VOLUME XXVIII · NUMBER 3

UNIVERSITY OF MINNESOTA

Medical Bulletin

OFFICIAL PUBLICATION OF THE
UNIVERSITY OF MINNESOTA HOSPITALS
THE MINNESOTA MEDICAL FOUNDATION
AND THE MINNESOTA MEDICAL ALUMNI
ASSOCIATION

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University of Minnesota Medical Bulletin

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OFFICIAL PUBLICATION OF THE UNIVERSITY OF MINNESOTA HOSPITALS, MINNESOTA MEDICAL FOUNDATION, AND MINNESOTA MEDICAL ALUMNI ASSOCIATION

VOLUME XXVIII *November 15, 1956* NUMBER 3

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Published semi-monthly from October 15 to June 15 at Minneapolis, Minnesota.

Staff Meeting Report

Levels of Scientific Inquiry*

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Prefatory Note: Modern philosophy of science endeavors to achieve a logical clarification of the basic concept, methods and presuppositions of the formal and the factual sciences. Pure logic and mathematics are classified as formal sciences because, "proof" in these disciplines being deductive, their truths hold with logical necessity and are by themselves empty of factual-empirical content. The factual, i. e. the natural and the social sciences, however, are essentially *inductive,* in that the confirmation of their truth-claims rests ultimately upon observation.

1. The aims of the pure empirical sciences are: Description, Explanation and Prediction of observable facts or of their regularities (functional-deterministic or statistical relations).

2. The aims of the applied empirical sciences are: Control or Production. The technologies and medicine, for example, require a focussing of knowledge gained in the fundamental physical and the biological sciences upon such areas of application as, e. g., electronic engineering or the prevention and cure of contagious diseases.

3. Objective (intersubjective) testability is a criterion which enables us to distinguish between scientific and *non*-scientific enterprises. Reliability (high degree of confirmation), definiteness (precision), logical coherence and scope (comprehensiveness) serve as criteria by means of which we can, at least as a matter of degree, distinguish between scientific and *un*-scientific knowledge claims. Superstitions like those in astrology or phrenology may serve as drastic examples of unscientific beliefs.

There are many hypotheses in the history of scientific thought which were originally formulated in a manner that rendered them susceptible at least to indirect test, but when such tests tended to disconfirm the hypothesis in question, the hypothesis was so reformulated that no conceivable objective test could refute it. By such a logical or seman-

*This is an address given at the Staff Meeting of the University of Minnesota Hospitals on November 2, 1956.

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tical shift the hypothesis is rendered metaphysical or non-scientific, i. e. it is made proof against disproof. Such hypotheses are not only fruitless, they are actually devoid of scientific meaning. Hypotheses regarding absolute space and time, metaphysical substances like the luminiferous ether, vital forces or entelechies, etc. are typical examples. Unconfirmability-in-principle, however, must not be confused with high indirectness of confirmation.

4. The advance of knowledge in the empirical sciences consists not only in the accumulation of observations but also in the discovery of laws and in the confirmation of theoretical assumptions. Scientific explanation and prediction can proceed only on the basis of laws and theories. At least three levels of scientific inquiry are thus roughly discernible: Description, Generalization, and Theory Construction. By means of fairly straightforward generalizations from observed and described facts we arrive at empirical laws (usually of the statistical or probabilistic kind); and by means of theoretical assumptions we attempt an explanation of the regularities formulated in those empirical laws. Generally, scientific explanation requires: a) laws, or law-like theoretical assumptions; b) descriptive statements based either on direct observation or inferential statements regarding the existence of unobserved but indirectly confirmable entities (existential hypotheses); c) a method of derivation, be it in the form of the simplest deductive inference (e. g. syllogisms) or of the complicated mathematical derivations. If one or the other of the explanatory premises is a statistical statement, then the derivation is inductive (probabilistic) and not one of logical necessity.

5. At a given stage of scientific inquiry any one, two or all three of the requisite components of an explanation (or prediction) may have to be sought. Isaac Newton, in his epoch making and paradigmatical employment of the hypothetico-deductive procedure postulated three laws of mechanics and the law of gravitation; he obtained from the geometers and astronomers precise descriptive data regarding the distances of the moon from the earth, and of the planets from the sun; and he developed his own method of mathematical derivation in terms of the differential and integral calculus. At a later stage of celestial mechanics hypotheses regarding the existence of until then telescopically unobserved further planets (Neptune, Pluto) or of components in double or multiple star systems were introduced in order to account for the peculiarities (perturbations) in the orbits of the observed planets or stars. Existential hypotheses of this and other

sorts have of course played an outstanding role in the atomic theory of matter in physics and chemistry; in bacteriology; in genetics; in neurophysiology; etc.

