A BIOMETRIC MODEL FOR PSYCHOPATHOLOGY

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INTRODUCTION

PSYCHOPATHOLOGY has been defined in a variety of ways, but the common denominator underlying these definitions has not yet been discovered. Most people express great surprise when informed that there are certain regularities in the behavior of the mentally ill. The bizarre and impulsive activities often exhibited by psychotics, the sudden onset of the illness and its often equally sudden disappearance or swift progress to a chronic state, give the impression that psychopathology is lawless. Psychopathologists, however, have made a vast number of observations which, upon analysis, demonstrate a regularity and even predictability for certain types of abnormal behavior. Unfortunately most of these observations are highly subjective and based on self-referred evaluations of the observer rather than on objective criteria.
It is our purpose today to suggest a framework, a scientific model if you will, for systematizing some of the regularities which have already been noted. For the facts in this field are multiplying at such a rapid rate that they may become a hazard rather than a help for scientific advance unless some generalizations are harvested. A scientific model capitalizes on the implications of the regularities and invariances already discovered and provides a direction for future experiments.

Science progresses through two complementary processes: (1) observation and (2) schematization, which interact in the production and continual improvement of scientific models.* The scientific model thus serves a double purpose: first, it is a device for arranging observations into an ordered system for easy comprehension, and second, it is a guide or logical mechanism for reaching out into the unknown. Scientific models usually display three major constituents: (1) definitions, (2) assumptions, and (3) propositions. The definitions prescribe procedures which show how the contents of observations are to be abstracted to provide elements for the model. In physics, for example, velocity and acceleration were terms which had acquired conventional definitions. Thus Newton could use them in building his gravitational model of the universe. In psychology, sensation and perception might become such terms if their referents could be restricted by convention to recognized sets of elementary observations. The assumptions used in a model are elementary statements about the terms which have

*For a more definitive discussion of models see references 2, 20, and 22.
been defined. An example is Newton's assumption that the mass of an object can be regarded as concentrated at its center of gravity or that velocity at a point in space can be regarded as the limit of the velocities associated with the vanishingly small regions in the neighborhood of the point. A corresponding psychological assumption is that a sensation is a modality-specific abstract which can be viewed as a limiting instance of perceptual experience.

By systematic application of the assumptions to the elementary terms in accordance with the rules of logic a set of propositions may be evolved. The definitions, in turn, provide the connecting link which permits the propositions to be translated into statements about the real world. Such statements derived from an abstract model represent the predictions or hypotheses which the model offers for experimental verification.

The power of an abstract model is its capacity to generate testable hypotheses, i.e. hypotheses which can be verified by observation or experiment. Since no model includes all the minutiae of the real world, a certain looseness of fit is to be expected between an abstract proposition and the corroborative observations. Statistical theory provides the criteria for determining whether the observed discrepancies are too large for the retention of a hypothesis. A hypothesis that has survived an experimental test is not thereby affirmed; rather its rejection is suspended. It remains on sufferance. A more sensitive test may subsequently lead to its demise or an alternative hypothesis may secure more substantial experimental support, thereby leading to revision of the underlying model or, in the
extreme case, to its replacement by a better-fitting model. Thus, the relativity model proposed by Einstein has replaced the gravitational model proposed earlier by Newton because the data obtained in later and more delicate experiments fitted Einstein's model more closely.*

What has been the history of model-making in psychopathology? Psychopathology is in the same position today that astronomy was before Newton. There is a considerable amount of data of all degrees of reliability. There are the models provided by Kraepelin, Freud, Meyer, and their followers. But the logical approach of theory construction and the observational approach do not mesh. Wittgenstein has pointed out: "The confusion and barrenness of psychology is not to be explained by calling it a 'young science'; its state is not comparable with that of physics, for instance, in its beginnings, (rather with that of certain branches of mathematics—set theory). For in psychology there are experimental methods and conceptual confusion (as in the other case conceptual confusion and methods of proof). The existence of experimental methods makes us think we have the means of solving the problems which trouble us; though problems and methods pass one another by." The current models in psychopathology do not provide sufficiently rigid frameworks for testing their implications through direct observa-

*An eclipse expedition to Sumatra measured the deviation of stellar light under the influence of the sun's gravitational field. According to Einstein's Theory, the relation between distance from the sun and deviation should be a hyperbola. Although the stars showed a large dispersion, when the curve was determined by the method of least squares a quantitative test of the theory was obtained.
tion, and the observations themselves do not provide any systematic cohesion from which theoretical models can be constructed, except in limited areas.

