Testing the Scientific Models for Schizophrenia

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Yesterday we outlined the several approaches to the problem of schizophrenia and ended up with a discussion of some of the developments in the descriptive approaches to the problem.

Since then you have heard the psychodynamic approach and the contributions that schizophrenic art makes to our understanding of the problem.

I have already described to you our systematic structured interviews which we have found to be reliable and whose validity is still being established. In order to arrive at a diagnosis based on this interview, we need some further specification of the types of behavior which we shall classify as schizophrenia. All of you are aware of the fact that today, no common agreement exists universally. What does one do under such circumstances -- The only solution is to try to extract the common elements in all of the proposed definitions and arrive at a quasi operational definition, which though not fully acceptable to everyone and not fully operational, will nevertheless serve as a common specified label-- like a common coin or legal tender. The quasi operational definition which we have used in our International Study is the WHO Glossary provided by the International Classification of Diseases, 8th Ed. -
INTRODUCTION TO THE GLOSSARY

The aim of this glossary is to ensure as far as possible that those who apply it will arrive at a uniform use of the diagnostic terms current in psychiatry. For this purpose it is less important that the diagnostic terms should be "correct" than that like conditions should be classified under the same rubric and that it should be known where a given syndrome or disease is being listed. Well-known instances of the need for such uniformity in interpretation and classification are afforded by the paranoid states, the varieties of depression, the overlapping of schizophrenia and affective psychoses, and the behaviour disorders of childhood.

In order to attain these aims, arbitrary definitions and instructions are laid down. Thus 65 years is the minimum age for senile dementia (290.0); severe paranoid conditions not associated with definite features of schizophrenia are allocated to paranoid states (297). Allowance has, however, been made for strong divergencies of diagnostic practice and outlook, e.g. in regard to the "reactive psychoses". Inevitably, there are difficulties arising from the concurrent use of dual axes, the one concerned with classification by phenomena, the other with classification by causes; an example of this is the allocation of alcoholic psychosis. Here again strict adherence to the guiding rules will minimise discrepancy. The divergent diagnostic status of such conditions as puerperal psychosis or involutional melancholia has similarly been taken into account in the glossary.

Exact or "operational" definition of diagnostic terms is at present in many cases unobtainable because of ignorance and loose concepts; the most familiar examples of this are the basic terms 'psychosis' and 'neurosis', which defy precise definition.
Schizophrenia

Includes a group of psychoses in which there is a fundamental disturbance of personality, a characteristic distortion of thinking, a sense of being controlled by alien forces, delusions which may be bizarre, disturbed perception, abnormal affect out of keeping with the real situation, autism, and nevertheless clear consciousness and retained intellectual capacity as a rule. The disturbance of personality involves its most basic functions which give the normal person his feeling of individuality, uniqueness and self-direction. The most intimate thoughts, feelings and acts are felt to be known to or shared by others and explanatory delusions may develop, to the effect that natural or supernatural forces are at work to influence the schizophrenic person's thoughts and actions in ways that are often bizarre. He sees himself as the pivot of all that happens. Hallucinations, especially of hearing, are common and may comment on the patient or address him. Perception is disturbed in other ways; irrelevant features may become all-important, and, accompanied by passivity feelings, may lead the patient to believe that everyday objects and situations possess a special, usually sinister, meaning intended for him. In the characteristic schizophrenic disturbance of thinking, which is usually prominent, peripheral and irrelevant features of a total concept, which are inhibited in normal directed mental activity, are brought to the forefront and utilised in place of the elements relevant and appropriate to the situation. Thus thinking becomes vague, elliptical and obscure, and its expression in speech often incomprehensible. Breaks and interpolations in the flow of consecutive thought are frequent, and the patient may be convinced that his thoughts are being withdrawn by some outside agency.

Mood may be shallow, capricious or incongruous. Ambivalence and disturbance of volition may appear as inertia, negativism or stupor. Catatonia may be present. The diagnosis 'schizophrenia' should not be made unless there is, or has been evident during the same illness, characteristic disturbance of thought, perception, mood, conduct, or personality — preferably in at least two of these areas. The diagnosis should not be restricted to conditions running a protracted, deteriorating or chronic course.

In addition to making the diagnosis on the criteria just given every effort should be made to specify one of the following subdivisions of schizophrenia, according to the predominant symptoms.

295.0 Simple type

Includes a psychosis in which there is insidious development of oddities of conduct, inability to meet the demands of society, and decline in total performance. Delusions and hallucinations are not in evidence and the condition is less obviously psychotic than are the hebephrenic, catatonic and paranoid types of schizophrenia. With increasing social impoverishment vagrancy may ensue and the patient becomes self-absorbed, idle and aimless. Because the schizophrenic symptoms are not clear-cut, diagnosis of this form should be made sparingly, if at all.