6. The concepts by means of which scientific statements are formulated may usefully be classified in a twofold manner. Firstly, according to the logical form of these concepts we may distinguish:

a) purely qualitative or classificatory concepts
b) semi-quantitative or rank-ordering concepts
c) fully quantitative or metrical concepts

The taxonomies and classificatory systems of the descriptive natural sciences are largely of the qualitative type. Rank-orders become indispensable when we deal with gradations of one sort or another. There are, e. g., degrees of severity of a given disease, which—even if they elude strict measurement—may well be arranged in a series of intensities by some operationally definable criterion. Once it becomes possible to introduce an operational definition of equality of intervals, and some (often quite conventional) fixation of a zero point and of the unit of a scale, we deal with metrical concepts pertaining to measurable magnitudes or scientific variables.

Secondly, scientific concepts may be usefully distinguished on the basis of their place in the explanatory hierarchy. Here, at the bottom we find concepts representing observable properties or relations; next dispositional properties introduced by test-condition ⟶ test-result empirical regularities; and finally theoretical concepts employed in the assumptions or postulates of scientific theories.

7. The two mentioned classifications of scientific concepts cut across one another. Thus, e.g., dispositional properties may be purely qualitative, semi-quantitative or fully quantitative. Theoretical concepts, as in the physical sciences, are usually fully quantitative, but may be purely qualitative as in certain parts of psychodynamics. Moreover, dispositional concepts frequently and significantly have a statistical rather than a fully determinate form. A typical example from medicine would be the concept of *dementia paralytica* (general paresis) as conceived *before* the etiology in terms of the micro-organism (treponema pallidum, a spirochete) was known. In this case, as in the case of many other diseases defined in terms of correlation clusters of symptoms, the observable symptoms serve only as probabilistic indicators of the "disease entity." (Multiple sclerosis or schizophrenia may serve as further pertinent examples as far as current medical knowledge—or ignorance—is concerned.)

8. Hard headed empiricists, operationists or positivists maintain that the meaning of a scientific concept is exhausted by the observable symptoms or tests results which generally serve as the evidential basis for the ascription of dispositional concepts. Closer logical analysis of the actual procedures of science, however, reveals that dispositional concepts are usually introduced as place holders for more fully specified theoretical concepts. The meaning of theoretical concepts cannot be reduced to the actual or possible evidential data which justify (with more or less probability) the application of the concept. It seems more adequate to explicate the meaning of theoretical concepts in terms of their place in the network of causal laws which connect them with one another and in terms of correspondence or correlation rules to the data of observation. This is a more "realistic" interpretation of scientific concepts, —in that it is a more faithful rendition of the actual role they play in scientific explanation, and in that it does justice to the assumption of the existence of causative factors inferred from (but not identical with) the observable symptoms.

9. Fairly generally, though not exclusively, the great syntheses and unifications in modern science have been achieved through the hypothetico-constructive-deductive method, proceeding from empirical laws on the *macro-* (or "molar") level of observed phenomena to *micro-* levels, either indirectly observable or purely theoretically postulated. *Examples*: The empirical regularities of acoustics are explained by means of the wave theory, and finally the molecular theory, of sound. The laws of macro-thermodynamics are reduced (again by molecular hypotheses) to the laws of statistical mechanics. The empirical laws of chemistry are derived from the assumptions of modern atomic and quantum theory. Many features of the communication of contagious diseases are explained with the help of assumptions about the behavior and the effects of microbes. Mendel's laws of heredity are explained by the theory of genes. Processes of sensory perception, and a good many aspects of the behavior of animals and human beings become progressively understood in the light of neurophysiological theories.

In all these examples the theoretical explanation consists in the recognition of certain principles which enable us to view a great variety of originally quite heterogeneous phenomena as essentially stemming from a common set micro-processes.

10. The distinction between macro-and micro-levels of scientific analysis is to be understood as relative rather than absolute. Thus, for example, in contrast to the macro-behavior studies as pursued by many

contemporary psychologists, the neurophysiological account of the innervation of muscular responses is a micro-explanation. But this explanation itself has macro-character when compared with the electro-chemical theory of nerve-impulse conduction. And finally there is still the project of a micro-micro-micro account of these electro-chemical processes in terms of current atomic, electron and quantum theory.

11. The place of biological and of psychological phenomena in the world of nature is a perennial issue of philosophical speculation and dispute. By and large there can be no doubt that vitalistic and animistic theories of life and mind have been beaten into an impressive retreat —although there are still, even among scientists, a good many thinkers who are unwilling to capitulate. If one wants to be cautious, perhaps the best position to take is as follows: Biophysics and biochemistry, fruitfully implemented by the new developments in cybernetics, have been making great strides towards a physico-chemical explanation of originally very puzzling phenomena. But since there are plenty of unresolved problems in these areas it is an open question—certainly in principle—as to whether something like the present (1956) set of basic physical laws will not have to be modified or even substantially supplemented in order to cover biological phenomena. After all, such modifications and supplementations have been the rule—and not the exception—in the physics and chemistry of the last 300 years. In addition to the basic laws of mechanics it was necessary (in the 19th century) to introduce the laws of electromagnetism, and these in turn have been incisively revised, modified and amended by the physics of the 20th century, especially in the theories of relativity and in the quantum theory.

