and hence may be an index of the integrative aspect of creativity which we have designated as problem solving.

A similar test of painting was administered to one patient and special tests of dress designing, piano playing, and diet making were given to suitably selected patients.

Two special tests of imagination were utilized in selected cases: The Productive Thinking Test and the What Would Happen If... Test. The Productive Thinking Test* attempts to gauge flexibility of thinking by providing the subject with some novel situations and requesting as many different possible effects as he could imagine on society, family life, individual well being, and other topics. For example:

Developments in nutrition laboratories have resulted in a palatable, highly concentrated food, each unit of which contains the equivalent of a balanced meal. The food requires no preparation, comes in a variety of flavors, and costs less than half of a home-prepared standard meal. Write down as many ideas as you can.*

In the What Would Happen If... Test,** the patient is asked to respond to a variety of items of the following type: What would happen... (1) if no one was ever punished (2) if nothing was ever the same (3) if no one was ever alone, and the like.

In addition, special ability tests of drawing,

*Test of Productive Thinking, Psychological Corporation, 1942.
**Adapted from test devised by Dr. Silvan Tomkins, Princeton University.
and no discernible difference could be noted. The navigator was able to solve navigation problems with equal facility before and after operation. The dress designer seemed to do as well before as after operation. The dietician also showed no change in his ability to prepare diets. The musician made a recording of her playing before operation but we have not yet obtained a postoperative recording. The needlework of one patient seemed to be much poorer after operation. But our observation extended for only 3 months.

A court stenographer was given a soundcriber recording of a jury trial and asked to take it down in shorthand and then transcribe the material. In the 3-month follow-up her performance was poorer than in the preoperative test. But no further follow-ups are available at the present time.

The only objective test which seemed to show a decline persisting as long as 3 months was the Productive Thinking Test. This test will be repeated a year after the date of the operation to see whether the defect is still present.

These results are to be regarded as tentative since in the time available only a superficial analysis could be made of the data. It is planned to make more systematic analyses of each of the tests and each of the patients when more time is available, and to follow them up at annual intervals to note further changes.

Previous studies.—There are only a few experimental studies of creativity following psychosurgery. Hutton and Bassett (1948) in a preliminary study administered the following tests to leucotomized patients: Rorschach, TAT, Raven projection test, story telling, and line drawing. They concluded that the operation did not affect the technical knowledge, practical ability, and persistence of the patients, since many of them returned to their previous jobs and were as efficient as ever. The changes which were found in the test performance were attributed to either deficiency in imagination or loss in emotional motives and to their associated judgment of value. This study, however, was conducted within 6 weeks to 2 months after operation and defects that were noted may be attributable to the temporary postoperative effects.

Ashby and Bassett (1949) selected as a sample of creative ability a task which "depended essentially on the patient's ability to add to a painting imaginative details which are neither present in the example provided, nor suggested by the experimenter." The actual procedure consisted of asking the patient to copy as exactly as he could a simple colored painting. Then he was given the mere outlines and contours of the picture and asked to paint the picture again, but now to paint it as he "would like to see it." The difference between the second picture and the first was then rated on several variables and was taken as an index of creative ability. This procedure was to have been followed before operation and after operation; in this way an objective index of change would be obtained. In the actual study that Ashby and Bassett conducted, no preoperative data were available. Instead a control group was utilized of 25 normal individuals and also 25 mental patients who were matched as closely as possible to the group undergoing the brain operations.

The products of these 75 individuals were scored for 5 characteristics: (1) Accuracy, based on the copy itself, covering 9 specific points regarding the exactness with which the first painting was reproduced; (2) creative ability, based on the ability to vary from the given example by the introduction of some new elements, such as design, shading, alteration of color scheme; (3) annihilation, the tendency to paint out objects, a negative trait from the point of view of good performances; (4) persistence of previously appearing colors—another negative trait; and (5) omission—another negative trait.