Inclusion terms

Schizophrenia (Dementia praecox):
  primary
  simple (type)
  simplex

Exclude: Latent schizophrenia (295.5)
An example of the usefulness of the new types of interviews combined with the operational definition provided by the glossary is shown by the following analysis based on a paper by Dr. Gurland, head of our Section on Diagnosis and Psychopathology in our Biometrics Research Unit, and his colleagues (1970). By means of our structured interviews, a group of patients was found in both the United States and the United Kingdom whose profiles indicated that they suffered from morbid depression and nothing else! They scored above the mean on the depression scale, and showed no symptoms which would counterindicate a diagnosis of an affective disorder according to the Diagnostic and Statistical Manual of Mental Disorders II or any standard textbook in the United States. They were contrasted with a group consisting essentially of schizophrenics who had to score below the mean in depression but score high on blunting of affect, incomprehensibility of speech, or delusions of control. Alcoholics, drug addicts, and organic disorders were excluded from both groups. These two groups each constituted about 10 to 20 percent of all the hospital admissions in both the United States and the United Kingdom.

In New York only 21 per cent of the morbid depression group were given the diagnosis of depression by their hospital staffs, while 60 per cent were given the diagnosis of schizophrenia, and 19 per cent were given the diagnosis of "other." In the United Kingdom the picture is reversed; 60 per cent were given the diagnosis of morbid depression, while 14 per cent were given the diagnosis of schizophrenia, and 26 per cent
the diagnosis of "other." In both countries morbid depressives are apparently mislabelled to some extent, but the proportion mislabelled is fully 79 per cent in the United States but only half as much (40 per cent) in the United Kingdom.

What effect does this mislabelling have on treatment and outcome? In New York only 50 per cent of this essentially depressed group were treated for depression, while in London more than 84 per cent were thus treated. In other words, half of the morbid depressives in New York missed out on the treatment of choice, while only 15 per cent of the London patients missed their opportunity to receive proper treatment. There is some evidence that the New York psychiatrists were sensitive to the presence of depression in this patient group, but their failure to make a diagnosis of depression rather than schizophrenia produced a situation which denied the best treatment to at least one group of patients. How long can this continue before it constitutes malpractice?

From this study we have learned that we must make greater efforts to develop a more sensible classification system to assure that patients receive proper treatment.
Let us now turn our attention to some emerging trends in descriptive psychopathology (and cross-cultural studies) whose future is still in doubt but which seem to have considerable promise. There seem to be at least five recognisable trends in the area of descriptive psychopathology: (1) new observational and interviewing methods, (2) new dimensional structures underlying the anatomy of psychopathology, (3) new typological approaches, (4) new developments in assessing normative aspects of patient behavior, and new, relatively culture-free, experimental techniques that differentiate schizophrenics from normals as well as provide fractionation within the schizophrenic group.

With regard to new observational techniques and interview methods, we have already pointed out the development of the systematic structured interview. Similar developments have occurred in the area of observation of ward behavior (Burdock and Hardesty, 1968). These techniques have paid off in drug research because the direct observation of patient behavior in the ward through the eyes of the ward personnel (attendants and nurses) often reveals behavioral changes which go unnoticed during the interview session with the psychiatrist or psychologist. Another advantage of focusing attention on specific behaviors is the establishment of specific targets which can be repeatedly observed in time. Essentially, this is the basis of behavioral diagnosis following Kanfer and Saslow (1965).

The object of behavioral diagnosis, like that of conventional clinical diagnosis, is to classify patients for the purpose of prognosis and, more important, for the purpose of treatment. In terms of the latter goal, behavioral diagnosis is directly oriented toward the elimination of undesirable behavior and the reinstatement of reasonable or well adjusted behavior.
behavioral diagnosis in contrast with a clinical diagnosis depends more on observation of the actual behavior in the situation where it usually takes place. Although some pertinent information can be obtained by means of the clinical interview for purposes of the behavioral diagnosis, most of the information must be obtained by collecting observations relating to the frequency of occurrence of events surrounding the behavior. Such information is not ordinarily kept track of by the patient or even by his relatives and employers. Behavioral diagnosis therefore requires that either the diagnostician himself or some other person — in the case of neurotics, the patient himself, but in the case of the sicker psychotics, the family or attendants around him — observe the patient. Behavior is analysed in terms of the response class to which it belongs, the occasion on which it is seen to occur, and the consequence of the behavior. Such an analysis allows one to determine what in the environment evokes the behavior in question and what in the environment strengthens it. For example, a schizophrenic might report that the voices that he hears occur whenever he is asked to do something he does not wish to do, and the consequence of the behavior of listening to his voices may well turn out to be that he gets out of doing the undesirable task. Another example of a behavioral analysis of schizophrenic behavior might be to determine the conditions under which a particular patient becomes violent and the consequences of that violence. Other kinds of information that are necessary for a behavioral analysis consist of the categories of behavioral deficits or excesses and of biological and social variables which determine the behavior.