12. Psychological and psychiatric phenomena continue to cause grave logical and methodological perplexities of their own, over and above those connected with biology. Even a superficial sketch of the ramified and intricate puzzles of the mind-body relation would lead us too far afield. My own (highly controversial and expressly tentative) view of these matters is as follows:

a) The behaviorist outlook in psychology has had an eminently salutary effect on psychological research in that the notorious unreliability of introspective, intuitive and empathetic reports and interpretations have been eliminated in favor of an objective scientific study of perception, learning and motivation.

b) A purely peripheralistic (stimulus-response or input-output) account of behavior—as, e. g., most forcefully and consistently carried

out by B. F. Skinner—has however the severe shortcoming of restricting itself to a purely "macro" account of behavior and thus neglecting the achievements and prospects of neurophysiological explanations.

c) Radical behaviorism, even in its more sophisticated forms, does not, and cannot, do full justice to the facts of direct experience (such as the "raw feels" of sensation or emotion, let alone the properties of phenomenal fields or the structure of the higher thought processes in human beings). I believe that the all around most satisfactory working hypothesis here is that of a thoroughgoing psycho-neurophysiological isomorphism. This approach, especially pursued by the Gestalt psychologists during the last three or four decades, and supplemented by the cybernetic account of teleological mechanisms in terms of negative feedback processes, seems to me to hold considerable promise. Whether one interprets (as I do) the isomorphism as an indication of a basic underlying identity of the mental and the physical matters perhaps more from a philosophical than from the scientific point of view. My own philosophical reflections have always favored a double-language theory of mind and body according to which the language of introspection (self-observation) refers to events in the flux of subjective experience which from the point of view of external observation are scientifically described in the concepts of behavior theory, and ultimately of those in neurophysiology.

d) The above mentioned shortcomings and restrictions of purely molar (peripheralistic) behavior theories can in any case be avoided by introducing neurophysiological hypotheses as a (relatively) micro-explanation of the macro-laws of behavior. The characteristic phobia of radical behaviorists regarding such neurophysiological explanations is methodologically parallel to the—now happily forgotten—opposition of some fifty years ago on the part of positivistically minded scientists like Mach and Ostwald to the atomic theory.

13. My emphasis on the just outlined physicalistic working hypothesis and research program should however not be misinterpreted. I do not wish to deny that extremely fruitful studies can be carried out on *any* of the mentioned levels of scientific inquiry. In some cases various types of inquiry plainly supplement each other. In historical retrospect we may say that the anatomy of Vesalius was supplemented by the physiology of Harvey, as was the descriptive astronomy of Copernicus and Kepler by the mechanics of Galileo and Newton. In other cases the addition of higher levels of explanation amounts to the discovery and confirmation of a deeper substructure of the proc-

esses to be explained. Atomic theory is related to laboratory chemistry as is neurophysiological theory to behavior descriptions. It should be clear that the experimental investigation of the functional relations between observable variables has not only been immensely fertile, but that it is an indispensable condition for the testing of higher level theories and hypotheses.

In this connection it is worth remembering that our knowledge of physiological (neural, endocrine, genic-enzymatic) processes is still so incomplete that in many cases we have at present no more than at best some explanation-sketches ("promissory notes" of hypotheses) for the phenomena of human behavior. This is overlooked especially by physicalistically oriented medical scholars and practitioners who consider psychodynamics and psychotherapy as essentially unscientific. The mental life of human beings, with its enormous complexities, subtleties and intricacies, has not been unravelled as yet in basic physico-chemical terms. Although our psychological theories are only poorly confirmed, often highly imprecise and of limited scope, they are the best that can be provided at the moment. And while brain surgery (e.g. lobotomy), electric and chemical shock techniques and the assorted new tranquillizing drugs have been remarkably successful in many cases and in several respects, there is as yet no physiological method to deal with psychoneuroses. Even if the statistical evidence for the effectiveness of psychotherapy (Freudian or otherwise) is far from convincing, it stands to reason that mental maladjustments of the "functional" type are, for the time being at least, more accessible to treatment through social interaction or psychotherapeutic re-education than by the blunter and cruder physical or physiological interventions. Since, presumably, psychoneuroses are partly, if not largely, the results of social interaction, the idea that improvements can be achieved through the "talking cure" should not be rejected offhand. Anxieties, depressions, phobias, etc., cannot be declared "unreal" just because they are "in the mind." If it helps physiologically oriented scientists to think (as I suggested before) of the mental experiences as the subjective aspect of as yet only extremely incompletely specified cerebral processes, then they should be able to see that social interaction (including the "talking cure") can also be regarded as physical processes in a basic sense.