While Newton was faced with the task of integrating the observational data of Tycho Brahe with the geocentric hypothesis of Ptolemy and the heliocentric hypothesis of Kepler and Copernicus, abnormal psychology today has to integrate the observations of men like Kraepelin with the ego-centered hypotheses of Freud and the socio-centered concepts of Sullivan, not to mention the electrophysiological, biochemical, and surgical approaches of modern neuro-physiology and neuropsychology. Newton had to dispose of the anthropomorphic characteristics with which Aristotle had invested earth, water, air, and fire, while modern psychopathologists are faced with a similar problem in dealing with will, motivation, learning, etc. Just what disposition will be made of these constructs, whether they are necessary for the understanding of abnormal behavior, is still a moot question. Abnormal psychology is waiting for its Newton to provide new integrating concepts.

What have been the successful models in psychopathology? Despite our tendency to regard general paresis and pellagra with psychosis, for example, as no longer important in the spectrum of mental diseases, it was but yesterday that they were regarded with the same confusion that now meets the eye in schizophrenia. It is interesting to take a glimpse at the history of these diseases. General paresis was a scourge of mankind for centuries and many models of the mechanism of this disease were constructed consciously or uncon-
sciously in an attempt to explain it. Since nightworkers in restaurants and theaters were more prone to develop general paresis, the “night air” was regarded as a culprit and closing the windows at night was recommended as a preventive. Because actors and artists seemed more susceptible, the emotional experiences that these artists underwent nightly were blamed. Krafft-Ebing reports that one of his students noted that 60 per cent of the patients suffering from general paresis in his clinic had a definite history of infection with syphilis and an additional 20 per cent gave evidence of probable infection. The student, according to the story, concluded that syphilis was the underlying cause. It followed that even those general paretics who gave no history of syphilis must have had the disease and that consequently all paretics should be immune against reinfection. To test his hypothesis he proposed to inject syphilitic matter into nine moribund general paretics who gave no history of previous infection with syphilis. Krafft-Ebing reports that he was at first horrified at the suggestion, but finally consented to the experiment. All the subjects responded to the vaccination with apparent immunity. Thus the infectious disease model was introduced as applicable to general paresis. This evidence was not finally accepted until Moore and Noguchi isolated the spirochete from the brains of paretic patients. In pellagra, similarly, a great variety of approaches was tried until finally the model of dietary deficiency was suggested and found to be applicable. Currently, certain genetic and biochemical causes are being suggested for schizophrenia, but determination of their relevance awaits suitable methods
for testing the hypotheses to be derived from these models. (One hypothesis emanating from the adrenergic model for schizophrenia is that there should be fewer blonds among schizophrenics than in the general population. Among schizophrenics who succumb early in life, this hypothesis seems to hold.) The infectious disease model, the defective nutrition model, and the biochemical model have one useful element in their favor—they are testable—and will soon be found either suitable or unsuitable as sources of further experimentation. There are some models in psychopathology which, despite their heuristic value and despite their great clinical usefulness, have not yet lent themselves to the objective tests which the previously mentioned models afford. The psychoanalytic model, despite its pervasiveness, its acceptance by more than three-quarters of American workers in the field of mental disease and its full-hearted acceptance by anthropology, sociology, and belles-lettres, has achieved few notable victories in science. Its most important contribution perhaps is the catharsis hypothesis for hysteria. The definitions, assumptions, and propositions of the psychoanalytic model have been known for more than fifty years, but not very many experiments have been launched by it. Goshen has already pointed out that though Freud thought he was working with neurotics, actually, most of his cases were psychotic. But his greatest contribution thus far has been for normals. Maybe that is why psychopathology itself has not benefited as much.