No system of classification of the kind which has evolved in clinical
practice has been produced in the behavioral model; behavioral diagnosis consists of categorizing only in terms of the kinds of control exerted over the questionable behavior, and such taxonomies are difficult to achieve. From the point of view of behavioral diagnosis it is important to find out the stimuli that currently control the behavior in question so as to be able to derive a method of eliminating, or otherwise modifying the behavior. Thus, knowing that a particular consequence is produced by the undesirable behavior allows the therapist to have that consequence be contingent on more desirable behavior or to eliminate the possibility of that kind of consequence altogether. Although behavioral analysis is not directed at non-environmental etiology, its objectivity and attempts at quantification make it a rather reliable kind of description to be related to any etiology and its methodology may also be useful for diagnosis directed toward finding physical causes.

We have seen that behavioral diagnosis surveys the field of behavior of a given individual to tease out special types of deviant behavior which characterize him and then, having defined these targets, employs the special armamentarium of behavior modification to eliminate them. Perhaps, because of its specific character, it allows direct, immediate testing of its efficacy more than other systems of diagnosis. By focusing on overt behavior to the exclusion of postulated internal feelings, attitudes, and emotions, it becomes more directly testable. However, it is clear that even such internal behavior as ideas of grandeur could be brought within the scope of the method. If it can be established that these ideas of grandeur are based on low self-esteem, an operant conditioning approach to raising self-esteem
should extinguish ideas of grandeur. By discovering ways of immediately reinforcing self-esteem whenever the patient accomplishes something good, perhaps higher self-esteem can be developed. It would be a mistake, however, to classify the behaviors in terms of the kinds of therapies to which they are amenable (e.g. sensitization), since therapies come and go in accordance with the Zeitgeist. But it would be possible eventually to classify the deviant behaviors in terms of situations in which they are most likely to occur and thus provide an ecological classification for deviant behavior.

Another new development in the descriptive area is the provision of information on patient behavior based on the observations of relatives and important others in the patient's life. Martin Kats has pioneered in this area with some rather striking results in which the patient's behavior in the home as perceived by relatives changed for the better in the hospital in one ethnic group and for the worse in another (Kats and Lyerly, 1963).

Although work in the area of the anatomy of psychopathology as determined by factor analytic approaches dates back to Father Moore (1933) in the 1930's, we have not yet reached a consensus as to final structure. The work of Wittenborn (1955) and Lorr (1953) is outstanding in this area, but the degree of agreement among different methods and approaches, while satisfactory, is not yet high enough to consider the matter finished. One of the problems with the earlier studies is that they were based on global observations of patient behavior over unspecified periods of time, gathered in a variety of unspecified ways. With the advent of systematic structured interviews it became possible to base the interview results on more
objective bases and on better specified uniform time periods of observation. The first factor analyses on such interview results by Spitzer et al., (1967) did not produce any startlingly new dimensions. The more recent factor analysis by Fleiss et al., (in preparation) on the United States–United Kingdom Combined Mental State Schedule has yielded some interesting contrasts.

The Combined Mental State Schedule used by the United States–United Kingdom Bilateral Diagnostic Project consisted of nearly 700 discrete items, over 460 from the Present State Examination of Wing, et al., (1967) and almost 200 from the Psychiatric Status Schedule of Spitzer et al., (1970).

As a first step in the analysis, the items were grouped on purely clinical grounds into 185 clusters of from one to twenty items each. A varimax factor analysis was applied to the set of correlations among these 185 clusters, with rotation only of those factors whose roots were greater than two. \[ \text{Subsequent analyses consisted of assigning individual items to tentative factors, correlating each item with each tentative factor, and possibly reassigning items to new factors on the basis of these correlations.} \]

A total of 25 factors was finally derived. An item was assigned to a factor only if its correlation with that factor was .45 or more, implying that at least .20 percent of the variance of an item was shared with the sum of the other items contributing to the factor. In exceptional cases, the minimum correlation was reduced to .40 to increase the number of items contributing to a factor. To reduce the correlations among the factor scores, an additional criterion for the assignment of an item to a factor was that the square of the item's highest correlation be at least twice the
square of its second highest correlation. Each factor was scored as the
unweighted sum of the responses to the items assigned to it. For scoring,
all items were dichotomized into the presence or absence of the behavior
described, even though some items were originally rated on a scale describing
varying degrees of severity.

Results from two reliability studies are available. In one, some 50
patients were rated by an observer watching, but not participating in the
interview. The median degree of agreement between the interviewer and ob-
server, as measured by the intraclass correlation coefficient, was over .80.
In the second study, about 30, patients were reinterviewed by another
project psychiatrist within a week of the first interview. The median
intraclass correlation coefficient, now measuring the degree of repeat-
interview reliability, was almost .70 (Zubin, 1969).

Probably the most important result of the factor analysis was the
separation of depression and anxiety into two factors. This result is in
contrast to the results of Lorr, who found a single factor on the Inpatient
Multidimensional Psychiatric Scale — anxious introversion — combining
these two dimensions, and of Spitzer, who found a single factor on the
Mental Status Schedule — depression-anxiety — also combining them.