Conclusion: Scientific explanation consists in the derivation of statements about observable facts from laws, or of laws from theoretical postulates. At any level of scientific inquiry the explanatory premises are subject to revision in the light of objective tests. The subjective

conviction of a scientist matters little in the face of contrary objective evidence. Any part of science is a conceptual system which can be held valid only until "further notice." Clinical intuition, be it in the field of organic medicine or in the field of psychopathology, can at best serve only as heuristic guide to predictions or hypotheses which have to be tested independently on objective grounds.

Even if the general trend of progress in the biological sciences seems to depend on the transition from macro- to micro-levels, there is still an enormous amount of research to be done on *both* levels of inquiry.

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Staff Meeting Report

Clinical Studies in Aphasia*

Hildred Schuell, Ph.D.[1]

In 1948 the establishment of an aphasia center at the Minneapolis Veterans Administration Hospital made it possible to study large series of patients over extended periods of time. Since no method of examination existed which was considered comprehensive enough to yield sufficient information, or sensitive enough to measure changes which occurred with recovery, work was begun immediately on constructing a test. No assumptions were made about the nature of aphasia, and no terms were used which could not be operationally defined. The test was conceived as an instrument for making observations in a uniform and objective manner, so that data could be compared from one time to another, and from patient to patient. The test has been revised from year to year in order to explore areas considered to need more investigation, as new insights were gained. The Minnesota Test for Differential Diagnosis of Aphasia is now in its sixth revision. This edition is now being used experimentally in various hospitals, medical schools and universities in this country, Canada, England, South Africa, and elsewhere. In Minneapolis about 400 aphasic patients have been tested since 1948, as well as a series of 40 patients with no neurological involvement.

Impairment of Auditory Processes

For about five years, all aphasic patients seen at the Veterans Administration Hospital have received pure-tone audiometric tests. In confirmation of Street's study, the losses which were found did not seem to be related to aphasia but were similar to those to be found in a comparable general population. Patients were found with severe impairment of comprehension who had no hearing loss, and patients with severe hearing losses had relatively good comprehension of speech under conditions in which they could hear.

Preliminary observations made during the first two years appeared

*This is an abstract of a report given at the Staff Meeting of the University of Minnesota Hospitals on November 9, 1956. A copy of the complete report, including references, may be obtained by writing to the Editor, UNIVERSITY OF MINNESOTA MEDICAL BULLETIN, 1342 Mayo Memorial, Minneapolis 14.

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to show a relationship between the degree of difficulty patients had understanding what was said and the degree of eventual recovery from aphasia. In order to explore the postulated relationship, the speech of 138 patients for whom records were available was rated by three clinicians at discharge according to carefully defined criteria. By this procedure, patients were divided into four groups; i.e., (1) excellent speech, (2) good functional speech, (3) limited speech, and (4) no functional speech.

The test records were then analyzed for each group of patients with the following results:

1. All patients made errors in understanding spoken language.

2. Patients in groups (3) and (4) made more than twice as many errors as those in groups (1) and (2).

3. The 31 patients who did not recover functional speech all made errors pointing to common objects when they were named by the examiner.

4. Of the 107 patients who recovered functional speech, only four made errors on this test.

The basic hypothesis that there is a direct relationship between ability to understand speech and ability to communicate through speech thus seemed established. Therefore, prognosis is guarded when patients make errors pointing to common objects named by the examiner.

Clinical observations suggested that there was a relationship between the length of material presented and the amount of difficulty experienced by patients. New tests were constructed in order to determine whether or not this could be demonstrated. Some of the tests used were:

1. Pointing to objects named singly, then in series of two and three.

2. Following short directions, then combining two and three of these directions.

3. Following directions of progressive length.

4. Repeating phrases and sentences of progressive length.

5. Repeating progressively longer series of digits.

Records thus obtained showed that auditory retention span as defined by these tests was impaired for all aphasic patients. Some patients could point to two objects named in a series, but not three. Others could repeat sentences of three or four words, but not sentences of five or six words. A few weeks later these same patients were re-

peating sentences of five and six words easily, but were unable to repeat seven or eight.

Following this study, clinical techniques were used to increase auditory retention span with the unexpected result that not only did auditory retention span increase, but ability in word finding, expressing ideas, and reading and writing also improved.

Impairment of Visual Processes

Analysis of records obtained from two previous series of aphasia patients showed that all had some impairment of reading and writing. Yet visual processes are not necessarily impaired in aphasia.

Almost all aphasic patients can match objects, colors, forms, and symbols with no difficulty, and most of them can match printed words to pictures, although they have more difficulty pointing to the correct printed word when it is spoken by the examiner. A patient who cannot recall the name of an object usually cannot write the word, or produce it spontaneously when the printed word is presented. For example, one patient had learned to sign in order to communicate with deaf parents. If he could name an object, he was invariably able to make the correct finger sign and write the word. If he could not name it, he was consistently unable to sign it or write it. His impairment appeared to be in recall of the sound patterns which composed the word.