Before adding another to the present panoply of models, I shall have to make one detour to examine
the possible relationship between personality and psychopathology. Defining personality as the individual's uniqueness, his style of life, or the integrated resultant of all his propensities which singles him out from the rest of mankind, we might raise the question whether the personality of the mental patient is in any way related, premorbidly or postmorbidly to his psychopathology. That his style of life will be affected by the presence of a mental disease is as true of a schizophrenic as it is of a tuberculous patient. But are there any more general statements that can be made about this relationship? Up until now the tacit assumption on the part of some workers has been that a very definite relationship exists. Kretschner, for example, regards normal behavior as a less extreme and more moderate form of abnormal behavior, thus basing his description of personality on a psychopathological model. But logically there are three possible ways of viewing the connection between personality and psychopathology: (1) that they are identical; (2) that psychopathology emerges from an interference with personality development; and (3) that they are independent of each other. At the present time each of these hypotheses is equally tenable.

Since the hypothesis of independence is in fact the "null" hypothesis, we shall adopt it as our starting point and if the evidence of our investigations contradicts it, it can be discarded. By adopting this model we temporarily discount previous experience encoded in personality as the chief determiner of mental disorders. Instead, we adopt the point of view that current brain function is disordered in a mental illness and
seek for techniques which will assay the present state of brain function in the individual. The objective techniques provided by psychophysics and by psychometrics become our chief tools.

It is interesting to note that it was Binet's influence which drove psychophysics out of psychopathology. But Binet's purpose was to study a general aspect of behavior—global intelligence—and for that purpose physiological and psychophysical measures were of little or no help. Our purpose today is to assay the specific capacities of the organism either before illness sets in, or during its early or later manifestations in order to be able to classify individuals with regard to the type of disordered functioning which results when a given mental disease strikes. Elsewhere,¹⁰,¹¹ I have pointed out how the clinical tests now in use, which are primarily conceptual and heavily dependent on previous experience, fail in dealing with the classification problem.

Here I wish to propose that we return to the time-honored categories of physiological, sensory, perceptual, psychomotor, and conceptual behavior and to experimental ways of eliciting this hierarchy of behaviors.* To some psychopathologists this may seem like turning the clock back to the 1890's but let us listen to one of the "gay nineties" notables speak:

As soon as our methodology has sufficiently proved itself through experience with healthy individuals, it would be possible to approach the actual ultimate goal of these efforts, the investigation of the sick personality, especially

*For a more basic discussion see Burdock and Zubin.*
### Table 1
**Examples of Measurable Activity Related to Behavior Categories and Stimulus Classes**

<table>
<thead>
<tr>
<th>Stimulus Order</th>
<th>I (Disturbances of Homeostasis)</th>
<th>II (Inappropriate Stimuli)</th>
<th>III (Appropriate Stimuli)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level of Observed Behavior</td>
<td>(IDLING STATE) S</td>
<td>ECT; Insulin shock; Lowering of oxygen tension</td>
<td>Electrical stimulation of temporal cortex</td>
</tr>
<tr>
<td>Conceptual</td>
<td>Reverie and Phantasy</td>
<td>Amnesia, Disorientation, Psychological test performance</td>
<td>Memories, Dreams</td>
</tr>
<tr>
<td>Psychomotor</td>
<td>Spontaneous movement</td>
<td>ECT</td>
<td>Seizure</td>
</tr>
<tr>
<td><strong>Perceptual</strong></td>
<td>Spatial and temporal orientation</td>
<td>Mescal</td>
<td>Effect on visual orientation</td>
</tr>
<tr>
<td>Sensory</td>
<td>Background noise; cortical gray</td>
<td>Novocain</td>
<td>Pressure stimulation above retina; Electrical stimulation of thermal receptors</td>
</tr>
<tr>
<td>Physiological</td>
<td>BMR; Basal EEG; Basal PGR</td>
<td>Hyperventilation</td>
<td>Effect on EEG</td>
</tr>
</tbody>
</table>