The results indicate that the creativity index failed to differentiate between the leucotomized patients and their matched psychotic controls, although both were significantly different in creativity from the normals. In only one variable did the leucotomized patients differ from their psychotic controls, namely, in the degree of accuracy; but in this the advantage lay with the leucotomized patients.

These are only two samples of the attempts to evaluate creativity experimentally in psychosurgical cases and the contradictory results which they gave rise to. The clinical evaluations of the effects of psychosurgery on creativity also differ widely, but there are numerous reports which indicate no apparent deficit. Thus Freeman (1950) reports the case of a toolmaker who was operated on because of a severe obsessional neurosis. This patient finally showed not only good judgment but enough initiative, imagination, and persistence to invent an elliptical wheel-dressing device. Sev-
eral other cases of Freeman showed evidence of constructive intellectual work after operation. Since there were no preoperative estimates or measures of these patients' abilities, it is a little difficult to determine whether or not their creativity was in any way lessened. At least it did not disappear.

Inferences

One should bear in mind that the apparently negative results reported in this preliminary study, in contrast with some previous clinical studies, may emanate from three sources: (1) type of operation performed, (2) type of measure used, and (3) time interval between psychosurgery and testing.

Certain types of operations, especially the radical and posterior cuts, do seem to produce changes not only in the so-called creative sphere but also in the other spheres of mental life. In fact, one of our most gifted patients seems to have suffered from the effects of such an operation and has shown defects in the creativeness tests as well as in specific abilities. It is interesting to note that in our experience creativity is hardly ever affected in isolation. Usually all four factors which underlie creativity, as well as general behavior, suffer together.

Let us now examine the individual factors which underlie creativity to see which of them are invariably affected by psychosurgery. In addition to the specific tests introduced for gauging creativity, the specific factors underlying creativity were also measured by our regular test battery. Imagination as measured in the TAT, Levy Movement Blots, and Rorschach does not seem to be affected. The skills and technics which the patient possessed preoperatively seem to remain with him after operation.

The capacity for problem solving, which is usually tapped by intelligence tests and other higher level tests, has not shown any alteration after surgery.

Flexibility of thinking and behavior, which would be reflected in fuller imagination and quicker problem solving, were tapped in our regular battery and in the productive thinking test. The street-map mazes attempt to set up a rigid pattern of behavior—a left-tending direction of movement. After this pattern is established the degree of resistance toward changing this rigid tendency is measured. This test showed no alteration after psychosurgery. The productive thinking test as reported previously showed an alteration 3 months after operation in several patients, but no longer follow-up on this test is now available.

The zeal factor, which covers such matters as motivation, drive, tension, needs and persistence, has been reported to be sensitive to the effects of operation. Thus far no efficient measures of this factor have been found. In the Columbia-Grey Study II study and in the New York State brain project an attempt was made to measure this factor by means of the free versus the forced-work technic. This technic compares the effectiveness of forced tempo of work of the assembly-line variety with the free tempo which is established by the worker himself. In normal individuals free work is only 90 percent as efficient as forced work. In the mentally ill and defective the ratio may drop to as low as 10 percent. Psychosurgery, however, showed no alteration in this function. It may be concluded that the objective measures of zeal that are available showed no change as a result of psychosurgery.

The drop in anguish which occurs in some of the recovered cases—which may or may not be the direct effect of the operation—may also release imaginativeness and zeal. This may be the cause of the outburst of creativity which Reitmann (1947) has reported.

Summary

We have defined creativity for the purpose of our investigation as a capacity for utilizing one's past experience imaginatively for the construction or development of new ideas, concepts, or products, not heretofore known to the producer, which lend enjoyment of an aesthetic, utilitarian, or other variety to himself and his fellows. We have postulated four basic factors which underlie creativity: Imagination, problem solving, skill, and zeal, and have provided several tests for measuring creativity globally and its underlying variables in isolation as well as in interaction.