When auditory retention span is reduced, errors writing to dictation increase in direct ratio to the length of the unit dictated. Reading comprehension is defective when auditory retention span is impaired, because the patient cannot retain long enough language units to integrate meaning.

These observations indicate that ability to read and write depends on the amount of language available to the patient. Aphasic patients tend to read and write much as they talk, and to make the same kind of errors in all language modalities. The records show that impairment of reading and writing in most aphasic patients is correlated with impairment of auditory processes, and should usually be considered secondary to it.

A small group of aphasic patients was studied who had specific difficulty recognizing and recalling the visual forms of symbols. These patients consistently confused letters and words which looked alike. Writing showed reversals and distortions of letters, and substitution of letters with similar visual configurations. There were reversals of letter

sequences in words, a tendency to spell phonetically, and to interchange upper and lower case letters at random. Asked why they had used a capital letter in the middle of a sentence, patients frequently reported they knew it was wrong, but could not remember what the correct one looked like. These particular patients tended also to have difficulty following the line and keeping the place when they were reading, and they sometimes complained of blurring and obfuscation of vision. Sometimes gross spatial disorientation was present, with confusion of laterality and inability to locate objects in space. Drawing a house and a man was grossly defective, as was performance on object assembly tests.

Since impairment of visual recognition and recall were frequently found without evidence of spatial disorientation, and since the latter correlated highly with tests for body image, it seems highly probable these cases represented combined involvement of visual processes relating to bodily sensation.

Impairment of Motor and Sensorimotor Processes

Most aphasic patients have difficulty expressing themselves because of impairment of auditory processes, and not because of motor involvement. An early study which analyzed several hundred errors in recalling words showed that the substituted words were not random, but associated with the desired word in sound, meaning, or experience. The evidence favoring the hypotheses that word-finding errors in aphasics are defects of auditory recall is 1) words are learned by ear initially; 2) there is a high correlation of these errors with errors in auditory comprehension; and 3) these errors decrease and disappear with intensive auditory stimulation.

A small percentage of the aphasic patients showed paralysis or paresis of the speech musculature. Unilateral vocal cord paralysis was found occasionally. Paralysis of the soft palate, both unilateral and bilateral, and varying degrees of paralysis of the tongue were sometimes present, often with dysphagia.

Another group of patients was found who showed no cranial nerve involvement, but had marked difficulty imitating gross movements of the speech musculature, such as opening and closing the jaw, or protruding and retracting the tongue. These patients showed difficulty initiating, controlling, and coordinating movements. They frequently behaved as though they did not know where the tongue was in the mouth, or how it was moved to a desired position. They were sometimes ob-

served to use their fingers to make the tongue go where they wanted it. The use of a mirror helped them perform desired movements. Such patients were consistently unable to produce sounds which required complex coordinations, and fluency was obtained much more slowly in contrast to patients having impaired auditory recall. A valid hypothesis explaining these severe speech difficulties is that it is due to reduction of kinesthetic and proprioceptive cues and should accordingly be considered sensorimotor involvement.

The following conclusions concerning defective speech patterns resulting from brain injury seem warranted:

1. Dysarthria may occur as a result of involvement of the descending tracts, cranial nerves of the cerebellum such as are found with poliomyelitis, cerebral palsy, peripheral nerve lesions, and cerebellar disease. Such disorders should not be considered aphasic disorders, although they may coexist with aphasia.

2. Consistent patterns of articulation errors may result from cerebral involvement which is probably of sensorimotor origin. These patients have more difficulty with sounds requiring complex coordinations, and the same sounds tend to be defective wherever they occur.

3. Inconsistant articulation errors result from impairment of auditory recall. These patients pronounce a sound readily at one time, and at another time substitute another sound in its place. They substitute sounds requiring complex coordinations for sounds which are much simpler to produce. Tensions such as are observed in stuttering are sometimes observed when the patient cannot find words, and this struggle behavior is sometimes confused with a motor disorder. If any fluent connected speech can be obtained, it is doubtful that a motor problem exists.

Patterns of Aphasic Impairment

It appears possible from our data involving 56 patients, tested with the fifth revision of the Minnesota Test, to identify five recurring patterns of aphasic impairment. These patterns remained stable throughout the recovery period, and each pattern appeared to carry a specific prognosis for recovery from aphasia. Forty patients were retested with the sixth revision of this test. Comparison of test data and clinical results obtained at the initial and the time of retesting appear to verify the initial predictions with remarkable accuracy, although the numbers are small. The resulting classifications are as follows:

Group 1. Severe Impairment

These patients made errors pointing to common objects named by

the examiner, and had no functional speech, reading, or writing. Often alert and highly motivated, this group frequently made progress in self-care and ambulation activities in the hospital, and sometimes showed a high degree of social awareness and social adequacy. However, these patients did not acquire functional language skills, and their prognosis was poor.