*Note: BMR stands for Basal Metabolic Rate, EEG for Electroencephalogram, and PGR for Psychomotor Response.*
<table>
<thead>
<tr>
<th>LEVEL OF OBSERVED BEHAVIOR</th>
<th>IV (CONFIGURAL STIMULI)</th>
<th>V (SIGHTS)</th>
<th>VI (SOURCES)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONCEPTUAL R</td>
<td>Aircraft forms or silhouettes</td>
<td>Classical delayed response stimulus in animal experimentation</td>
<td>Word association test</td>
</tr>
<tr>
<td></td>
<td>Recognition of identity of forms</td>
<td>Successful response by animal subject</td>
<td>Association to stimulus words</td>
</tr>
<tr>
<td>PSYCHOMOTOR R</td>
<td>Star-shaped maze</td>
<td>Wagging of tail, nuzzling (dog)</td>
<td>Psychiatric interview</td>
</tr>
<tr>
<td></td>
<td>Mirror tracing</td>
<td>Petting by human observer</td>
<td>Electromyographic response</td>
</tr>
<tr>
<td>PERCEPTUAL R</td>
<td>Visual forms</td>
<td>Usual visual alternatives in animal discrimination experiment</td>
<td>Musical tones</td>
</tr>
<tr>
<td></td>
<td>Discrimination</td>
<td>Selective response of animal subject</td>
<td>Pitch discrimination</td>
</tr>
<tr>
<td>SENSORY R</td>
<td>Patterned light stimuli</td>
<td>Infant's faint cry</td>
<td>Words or sentences</td>
</tr>
<tr>
<td></td>
<td>Visual threshold</td>
<td>Mother's auditory threshold</td>
<td>Visual threshold</td>
</tr>
<tr>
<td>PHYSIOLOGICAL R</td>
<td>Patterned visual stimulation</td>
<td>Bell-ringing in Pavlovian conditioning</td>
<td>Verbal instructions to prevaricate</td>
</tr>
<tr>
<td></td>
<td>Effect on EEG</td>
<td>Salivation</td>
<td>Effect on PGR</td>
</tr>
</tbody>
</table>

By sensation is usually meant the primitive experience-correlate specific to the stimulation of a sensory-modality. Recent advances in neurophysiology seem to indicate that a sensation is a complex event which in
the intact organism includes the following elements:
1. Stimulation of a sense organ or free-nerve ending.
2. Activity of the specific afferent system of a sense organ.
3. Alerting of the organism via the collateral non-specific afferent system.
4. Small nerve fiber efferent regulation of the sensitivity level of the sense organ.
5. Integration of the afferent and efferent systems at the level of the diencephalon.

Sensation is thus an event in the nervous system involving far-flung activities ranging from the periphery to the cortex, but with the focus of greatest intensity in the thalamus. The occurrence of sensation is detected from behavioral signs displayed by the organism and from concomitant variations observed in the sense organ. With humans, the subject's verbal report is regularly employed as the evidence of his sensory experience. The complexity and subtlety of the experimental situation in which sensory activity is observed are often underrated by an experimenter.

It should be noted that pure sensation is a conceptual abstraction, since sensory activity in most instances merges into perception. Nevertheless, in the study of behavior, the sensory components of activity can be distinguished generally from those which are primarily perceptual. By making a simplifying assumption, the experimenter is thus enabled to set limits to the complexity of his task.

Perception has commonly referred to the process by which patterns are experienced in response to receptor stimulation. The perceptual event appears to involve
all of the activity that characterizes sensation with the addition of the large-fiber efferent systems. However, the focus of integration has now moved up to the cortex. Thus, I may have a sensation of light, but I perceive an object. George Herbert Mead's distinction is worth noting here:

One perceives an object in terms of his response to it. . . . It is true of all of our experience that it is the response that interprets to us what comes to us in the stimulus, and it is such attention which makes the percept out of what we call "sensation." It may well be that the distinguishing aspect of the behavior of an abnormal subject is in his selection of what he will attend to in an experimental situation.14, p. 114

Whether attention* is a function which the patient is somehow in control of, turning it on or off in what one might call voluntary fashion or whether there is a sort of automatic screening device which places out of focus or inhibits the registration of inputs that are not prepotent, is an important problem for psychopathologists. Hernández-Peón, et al.8 have observed that in the cat there seems to exist a focus which automatically inhibits a previously ongoing registration of auditory input in favor of a prepotent visual stimulus (mice).