The possible effects of psychosurgery on creativity that may be considered as a result of our analysis are the following:

First, the psychosurgical operation may influence creative capacity directly without influencing creative ability or its underlying components. Since the abilities of mental patients are generally below their respective capacities in general, their
creative ability may also be below their capacity for creative work. The operation may lessen this capacity, but since it reduces anguish, which interferes with ability, the level of ability may actually rise.

A second possibility is that creative capacity may remain unchanged but that creative ability may increase or decrease because of the lowering of anguish or the possible diminution of zeal.

A review of previous studies and clinical reports indicates that much confusion now exists regarding the definition of creativity, techniques for its measurement, and conclusions regarding the effects of psychosurgery on it. Some of the confusion emanates from differences in definition, some from differences in techniques, and some from failure to establish a suitable baseline for evaluation. It is doubtful whether the preoperative level or even the premorbid level of creativity is a suitable baseline for judging the effects of psychosurgery. Perhaps changes in creativity in spontaneously improved patients would serve as better base lines than either the premorbid or preoperative levels.

The preliminary study carried out in the light of the definitions and techniques described in this study indicated that by and large no striking changes in creativity were found. A few patients failed to return to their premorbid level in some of the functions by the end of 3 months after operation. But these patients must be followed up further to determine whether such deficits persist. For the future, a few very creative patients who can be tested by the several techniques suggested in this study and who can be provided with suitable controls should be studied. Such a study, even though limited to a few individuals, would go a long way in answering some of the basic questions raised.

Zorin. Are there any questions on the testing?

Mettler. How did you happen to include a test on navigation?

Zorin. He was a navigator, a first mate, who just happened to tell us that was his special ability. You see we are not tapping creativity in the pure sense. We are satisfying ourselves with the levels of higher skills and special abilities, because creativity was absent. I notice I have not described the patients, but those of you who are acquainted with the Greystone II group and the Rockland group know what patients we have. Greystone II was primarily schizophrenic and Rockland also had long-standing compulsive neurotics, or pseudoneurotic schizophrenics.

Lindsay. Are these drawings [indicating] from the same patient?

Zorin. These are all from the same patient. Here is the tree done in the immediate postoperative period. Here are her free drawings, 3 months or longer after operation. There is your butterfly coming back. "I am washing that man right out of my hair," she says; but these [indicating], they tell me, show a kind of organization, an ability which is quite good and certainly we see no signs of organic deterioration or schizophrenic deterioration in this.

Heath. What?

Zorin. Schizophrenic. I should not mention that word, should I?

Kramer. These patients had some ability when it came to drawing?

Zorin. She had some ability. She preferred to do this.

Grundfest. You did not give her the same test objects to draw?

Zorin. No. We are going to do that. Those were done on her own. She wanted to go into occupational therapy work.

Mettler. (to Dr. Grundfest). That is even more significant because one of the criticisms is that these patients produce only when they are asked to. This material is in some respects more significant than when she does it by herself.

Grundfest. I was thinking of it in terms of judging the same quality, the matter of design.

Zorin. We are waiting for a 1-year follow-up. It is not quite but almost a year now. One hairdresser actually dressed the hair before and after operation and according to the best estimate of people who are supposed to know, no discernible difference could be noted in the hair dressing job. I have the photographs here. You can see that latter point for yourself.

Mettler. When the New York State project was begun we realized that our Greystone I series of cases did not provide an answer to a criticism which had been made; namely, that psychosurgery did not produce ill effects in those persons, because their capacities were so low to start with. Consequently, before the New York State project was started I went to each of the mental hospitals of New York State looking for patients with creative ability. I suppose I should have known then
what I knew when I had finished with the trip, mainly that there are no patients in State hospitals with any high degree of creative ability for a very real reason. That reason is that as long as an individual possesses any high degree of creative ability, this creative ability is so valued by his environment, even though he shows marked deviations in psychiatric behavior, that he can stay out. The number of patients that has been available for such investigations is therefore very small, and such cases do not for the most part fall into the same categories as the other patients in our studies. The particular cases referred to here were, as Dr. Zubin suggests, severely psychoneurotic.