Group 2. Impairment of Auditory Retention Span and Auditory Recall.

In this group auditory recognition was intact, but impairment of auditory retention span and auditory recall was present. Such defects were reflected often in severely impaired speech or reading and writing ability. All language modalities improved simultaneously with treatment. Some patients in this group were able to return to professions which placed considerable demands upon language, such as medicine and teaching. The prognosis in these patients was excellent.

Group 3. Impairment of Auditory Retention Span and Auditory Recall with Coexisting Visual Involvement.

Patients in group 3 were like those in group 2, but in addition, had specific difficulties recognizing and recalling symbol forms. Prognosis for recovery of speech was excellent, but recovery of reading and writing was slower than for group 2 patients. Such patients should be counseled against returning to occupations requiring speed and accuracy in reading and writing, such as editing or accounting. When spatial disorientation is present, the prognosis for reading and writing is poor.

Group 4. Impairment of Auditory Retention Span and Auditory Recall with Coexisting Sensorimotor Involvement.

When first seen, patients in group 4 often appeared as severely involved as patients in group 1, except that they did not make errors pointing to common objects named by the examiner. Language was acquired slowly, and speech was hesitant and laborious but it was functional as it was acquired. The patient soon acquired a basic vocabulary which he used to make his needs and wishes known. The prognosis, therefore, was good for limited recovery.

Group 5. Scattered Auditory, Visual, and Motor Impairment.

For group 5 patients there was always some auditory, some visual, and some motor, usually cranial nerve, involvement present but most

retained same language ability. The severity of involvement of each process varied greatly from patient to patient.

All of the patients were over 50 years of age; 75 per cent were over age 60. Eighty-three percent were known hypertensives who had incurred more than one cerebral insult. Prognosis is guarded for this group. Although these patients improved in ability to communicate, they usually showed impaired judgment and were unable to concentrate on assigned tasks.

Editorial

Politics and the Medical Scientist

Now that the tumult and the shouting of the campaign and election are behind us, the time seems appropriate for a brief comment concerning the medical scientist's approach to politics. What we have to say may, of course, apply to scientists in other fields as well. Since our exposure is primarily to the medical group, however, we do not feel qualified to extend the application of our remarks to scientists in general.

In approaching problems in their own fields of interest, our colleagues follow a definite pattern. Careful observations, which may be clinical or experimental or both, are, of course, made first. The data are then assembled and, if appropriate, subjected to statistical analysis. From the data, certain conclusions, usually quite limited, may be reached but only if they conform with all of the observed facts. Tentative conclusions, based on incomplete data, and hypotheses are clearly labeled as such.

We might well expect our associates to employ a similarly incisive technique in reaching their decisions in the political sphere. We have, however, seen and heard little to suggest that they employ such an approach. It appears to us rather that the conclusion is reached first. Then data are sought which support the conclusion. Data, however tenuous, supporting the conclusion are accepted without question and expounded. Data which would tend to bear out an opposite view are dismissed peremptorily as false, misleading, or propagandistic. By means of this process of careful data selection, our colleague can convince himself, if he feels the need of so doing, that his conclusion is the result of the application of pure reason.

While in his own medical scientific field our colleague carefully avoids generalizations based on limited or dubious evidence, he has no hesitation in generalizing in this manner when he addresses himself to political questions. Terms such as "the war party" or "the depression party", which he uses just as so many others do, are examples in point. Catch phrases or slogans, such as "Don't let General Motors run the country!" or "Don't turn everything over to the labor unions!" are not unknown to our friend, and he may make free use of them in attempting to convert a wavering colleague to his view.

In short, we believe that the factors which determine the political leanings of the medical scientist are just as imprecise, emotion-laden, and difficult to identify as those which determine the preferences of persons not scientifically trained. We know that this is true in the case of our own personal views.

Despite what we have said above concerning generalizing and drawing conclusions on the basis of limited and selected data, we are impelled to draw certain *tentative* conclusions about this subject. It is our opinion a.) that politics, with an infinite number of variables, does not lend itself to a truly scientific approach; b.) that in most areas of human behavior — politics, religion, the choosing of a mate, etc. — the medical scientist's reactions and motivations cannot be distinguished from those of the public at large; and c.) that the political opinions of the medical scientist should carry no more — and no less — weight than those of other citizens.