One reason for having found a separate factor for anxiety is that there
were over 50 separate items describing various kinds and intensities of
anxiety; clearly, the more items of a certain kind one has, the greater his
chances of finding a separate factor containing them. Another reason, however,
is that almost all the items in the anxiety factor describe the occurrence of
an anxious response or its avoidance in some specific situation, whereas
there are no items in this factor describing general or nonspecific feelings of anxiety. In fact, the items of the combined schedule which describe somewhat general anxiety correlated higher with the depression than with the specific, situational anxiety factor. Perhaps a reason others have failed to find a separate anxiety factor is that they have not surveyed in sufficient depth the many situations in which anxiety may be evoked nor the many ways in which anxiety may be manifested.

The usefulness of separating depression from anxiety has been demonstrated in a discriminant analysis of psychotic and neurotic depressives. The psychotic depressives tended, as expected, to have higher scores on the depression factor than the neurotic depressives. On the other hand, the neurotic depressives generally scored higher on the anxiety factor than did the psychotic depressives. This occurred in spite of a positive correlation between depression and anxiety.

Other findings from the factor analysis which are being followed up are the separation of reported from observed restlessness; the separation of retarded speech from retarded movement; the separation of delusional from non-delusional grandiosity; and the separation of delusional from non-delusional suspiciousness.

Another emerging trend is typology. In a sense, this is the complement of the dimensional approach, clustering individuals rather than items. Another way of contrasting these two approaches is to regard them as testing the assumption of continuity and discontinuity in the distribution of the observed behaviors. Whether the discontinuity inheres in the behavior of the patient himself, in the interrelationship of his behaviors, or in the observer's judgment of the patient's behavior, are important issues which
have been discussed elsewhere (Zubin, 1968).

No conflict need exist between preferences for the typological and the dimensional approaches. They are tools to be used simultaneously to find more homogeneous groups of patients and then to find better clusters of items characterising the dimensions on which the clustering of individuals was based. In this iterative fashion we may eventually arrive at greater homogeneity in both (in the same manner as the decision tree data was structured in previous sections). The relation between such homogeneous subgroups and our classic diagnostic categories will be most interesting.

This audience need not be reminded, however, that ad hoc clusters based on drug studies, like ad hoc factors based on such studies, have a very short half-life. We need more sophistication in finding the best classification system for behavior, and perhaps limiting such studies to patients only is a major fault. The need today is to develop either new scientific models of a substantive sort or new mathematical models with a specific assumption regarding the distributions of measures, before clustering or dimensional analysis can make any progress (Fleiss and Zubin, 1969).

Another emerging trend is the recognition that counting the liabilities in patient behavior is not enough, just as looking at the liability side of a business ledger is not enough. We must find the assets which turn a gifted individual, despite his psychopathological liabilities into a creative leader. Perhaps one of the most promising leads in this direction is the work of the Sjöbring school at Lund (Sjöbring, 1953; Nyman, 1956). The Sjöbring dimensions seem to distinguish between psychopathology (of the
lesional variety, as they call it) and personality; premorbid personality is not predictive of breakdown but is predictive of the occurrence of cancer (Hagnell, 1966, 1966a). These are striking findings which should challenge our curiosity and make all of us eager to learn the method and to apply it.

I have selected these emerging trends as representative of the new directions in descriptive psychopathology. Although these approaches have yet to prove their final value, they indicate that descriptive psychopathology, like the etiological approach, is not stationary, but apparently teeming with life. While description is only a preliminary step in the search for causes, its interaction with causal research in an iterative way as previously described can redound to the benefit of both.

One of the purposes of descriptive psychopathology is to lay down a basis for prognosis. We have already seen that premorbid personality, at least as measured by the Sjöbring method, is not prognostic of the occurrence of illness. Could it be predictive of the outcome of illness? The only finding that has stood the test of time in prognosis is that good premorbid personality leads to good outcome and poor premorbid personality leads to poor outcome (Zubin et al., 1961). This has prompted me to assume the role of the devil's advocate and deny any value whatsoever to prognosis. I adopt the stance that the duration of mental disorders like that of physical disorders is self-limited either by death, spontaneous recovery, or in some cases by therapeutic intervention. When the illness is terminated — as it is in all cases — the patient returns to his premorbid level. If that was good to begin with, he is said to have recovered. If his premorbid level was poor, what does he have to return to? He will not be regarded as recovered, even if the disease is finished, and he may have a recurrence of another episode.
because of his inability to adjust. In other words, all illnesses have a
good outcome, but the evaluation of the "cured" patient is dependent on his
premorbid status. From this point of view, therapy takes a new stance. It
has to study the premorbid status very carefully and try to develop means
for altering the premorbid personality for the better. This should be the
goal of all therapy.