LANDIS. They were neurotic cases that had been under psychiatric treatment for a long period of time and were so badly handicapped by their obsessions and compulsions that they could no longer earn a living. They constituted a special category of patients.

CHRUTCHER. Did I understand you to say we did not have patients with creative abilities in the hospital?

MEYTLER. Not with any high degree of creative ability. The number of such patients that it was possible to discover in the New York State system who fulfilled the requirement of the project was really quite negligible.

CHRUTCHER. The patients did not fulfill the requirements, but I can think of one at the moment whose paintings are displayed all over Cleveland and Columbus.

MEYTLER. I don’t mean that there were not people in the New York State hospitals who had not been creative at one time or another. I mean at the time that they were in the hospital.

CHRUTCHER. They were not creative at that time?

MEYTLER. If they fulfilled the requirement of a 2-year minimum length of institutionalization they were not notably creative. There were several ladies, for example, up at Ogdensburg who played the piano in an indifferent manner, and a judge who wrote poetry in a mid-Victorian fashion, but nothing very remarkable.

KRAMER. Did the age of the people seem to have any influence on creative ability?

ZUBIN. On the outcome of psychosurgery in the Greystone project I there was no relationship to age. Our age range was selective. Maybe when you operate on very old people you get a different result.

GRUNDFEST. I would like to break down something about these factors that Dr. Zubin has been working with. You say that there are no outstanding creative people there, and actually looking at these things, these people are essentially competent craftsmen. In some cases, however, they are not even very competent.

MEYTLER. I did not say that there were no outstanding people in this group.

GRUNDFEST. Nor is it what I said. Dr. Zubin said there were no very creative patients found.

ZUBIN. We could not find creative people.

MEYTLER. You mean in the original survey?

GRUNDFEST. Yes.

MEYTLER. That is correct; but this group is separate from the original survey. These people are not psychotic patients. These patients are not psychotic. They do not belong in the Greystone project. They did not come within the scope of the project.

GRUNDFEST. My point still is that these people would not, from my limited knowledge of these art forms, be considered anything like even halfway good painters or dress designers, or anything of the sort, although some of them show skill. So the factor of skill can be studied here. Problem-solving ability requires synthesis, which is again something like the original one, the first one, imagination—something which may vary in different proportions depending upon the creative activity of the individual—but here skill is probably the one common denominator. I suppose there is some zeal factor too. I think you have the factors for skill and zeal, maybe things which can be fairly easily discovered in this group, but the others probably not. Then there is another group of factors which I think you have not touched on, which has been omitted here. Those are the ones that would strike me as extremely important for really creative individuals; that is, the capacity for criticizing their own work and for being honest about their evaluation of their work and honest about trying to improve it. In other words, a creative individual, a creative artist for example, is very much like a scientist in that they both are experimenters. They both try to do new things and solve new problems. I believe that is something which has to be taken into account if one works with a group of really creative individuals.

ZUBIN. The only comment I can make there is that in my definition of creativity I try to indi-
cate that the product has to be new, novel to the producer rather than to society. So it is possible that these people at their level partook of the nature of creative effort and that that particular aspect of their mental life did not seem to be changed very much by operation. So, although I started out by saying that creativity is of the all or none variety, I might add we also have levels of activity approaching creativity. Certainly this girl showed it in trying to design the dress with the given directions. She made a compromise between what we had told her and the way she felt she should be doing it. She had not only to draw the picture but to select the material, estimate what it would cost, and design the whole job.

GRUNDFEST. That is not creativity. That is something that is taught in the High School of the Needle Trades to thousands of students who do it very much by rote and do it very competently by rote. The creativity in that is something extra.