Psychomotor tests evoke from the subject a per-

*As Mead 14, p. 25 has pointed out: "Our whole intelligent process seems to lie in the attention which is selective of certain types of stimuli . . . we open the door to certain stimuli and close it to others, but our attention is an organizing process as well as a selective process. When giving attention to what we are going to do, we are picking out the whole group of stimuli which represent successive activity. Our attention enables us to organize the field in which we are going to act."
ceptual process, including overt movements to which the observer confines his attention. *Perceptual* tests, on the other hand, are aimed at the experience correlative with the patterned activity characteristic of the perceptual event. Thus the distinction between psychomotor and perceptual tests really depends on what the experimenter chooses to scrutinize.

The characteristic feature of *conceptual* activity is the use of symbols* to test the implications of various behaviors in the organism's repertory. The conceptual event probably differs from perception primarily in the complexity and subtlety of cortical elaboration.

When we emphasize the capacity of an organism to form concepts by establishing relations between classes of objects, we are abstracting the end product at which the organism has arrived by a process of symbolic activity. Sign† behavior as the forerunner of symbolic behavior stands on the threshold of conceptual activity. Moreover, the possible complexity of sign behavior should not be underestimated. Thus, in delayed reward experiments, animals respond to a sign which evidences an event remote in time or space. Lower animals probably are limited to relations dependent upon signs. It is for this reason that lower animals are incapable of elaborating complex conceptual

*A symbol is a concrete representation for an abstraction from actuality or possibility. It stands for a map or model of the common elements in a class of related events or their signs. For a definition of sign, see the next footnote.

†A sign is a representation which is used as evidence for the occurrence of some event. Alternatively, a sign is a symbol whose representation class consists of a single event. For a definition of symbol, see preceding footnote.
chains. They are like medieval mathematicians for whom long division was arduous labor because of the Roman numeral system. In man the development of the vocal gesture into a linguistic symbol, socially defined, has made possible the peculiarly human distinction between self and others. According to Mead, this distinction gave rise to the capacity to assume the role of the other by implication. From this role-playing, at first limited to social roles, gradually evolved the ability to adopt the role of a nonsocial object.

Each of these categories of behavior can occur in the "idling state," when no controlled stimulation is introduced by the experimenter. The behaviors noted during the idling state at the physiological level and perhaps also on the psychomotor level can often be measured directly, but data on the idling state behavior in the sensory, perceptual, and conceptual spheres can be obtained only retrospectively through interview.

As an example of sensory activity without any controlled stimulation, we might take the background noises which are sensed even when no special attention is paid to auditory stimulation. These background noises seem to have the function of informing the sensorium that the auditory mechanism is working. The severe depression suffered by persons who suddenly lose their hearing has been traced to the elimination of this reassuring information in the sensorium. Perhaps the experience of cortical gray with eyes closed is another example of ongoing sensory activity. The effect of restricted stimulation, as shown by Bexton, Heron, and Scott, dramatically illustrates the
importance of the sensory component in complex activity. According to their findings, persons subjected to such "sensory deprivation" usually experience hallucinations. In the light of recent findings relative to efferent modulation of sense organs, these anomalies may correspond to abnormal lowering of threshold. It is as if in the absence of the normal signal, the gain in an electronic amplifier was increased to the point where noise was being interpreted as signal. Similarly, the auditory and visual hallucinations and the paraesthesias reported by mental patients disclose to the observer that the sensorium is "out of tune" with the environment.

Perceptual ongoing activity is exemplified by the framework of spatial orientation even when no special attention is paid to the location of objects. Subjective experience of the passage of time is another example. Since schizophrenic patients seem to deviate in spatial orientation and in time judgment, the examination of such ongoing activities is of importance diagnostically.

Ongoing conceptual activities are exemplified by reverie, daydreaming, and phantasy. Deviations in reverie and phantasy are too well known as earmarks of psychopathology to require further mention. It should be realized, however, that these ongoing activities cannot be measured or detected while in process, since the attempt to measure them may interfere with them. The only way we can obtain information on these states is after they have occurred, in retrospect, through interview.