Regarding the emerging trends in cross-cultural studies, it is
interesting to note that one of the barriers to such studies is beginning
to fall. This barrier has consisted of the absence of any taxonomic approach
to the factors that underlie the ecological forces shaping the niches men
occupy. Our description of the ecological surround in terms of socio-
economic status, educational level, occupation, overcrowding, ethnic origin,
poverty, and other socio-cultural variables has not been fruitful. We are
beginning to analyze these gross ecological features into more meaningful
components. Thus, even within the same socio-economic class, the structural
interconnectedness of family members, neighborhood members and even random
gatherings may differ considerably and the amount of communication within
such groups may vary. Dr. Hammer (1969) has begun to examine the network
of interconnectedness in small neighborhood groups in New York, Vermont, and
London and has applied the close technique to measure the degree of
communicability in such small groups. The role of community disorganization
as measured by Leighton et al., (1963), the role of isolation as measured by
Granick and Mahemow (1961), and the role of persuasibility as measured by
Mahemow, (1963), are some of the important factors that will make cross-
cultural studies more enlightening.
Another emerging trend in cross-cultural studies is the possibility provided by systematic structured interviews of identifying individuals having similar profiles in the dimensions of psychopathology even though they exist in different countries or cultures, as was done in the United States-United Kingdom project. Armed with the possibility of identifying similar patients cross-culturally, the role of labelling, the choice of therapy, and the observation of outcome can be compared cross-culturally to see whether the same patients have identical fates in the contrasted cultures.

We shall now turn our attention to considering the role of the ecological, developmental, learning and neurophysiological approaches to the problem, and some of the research engendered by these approaches.

The ecological model which is built on the assumption that the source of schizophrenia is to be sought in the forces impinging on the ecological niche which the person occupies has been largely in the hands of sociologists and anthropologists. The very first observation on this model is due to Plato who pointed out that only the rich can afford treatment while the poor who must continue working despite illness rarely come to the attention of therapists. Had there been a statistician available he would have reported a positive correlation between the number of patients and socioeconomic class. In modern times negative correlations are usually found between socioeconomic status and rate of schizophrenia, but the early studies in this area suffered from the ecological fallacy of interpreting
the correlation found between averages for groups as the correlation within individuals. Actually, when several investigators examined their data more carefully, they found that the correlation between average rental for an area, the socioeconomic variable, and rate of first admission for schizophrenia was fed by the loners, regardless of whether they lived in plush hotels or in flop houses. However, the preponderance of lone dwellers in flop houses produced the negative correlation. Whether the schizophrenics are created by the low socioeconomic niche or whether they drift into the low status is still a moot question, but recently, the Dohrenwends have begun to test this proposition. They compare the incidence of schizophrenia in old native American groups in contrast with newly arrived immigrant groups. If the drift hypothesis is correct, there should be higher rates in the lower socioeconomic native American group who have either drifted to the bottom or never rose because of a genetic factor, while the rates for the newly arrived are diluted by the presence of healthy individuals in the low socioeconomic levels because they had not yet had time to rise. On the other hand, if environmental stress is the explanation for schizophrenia, the immigrants in the higher socioeconomic status should have the higher rates than their native counterparts, because the former underwent greater stress in reaching the top.
Among the other contributions of the ecological model have been the establishment of the importance of such factors as population density, isolation, educational level, occupation, neighborhood disorganization, in the development of both mental and physical disorders. Just how these factors bring about a mental disorder is still a moot question. They may be necessary but not sufficient even as the tubercle bacillus is a necessary but not sufficient agent in the development of T.B. Among the conditions suspected of being ecologically influenced or even produced are garden variety mental retardation without organic or genetic involvement, and higher rates of schizophrenia in Catholics regardless of their ethnic origin in Canada.

In the developmental model, two examples of its relevance to schizophrenia are as follows: (1) adolescent friendship patterns and (2) adolescent test performance patterns.

Our interest in the adolescent friendship pattern arose from the fact that we wished to determine the type of onset that characterized a given
patient. In an early prognostic study we found on reviewing the literature that insidious onset had a poor prognosis. After searching for evidence of onset in the premorbid period we hit upon the possibility that the adolescent friendship pattern might differentiate the insidious from the sudden onsets. Dr. Dolores Kreisman who conducted this study compared a group of young schizophrenics aged 19-24 with a corresponding control group for their adolescent friendship patterns at 12-14 years of age. On factor analyzing the results of her interview she emerged with the following factors:

1. Sociability (number of favors done for and number of favors done by, best friend; found it easy to go to parties, preferred being with other people).

2. Satisfaction with friendship (feeling of closeness, friend kept promises).

3. Loneliness.

4. Intimacy (best friend confided in him, reciprocal confiding etc.).

The degree of sociability did not differentiate the two groups, but satisfaction with friendship, loneliness and especially intimacy did differentiate the groups. Apparently number of friends and doing favor for and receiving favors from friends was equally prevalent in the preschizophrenics and their controls, but confiding, loneliness and satisfaction differentiated the groups.
One of the hazards that face the growing child "in his transition from pre-adolescence to adolescence is the need to free himself from family dominance and enter the peer group. Friendship is the avenue which permits the transition and difficulties in developing suitable friendships especially those involving intimacy may be the cause, or the product of the insidious process of schizophrenia.

The pattern of psychological test performance was noted in the subjects of Project Talent -- a 5% sample of the high school students of the country.