ZUBIN. I am not arguing that these are creative people of the highest caliber. I think they approach nearer the creative level rather than the routine level.

GRUNDFEST. No. What I am thinking of is that there are certain parts of your vector analysis which can be studied more precisely than others. They do not require really high creativity.

FREEMAN. That article by Hutton and Bassett is a very sensible analysis. I see you follow that considerably in your restatement of the problem.

Ashby and Bassett got off on the wrong foot when they imposed certain conditions or gave certain directions to their subjects: “Copy this as closely as possible,” “draw this as you would like to see it.” Well, that immediately presents a situation imposed from the outside. Probably it had more to do with the creative zeal of the examiner than it did with the patients. The Reitman series of cases came closer to the idea of the creative spell. According to Reitman it was a very temporary thing and once having been completed there were no further efforts at expression in those art forms. There was a fairly definite self-criticism in connection with those productions, but the desire to go forward and produce beyond that was lacking. It seems to me likely that in those cases the individual had been pondering these problems of self-expression through the art medium but had been blocked from performance by the psychotic eruption. When the emotional stress was relieved he could go forward and complete that particular problem that had been absorbing his attention on the fringe of his consciousness. Then, being out of the way, he could relax. To a certain extent that was also true in this tool designer. He never designed or patented another invention. He told us at one time, furthermore, that he had been thinking over this problem for a considerable period of time before his operation but that he did not see how he could get materials of the requisite strength to carry through this particular problem of design. But during the period of recovery from his very severe neurosis the ideas finally fell into place so that he was able to construct this machine and he secured his patent rights on it. He went on with his tool designing but it was largely on the basis of other people’s ideas. In other words, he was a very competent draftsman, but as far as his inventive genius was concerned, it seemed to have been arrested.

ZUBIN. Is that an arrest or perhaps a conclusion of his career as an inventor? After all, inventors don’t keep on going forever, do they?

FREEMAN. His inventive career, let us say, was finished with that piece.

ZUBIN. A comparable nonoperated inventor, would he have done any more than the patient did at his age?

FREEMAN. He was 57 when that occurred.

GRUNDFEST. How many scientists do we see with one paper to their credit and then nothing at all?

FREEMAN. It was a creditable performance and he might have gone farther. Take the case of a schizophrenic school teacher, whose case is being reported in some detail in the second edition of our book (Freeman and Watts, 1950). She had creative ability to a considerable degree. I have a oil painting that she sent to me. She also wrote verse with a certain amount of imaginative flavor. After operation her attempts at verse were pitiful, rhyming “love” and “dove,” that sort of thing. Her performance with the brush and palette was of pretty inferior quality, and I think only one painting was completed. Also, having a certain due regard for her doctor, she made a feetstool in needlepoint, with the figure of a donkey on it, which was executed at about the 13-year-old level. I would say, and then she stopped. Remember, that was a schizophrenic, a severe paranoid, and she is still hospitalized. So, up until recently I was quite pessimistic about the creative ability of pa-
tients after operation. But just last month I called on a lady who had been operated on at the age of 49, a transorbital lobotomy in February of 1946 with an agitated depression going back to 1939. Within the past year she went to art school with her daughter and she showed me a portrait that she had painted. Well, I looked at that portrait and I said, "My gosh!"

She said, "That is a rather nice study of a blind man, isn't it?"

I immediately recognized that it was very characteristic. She caught the expression of this blind man. She pointed to several other pictures that she had painted and she said "That is just magazine-cover art" (which it was). "There is no depth to it."

This is the only instance in my experience in which an individual after operation has taken up a new form of creative artistry. I will grant that there are artists with a cookbook. There are artists with the pencil. There are artists with their feet. One of our girls works regularly at Boston Psychopathic Hospital and takes part in amateur theatricals, and she has on occasion been leading lady. So there seem to be possibilities of artistic creativeness in these patients who have had psychosurgery, but very seldom do they come up to their prepsychotic level.