Alumni Association

Homecoming Dinner-Dance

The Minnesota Medical Alumni Association held its Annual Homecoming Dinner-Dance on Friday, November 2, in the Grand Ballroom of the Radisson Hotel, Minneapolis. Approximately one hundred and fifty alumni and their wives attended. DR. MALCOLM A. MCCANNEL served as toastmaster for the program and was in his usual good form. DR. F. A. ("'Pie") THOMPSON, '31, presented the Class Memorial gift to the Medical School which was accepted by DEAN H. S. DIEHL, '18. DR. BYRON B. COCHRANE, '37, President of the Alumni Association, opened the brief business meeting. Principal item on the agenda was election of officers and board members. The Nominating Committee presented the following slate which was adopted unanimously: DR. BYRON B. COCHRANE, '37, St. Paul, President; DR. VIRGIL J. P. LUNDQUIST, '42, Minneapolis, First Vice-President; DR. SHELDON M. LAGAARD, '43, Minneapolis, Second Vice-President; DR. LEONARD A. BOROWICZ, '38, Minneapolis, Secretary; and DR. JAMES C. MANKEY, '43, Minneapolis, Treasurer. New members of the Board of Directors are DOCTORS CHARLES J. BECK, '40, JOHN LINNER, '43, ROBERT H. MONAHAN, JR., '42, E. HARVEY O'PHELAN, '44, and NORMAN STONE, '44.

Dancing to the music of Wes Barlow and his orchestra followed the meeting. All who attended agreed that this was the best dinner-dance yet and that DR. VIRGIL J. P. ("Slug") LUNDQUIST, '42, Association Vice-President, deserved a real vote of thanks for once again handling the arrangements in his customary capable fashion. Thanks are in order, too, to the Rowell Laboratories for their sponsorship of the social hour which preceded the dinner.

CLASS REUNION

While the Medical Alumni Association was holding its Annual Homecoming Dinner-Dance, the Class of '31 held a Class Reunion, celebrating the twenty-fifth anniversary of their graduation from the Medical School. Their dinner took place in the Gold Room of the Radisson, and they joined the other group later for dancing. DR. VERN SMITH was responsible for organizing the Reunion and did a fine job. We are happy to be able to announce that the Class Memorial gift amounted to more than $2,000. DOCTORS O. L. NORMAN NELSON and F. A. THOMPSON were chairmen of the Class Memorial Committee.

Medical School Activities

Medical Students' Summer Research Fellowships

The program of Summer Research Fellowships for Medical Students provides an opportunity for students to carry out research projects during their summer vacations and at the same time to receive a stipend nearly comparable to what they might have earned had they been employed at jobs unrelated to their medical studies. Initiated in 1954, the program has expanded continuously since then. Last summer 54 students participated, twice the number that took part the previous summer.

The students who have participated have expressed a real interest in the program, indicating that they consider this type of activity an important part of their medical education. Members of the Faculty have been pleased at the fine work that most of the students have carried out. A number of the students will publish the results of their investigation.

The Summer Research Fellowships have received financial support from the following organizations: National Foundation for Infantile Paralysis (6 Fellowships), National Science Foundation (7), U. S. Public Health Service (6), Kenny Foundation (6), Lederle Laboratory Company (3), Tobacco Industry Research Committee (1), Minnesota Trudeau Society (1), Minnesota Hemophilia Foundation (1), Minnesota Pathological Society (1), and specific departmental funds (22).

The following is a list of the students who participated and the Departments and Divisions with which they were associated:

JAMES M. ANDERSON (Pathology)
WILLIAM W. BAAK (Pediatrics)
EDWARD J. BARDON (Phys. Med.)
PAUL G. BELAU (Neurology)
MALCOLM N. BLUMENTHAL (Physiology)
WILLIAM E. BRADLEY (Neurology)
PAUL E. BRINK (Public Health)
WILLIAM J. BROUSSARD (Physiology)
JOHN R. BURTON (Phys. Med.)
JOHN B. CARDLE (Anatomy)
JOHN J. CASEY (Neurology)
PAUL C. DAVIDSON (Medicine)
MICHAEL W. DAVIS (Physiology)
FRANKLIN R. ELEVITCH (Phys. Chem.)

BRADFORD E. FRIEDRICH (Anatomy)
THOMAS GONIOR (Phys. Med.)
LAWRENCE M. GREENBERG (Anatomy)
BARRY GRUNDLAND (Neurosurgery)
MARK D. HAFERMANN (Physiology)
GLEN A. HARTQUIST (Anatomy)
NORMAN M. HORNS (Neurology)
VINCENT HOVERSTEN (Neurology)
GENE G. HUNDER (Medicine)
MORTON C. KANE (Pediatrics)
STEPHEN A. KIEFFER (Pediatrics)
LOREN R. LESLIE (Phys. Med.)
JOHN I. LEVITT (Bacteriology
ARNOLD W. LINDALL (Anatomy)
THOMAS LITMAN (Physiology)
RICHARD R. LUND (Neurology)
ARTHUR A. McGUIRE (Neurology)
JOSEPH MLINAR (Medicine)
GENE C. MUCHOW (Pub. Health)
JOHN E. MULVAHILL (Physical Medicine)
DUANE L. ORN (Orthopedics)
BERNARD POLLARA (Pediatrics)
ROBERT L. POWERS (Phys. Med.)
FRANKLIN D. ROLLER (Anatomy)
BARBARA A. ROSINE (Public Health)
ROBERT L. SADOFF (Pediatrics)
JEROME J. SCHEREK (Neurology)
LEONARD D. SCHLOFF (Physiology)
WAYNE H. SCHRADER (Pathology)
GEORGE J. SCHROEPFER, JR. (Medicine)
EDWARD L. SELJESHOG (Physiological Chemistry)
WILLIAM N. SPELLACY (Physiological Chemistry)
LENNART E. SUTHER (Phys. Med.)
THOMAS O. SWALLEN (Anatomy)
ROBERT L. TELANDER (Bacteriology)
RALPH F. WELLS (Medicine)
WALDEMAR H. WENNER (Pathology)
DOUGLAS WHITING (Phys. Med.)
EDWARD T. WONG (Anatomy)
JOHN F. ZACHMAN (Pediatrics)