The students in the high schools in New York State who participated in Project Talent were matched against the list of admitted patients to the facilities of the Department of Mental Hygiene in the State of New York to find out which of the students in 1960 had become psychiatric casualties during the succeeding ten years. Mr. Victor Bergenn who is conducting this study found 166 individuals who had become psychiatric casualties and compared their test performance with the performance of the control group consisting of some 600 individuals matched against the 166 casualties. While the results are not yet fully available it is clear that at least on two factors the casualties differentiated themselves from their normal peers. The first factor was a reasoning factor in which the students in grades 9, 10, 11 and 12 who later became casualties did less well than their normal controls. In another factor, the verbal factor, the pattern was somewhat different. The students in grades 9 and 10 were inferior to their controls while the students in grades 11 and 12 were superior to their controls. Apparently it is possible to detect deviant behavior in individuals who later
succumb to mental disorder and by proper testing and observation, high school teachers could help in detecting and perhaps even preventing the occurrence of such disorders.

Other suspected developmental factors in the causation of schizophrenia or schizophrenic like behavior are paranatal difficulties (Mednick & Schulsinger).

With regard to the learning theory model we have already pointed out the role of behavioral analysis following learning principle in describing and modifying schizophrenic behavior. Let us examine the learning theory approach to the causation of schizophrenia. Some of the ritual behavior characteristic of some schizophrenics has been duplicated in animals who receive reinforcement at random and has been labelled as superstitious behavior. A stimulus which merely happens to be present while the organism is behaving in a given way appears, at least in some cases, to acquire control over the behavior in question. Is it possible that delusions are developed this way—i.e. that the individual behaves in the presence of some stimuli as if they possessed characteristics which they do not in fact have?

Among the other phenomena we might mention with respect to a learning model are hallucinations. (Hefferline and Perera (1963) showed that subjects can be conditioned to respond to a thumb twitch of which they are not aware (as shown by the fact that they cannot report its occurrence), and, what is more relevant to this discussion, they were able to train subjects to respond to a tone which was not there. Their procedure consisted of the following: the occurrence of a tone was first made contingent upon the thumbtwitch (detected electromyographically by the experimenter); then the

\[ \text{[written in an unclear manner]} \]
tone's intensity was gradually reduced until it no longer occurred at all; under these conditions the subject continued to respond in the presence of the thumbtwitch, reporting that the tone was his signal for response. It is of interest to note here that a subject reported the presence of two tones when the experimenter turned on the tone a little too late after the thumbtwitch. In other words, the subject was not able to discriminate between the hallucinated and the actual tone. Certainly this experiment would seem to qualify as a technique for the production of hallucinations by means of a learning model.)

Salzinger has developed similar learning theory based causes of lack of reality, compulsive behavior, bizarre behavior and other manifestations of psychopathology.

The low communicability of schizophrenic speech has been often regarded as an index of schizophrenic behavior and the "cloze" technique method has been used for measuring it. This consists of presenting a class of normal students with the typescripts of schizophrenics' and normals' monologues from which every fifth word has been eliminated. The degree of speech disorder is measured by the number of gaps that cannot be filled correctly. Using speech samples from pairs of schizophrenics and normals matched for educational level, age, and language background, Salzinger showed that the schizophrenics' speech was significantly lower in communicability.

This lack of communicability in schizophrenic speech has been postulated to result from the fact that the immediately preceding word in schizophrenic speech is more influential in determining the subsequent word than the total of the preceding speech sequence i.e. the thought he wishes to express. Thus, as he tries to convey the message "yours is yours and mine is mine," he might be railroaded into saying "yours truly is yours and mine thine
is mine" because the word "yours" has a high probability of eliciting "truly" after it and this probability takes over despite the trend of the thought he wishes to convey, and similarly for mine thine.

The last model we will deal with is the neurophysiological model. All of the emerging trends presented thus far have dealt with culture dependent techniques such as the interview. Since mental disorders can be occluded as well as elicited by the ecological niche in which the individual finds himself, it would be well if we could free ourselves from dependence on culture-bound techniques and develop culture-free or at least culture-fair techniques.

In general, the various aestiological models differ with regard to the tools required for testing the hypotheses emanating from each of them. Thus, the ecological model is usually tested with the culture dependent interviews and observational techniques since these are the only tools now available for estimating the parameters of this model. The developmental and learning models are usually tested by either culture dependent or by culture-fair techniques such as measures of speech communicability (cloze technique) or measures of reinforcement effects. The genetic, internal environment and neurophysiological models are largely tested by means of culture-free techniques. One approach to culture-free techniques is afforded by studying responses of the individual which come within the first 1,000 milliseconds following stimulation. The response comes so rapidly that it may be relatively unaffected by ecological forces.