Table 1 gives examples of the idling state for each of the types of behavior in the first column. It also lists var-
ious types of stimulation that elicit behavior of differing complexity in controlled experimental situations. A study of the idling state offers evidence of the basal level at which the organism is functioning. Significant variation from the normal idling state may provide evidence of malfunction, as in senescence. It should be noted that the stimulus classes compose a hierarchy in terms of the complexity of the independent variable which the experimenter is manipulating.

This hierarchy ranges from stimuli whose physical parameters alone are sufficient to evoke the observed response to those in which the physical characteristics of the stimulus simply serve as signs or symbols whose properties derive from the previous experience of the individual. S-R relations may also be distinguished as either “energy systems,” in which the energy transfer from stimulus to organism is the principal component of observation, or “signal systems,” in which the energy of the stimulus simply serves as a trigger to release the intrinsic energy of the response.

Disturbances of homeostasis involve mainly chemical, electrical, or surgical modification of the internal environment. Appropriate stimuli are energies within the characteristic sensitivity range of a sense organ, while energies outside of that range are inappropriate stimuli. Configural stimuli present discontinuous gradations of energy to one or more sense organs. Signs and symbols involve situations in which the experimenter seeks to evoke a response to the signal rather than to the energy content of the stimulus.

The attempt to specify the stimulus that evokes a given type of response is, of course, one of the primary
problems of psychology.* Indeed, all we really mean when we designate a stimulus is that this is what we have chosen as the independent variable which is to be submitted to controlled variation. Our success in damping out the activity of other "situational" variables is always open to question. We can usually be much surer of the observed response than we are of the alleged stimulus, and we often have to infer the stimulus from the characteristics of the response. Especially difficult is the problem of drawing a line of demarcation between perceptual and sensory stimuli.

Once a controlled stimulus, or stimulating situation, is introduced by the experimenter, physiological activity (bottom row) can be elicited not only by disturbances of homeostasis but by all the other stimulus classes as well. Thus, the EEG will reflect not only brain potentials in the resting state (first column) but also brain potentials under mild hyperventilation (disturbance of homeostasis), under photic driving (appropriate visual stimulation), under conditions of patterned visual stimulation (configural stimulation), and under conditions of problem solving (symbolic stimulation). Conversely, one must remember that a stimulus of one type may elicit responses at all five behavior levels—physiological, sensory, perceptual, psychomotor, and conceptual. In short, both the stimulus classes and the behavior categories comprise transitive hierarchies in which the more complex events include the simpler. In a given experiment, however, the experimenter is usually concerned with

*Klüver's now classic paper presents a comprehensive and incisive discussion of the problem of the equivalence of stimuli.
only one aspect of the response. Thus, the introduction of hyperventilation will probably affect all five levels of response, but in physiological experiments, its effect on EEG alone may be in the focus of attention; while in conceptual experiments, the panic or fear it may induce is what interests the experimenter.

It may very well be that schizophrenics, for example, have different physiological responses from normals. Hence, the introduction of changes in conditions likely to disturb homeostasis is a desirable experimental procedure of psychopathology. It is this field of behavior—the internal milieu of the organism—which has been neglected by many psychopathologists in favor of the interpersonal aspects, a most unfortunate neglect.

In similar fashion, sensory, perceptual, psychomotor, and conceptual behavior can be elicited by the various stimulating situations—disturbances of homeostasis, inappropriate, appropriate, and configural stimuli, and signs and symbols.