Dr. Sutton of Biometrics Research was interested in investigating the effect of a subject's shifting attention from a light stimulus to a sound stimulus (and vice versa) on the reaction time. We asked our psychiatric colleague at a state hospital to select newly admitted schizophrenics for
us to test and also asked him to survey the normal controls which we selected from a state employment agency and other sources. We hypothesized and found that the retardation in reaction time brought on by shifting modalities would be longer for schizophrenics. By the time the experiment was finished, we had developed our new systematic structured interviews and naturally thought that we could obtain measures of psychopathology by these instruments. We interviewed the subjects of the experiment and subjected the results to a computer analysis yielding a diagnosis. To our great surprise, half of the patients were not diagnosed as schizophrenic and half of the controls were not diagnosed as normal.

An examination of the reaction time scores indicated that a comparison of the purified schizophrenic group and the purified normal group gave a much clearer separation; furthermore, the variability in both groups dropped considerably. We can now proceed to take schizophrenics who resemble our pure group in their profiles and examine them on our reaction time studies to see if we can validate this finding — and if we find deviants among this group, to see how they differ from the rest. The use of this iterative method of going back and forth between laboratory measures and interviews will produce much more homogeneous subgroups for research and, hopefully, a better selection of treatments.

Another study utilizing the modality switch technique has recently found (Cancro et al., personal communication) that this type of data will differentiate process from reactive schizophrenics and furthermore, will predict outcome (as measured by the number of nights spent in mental hospitals following admission) with a multiple correlation of .79 for
reactive schizophrenics and .55 for process schizophrenics.

Another example of such an approach is afforded by a study conducted at Biometrics Research (Sutton et al., personal communication). They have found differences between schizophrenics and normals in the critical duration of stimulation specified by the Bunsen Roscoe Law or Bloch's Law. According to this law the intensity and temporal duration of stimulation are interchangeable for a brief period of time, i.e., the packaging of the energy (high intensity for short duration or low intensity for long duration) does not influence the response, provided the total energy input (product of intensity and duration) remains unchanged. This critical period, lasting for 13 msecs in normals, is much reduced in schizophrenics, lasting only six msecs. In other words, even though the total energy input remains unchanged, integration of energy over time is incomplete after six msecs in the schizophrenics, as evidenced by an increase in reaction time at six msecs compared to that at four msecs. This increase in reaction time may be interpreted as due to a reduction in the effective energy of the stimulus when the duration exceeds four msecs indicating partial, rather than full sensory integration over time.

Furthermore, the schizophrenics who exhibit this reduction in the critical period tend to exhibit thought disorder in their interview results i.e., they attain high score on this dimension. Here again we have an example of the iterative method in which a clinical subgroup is found to differentiate itself from the rest of the group on a particular psychopathological trait. Now, those suffering with thought disorder who also show the reduction in critical duration can constitute a new more homogeneous group for further
study. It is also interesting to note that schizophrenics are distinguishable from depressives; the latter appear similar to normals.

Perhaps the most exciting application of the neurophysiological model is to be found in the investigation of the average evoked potential in schizophrenics. Just as the EEG tends to reflect spontaneous ongoing brain activity, the average evoked potential reflects the influence of sensory input and the resulting processing of information. Dr. Samuel Sutton, Deputy Director of our Unit has discovered that a special wave form designated by him as P₃, occurring within 300-350 msecs following stimulation, is an index of what the brain does when the mind is characterized by (1) degrees of uncertainty, (2) when it shifts gears from processing one stimulus modality to another, (3) when it is rewarded by success and negatively reinforced by failure in guessing, (4) when the payoff for successful guessing is varied etc. In a series of experiments in which uncertainty, modality shift, correctness of guessing were manipulated, schizophrenics (mostly suffering with thought disorder) had smaller amplitudes than the depressives and these in turn were smaller than those of normals (8.24, 12.2, 15.9 microvolts). When the uncertainty regarding the next stimulus was introduced, the amplitude was increased, since greater information was transmitted by the appearance of the stimulus in relieving the uncertainty, schizophrenics, however, showed a smaller increase than normals and in general were less influenced in amplitude their evoked potential by uncertainty than they had been in their reaction time response. Guessing correctly influenced the AEP more than guessing wrongly and here again the schizophrenics did not show as strong an influence on the AEP as they showed in RT.
Shifting from one modality to another (vision to audition and vice versa) generally increased the amplitude of the AEP, but again while schizophrenics were more affected than normals by the change in stimulus when their RT responses were examined, they were far less influenced than normals when it came to their AEP response.

It is interesting to note that when clinical improvement occurred, the AEP of the schizophrenic returned to normal but drugs such as phenothiazine did not affect the AEP unless they also brought about improvement. The AEP was not only smaller for schizophrenics, but its shape was also quite different. In an experiment in which triplets of AEP's belonging to a normal, depressed and schizophrenic were judged to see which record was the most deviant, the schizophrenic record was chosen as the odd one fully 21/24 or 87.5 per cent of the time.
Summary

In order to develop a common language with regard to diagnosis and classification, operational definitions of the various diagnostic categories were resorted to, based on the WHO glossary. On the basis of this glossary, it became possible to classify the patients in Metropolitan New York and Metropolitan London according to the same system and the results revealed that many more patients in New York than in London are misdiagnosed with regard to the schizophrenia-affective polarity.

Among the trends in the descriptive area, behavioral analysis seems to be emerging as an important new development, by focusing on observable behavior that can be subjected to reliability and validity checks.

A second trend, based on the availability of systematic structured interviews, is the emergence of a new set of dimensions of the anatomy of psychopathology which can now be used to determine the dimensional profiles of various subcategories of psychopathology. Furthermore, the availability of the individual profiles can supply the statistician with the means of grouping or clustering the profiles into subgroups based on similarity of profiles and thus develop a new typology of mental disorder which may confirm some of our current classifications or provide new categories.

Another trend is the search for the assessment of the personality assets as contrasted with the psychopathological liabilities of the patient. The Swedish psychiatrist Sjobring has succeeded in separating personality from psychopathology and the application of such methods to the study of the premorbid personality may provide us with better goals for our therapy. If it is true that all schizophrenic episodes are self-limiting and that
the reason why some patients become chronically ill is due not to the
persistence of the disorder but rather to the return to their poor premorbid
personality when the episode ends; it becomes essential to try to improve
the premorbid personality of such patients.

Turning to etiology, the ecological, developmental and learning
theory models are providing new ways of perceiving the origin of the schizophrenic
disorder and some new tools for testing their hypotheses. Such contrasting
hypotheses as genetic drift vs. life stress in the causation of schizophrenia
are now open for investigation and the importance of friendship patterns
and test-performance patterns in the subsequent development of the disorder
can now be examined.

Perhaps the most exciting new trend is the availability of the average
evoked potential for determining the connection between the mind and the brain.

While the mind is responding with uncertainty, the brain produces
a pattern in its evoked potentials, occurring at 300 milliseconds following
the uncertain stimulus, which characterizes the state of uncertainty. Similarly,
the brain responds to the effect of stimulus shift, reward, punishment and
in general to the salience of the stimulus -- its significance.

Furthermore, the patterns of this brain functioning across the
physiological, sensory, perceptual, psychomotor and conceptual responses
differentiates some types of schizophrenics from others.

What does this all mean? First of all, one can raise the question
as Dubos has done, whether all of our scientific findings have any significance
for the human condition -- and we can go further -- has it any significance
for the human condition known as schizophrenia?
"We know a great deal concerning the physiochemical phenomena that make life possible, and we can formulate reasonable hypotheses concerning their origin and evolution. We can imagine, even though we do not completely understand, how each particular living thing is shaped by genetic constitution, experiences and environment . . . . the physiochemical forces provide (however) only the props and stage machinery. (Dubos )

Thus far we have described the etiological models as blind forces which control man's destiny and to some extent, given the current scene, it is a true picture. For the ecological niche in which man finds himself does determine his well being, his genetic make up does limit his potential, his developmental past and learned behavior do confine his future, his internal environment and neurophysiological make up do control his behavior. And in fact, we might agree with Dubos, that all of these forces are merely the stage props for the drama that man is to enact above on the stage of life. However, we have left out perhaps the most important determinant of man's stage behavior -- his ability to be a self starter, to alter developmental trends, to modify the internal environment as well as his neurophysiological equipment. Unlike other organisms which are shaped by their environment through aeons of gradual evolutionary developments man can shape his own environment if he chooses to do so and has developed the know how to apply changes not only to the exogenous but also to the endogenous environment. It is in these directions that the future of man's normal development as well as the containment and improvement of abnormal development lies. And it need not take aeons to accomplish, for we can produce changes for the better even in our own lives and in our own lifetime. The options that such changes make possible are
the real problem we are facing. How are we to decide what changes to bring about, and where does the moral and ethical imperative come into play? I am afraid that such questions are beyond my ken, and perhaps beyond the ken of science. They, nevertheless, are issues which we cannot help but face and only by increasing our scope to include within our rank philosophers of science and ethical and moral scholars, can we hope to come to any agreement on these issues.

However, despite the fact that the underpinnings of the stage do not control the life drama enacted upon it, there is a faint hope that the underpinnings we have been studying scientifically through reductionism may determine not the content but the form of the drama -- perhaps the underpinnings of tragedies are different from those of musical comedies. Perhaps these simple differences which differentiate the schizophrenic -- his inability to shift as readily, his shorter critical duration, his lower amplitudes in evoked potentials and the different patterns produced psychomotorically as contrasted with perception under the influence of uncertainty, reward, punishment, etc.-- constitute the real building blocks of schizophrenia. He begins to feel different and appears to his friends to be different because of the small discrepancies in his behavior. - Once these differences become recognized by him and by his peers, the rest of schizophrenia begins to develop. - In other words, schizophrenia is "caused" by these small losses of powers in the game of life -- the rest of schizophrenia is merely an epiphenomenon. I realize that this is a highly controversial point of view, but this is what I have come to believe is a possible, though not yet probable, explanation of some types of schizophrenia-- In short - schizophrenia occurs
in a vulnerable individual when subjected to sufficient stressors — and
his vulnerability is detectable in the differential patterns of his central
nervous system.