In addition to the usual method of eliciting behavior beginning with a subject in the idling state, we might begin the experiment after a stress-producing load had been imposed. These loads could be either of a homeostatic type (drug, temperature increase, etc.); an inappropriate type of stimulation (pressure on the optic nerve); an appropriate type (excessive sensory input or deprivation); configural (patterned auditory stimulation); sign, or symbol (psychological threat). It is quite possible that stimuli administered under a load which taxes the limits of tolerance might reveal deviations in the performance of a schizophrenic which would not otherwise become apparent.
The tentative conclusions which a survey of the literature yields for the various rubrics of this table are as follows:

1. Class of Stimuli
   a) The idling state of mental patients, has offered interesting observations, but not as many as those found when a load is imposed on the idling state.
   b) Homogeneous stimuli, such as those used in eliciting sensory responses, do not yield thresholds which differentiate the mentally ill.
   c) Nonhomogeneous, or patterned stimuli, of the variety used in eliciting perceptual responses indicate a raised threshold for neurotics, even when the sensory threshold in the same modality is normal.
   d) Symbolic stimuli tend to evoke responses in the mentally ill which do not differ in quality from those of normals but only in the degree of communality which they represent.

2. Class of responses
   a) Under a stress-producing load a difference is sometimes found between normals and mental patients, usually in the direction of lower efficiency for the latter.
   b) Under conditions of sensory deprivation, or other types of unloading, absence of the normal braking effect of input noise leads to a disorganization of behavior, probably on all levels—physiological, sensory, perceptual, psychomotor, and conceptual.

Finally, the affective and volitional aspects of psy-
chopathology can be investigated with focused inter-
view techniques in which certain features are manip-
ulated by the interviewer, and assessed by objective
methods of content analysis. An example of such an
interview is the attempt to condition affective com-
munication by the technique of Greenspoon,7 and
Verplanck.15

The first line in each chart shows the cumulative
number of affective utterances during the initial stage
of an interview before any reinforcement was intro-
duced (operant level). The second line shows the
cumulative number of utterances after reinforcement
of affective utterances is introduced, by saying "uh
huh" or generally agreeing with the patient and en-
couraging affective utterances while withholding
such approval from neutral utterances (conditioning).
In the final period, the interviewer returns to the
operant level procedure (extinction). Each of these
periods lasts ten minutes. Note that the conditioning
period invariably results in a steeper slope and a greater
number of affective utterances, though considerable
individual differences occur. Three different methods
of reinforcement were utilized, which we cannot go
into at this time, but it is the hope of our research team
that some parameters or combination of parameters
involved in these curves will remain invariant, tran-
scending the variation in rapport between a patient
and different interviewers. If this is found to be true,
a measure of flatness, or dullness of affect, useful in
prognosis may be evolved.*

*This study is being conducted by Suzan H. Salzinger in connection
with Project M-586 C supported by a grant from the National Insti-
tute of Mental Health.
Figure 1. Cumulative frequency distribution of affective utterances under three conditions of interviewer behavior.
SUMMARY

The accumulation of isolated facts in psychopathology is impeding rather than accelerating progress, because no suitable models have been proposed for ordering the data. Thus far, the most successful models in psychopathology have been: the infectious disease model, e.g., general paresis; and the nutritional defect model, e.g., pellagra with psychosis. Current research indicates that biochemical models may some day be very helpful in solving the riddle of schizophrenia. The psychoanalytic model has also had its success, e.g., catharsis in hysteria, but has thus far served a heuristic rather than an integrative role. It has been suggestive rather than conducive to further research. One of the difficulties with current models is their tendency to regard the premorbid personality as basic to the development of a mental disorder. The possibility that premorbid personality is independent of the eventual mental disorder, or at best only determines the efforts of the patient in adjusting to the illness, has not been sufficiently explored. If we postulate independence between personality and mental disease, and if we further postulate that disturbed brain function is an important factor or concomitant of mental disorder, we can provide a systematic method for determining the behavioral effects of the disturbed brain function which underlies mental illness. Deviations in the physiological, sensory, perceptual, psychomotor, and conceptual functioning of the patient can be determined under usual conditions, as well as under conditions of a stress-producing load which tests tolerance limits. The affective aspects of behavior can be investi-
gated by means of focused interview techniques, and
a content analysis of these interviews can be made in
an objective manner. With these two sources of data,
the patient population can be diagnosed more ob-
jectively, prognostic indicators of outcome promul-
gated, and the most suitable therapy for each type of
patient determined. If this is accomplished, it may be
possible to demonstrate that we already have some
therapeutic procedures which bring about a degree
of improvement greater than that attributable to
“spontaneous improvement.”

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