We are grateful for the support this program has had and look forward to further expansion of it in future years.

Faculty News

DR. JEROME T. SYVERTON, *Professor and Head,* Department of Bacteriology and Immunology, participated in the Gordon Cancer Research Conference, New London, New Hampshire, August 26 to 30, 1956, as one of the 18 invited speakers. Dr. Syverton also attended the Viral Chemotherapy Conference held at the Barbizon-Plaza, New York City, October 1 to 2, 1956, and he presented a paper at the

International Decennial Review of Tissue Culture Research held at Woodstock, Vermont, from October 7 to 12, 1956.

DR. RICHARD L. VARCO, *Professor,* Department of Surgery, spoke before the Los Angeles Surgical Society on October 12 on "Problems of Home-Transplantation and Certain Approaches to Their Solution."

DR. WESLEY W. SPINK, *Professor,* Department of Medicine, acted as Chairman of a Medical Advisory Panel for the Food and Drug Administration in Washington on September 10 in relation to the public health aspects of antibiotics in market milk.

MISSES ISABEL HARRIS, SIBYL NORRIS and MURIEL BLOOMDAHL were three of the 33 nurses in the country awarded substantial scholarships for advanced study under a grant from the Commonwealth Fund to the National League for Nursing. Miss Harris will complete requirements for her doctorate at the University of Minnesota; Miss Norris for her doctorate at Teacher's College, Columbia University; and Miss Bloomdahl for her masters at Teacher's College, Columbia University.

Under the Health Amendments Act of 1956, funds have been made available for graduate nurses to study. Of approximately five hundred traineeships awarded, 33 came to the University of Minnesota School of Nursing for advanced study in nursing education and nursing administration.

DR. JOSE REYES, physician in charge of the North Manila Hospital in the Philippines, is the guest of the University and is spending approximately three months in the University Hospitals to observe the professional and business management of the University Hospitals. Dr. Reyes has been sent to the University under the sponsorship of the International Cooperation Administration.

The National Foundation for Infantile Paralysis made a grant of $135,111, effective last July 1, to the University of Minnesota for continued research on polio under the direction of DR. JEROME T. SYVERTON *Professor and Head,* Department of Bacteriology and Immunology. The grant was announced jointly early in the summer by J. L. MORRILL, *President* of the University, and BASIL O'CONNOR, *President* of the National Foundation.

Postgraduate Education

Urology for General Physicians

The University of Minnesota announces a continuation course in Urology for General Physicians which will be held at the Center for Continuation Study from January 3 to 5, 1957. Management of the commonly met urological problems will be stressed. The program will be presented under the direction of DR. C. D. CREEVY, *Professor and Director,* Division of Urology. The faculty for the course will include members of the faculties of the University of Minnesota Medical School and the Mayo Foundation.

Dermatology for General Physicians

A continuation course in Dermatology for General Physicians will be presented by the University of Minnesota next January 7 to 9, 1957, at the Center for Continuation Study. Diagnosis and management of those skin disorders most frequently seen in general practice will be emphasized. Guest speaker will be DR. NORMAN F. CONANT, *Professor* of Mycology and *Associate Professor* of Bacteriology, Duke University School of Medicine, Durham, North Carolina. The course will be presented under the direction of DR. HENRY E. MICHELSON, *Professor,* Department of Medicine, and *Director,* Division of Dermatology, and the remainder of the faculty will be drawn from the faculties of the University of Minnesota Medical School and the Mayo Foundation.

Notice

All continuation courses presented by the University of Minnesota are approved for formal postgraduate credit by the American Academy of General Practice. Attendance certificates will be furnished on request.

Further information concerning the above programs or others to be presented may be obtained by writing to Dr. Robert B. Howard, 1342 Mayo Memorial, University of Minnesota, Minneapolis 14.

Coming Events

November 19-21 ——Continuation Course in Fractures for General Physicians

November 20 ——MINNESOTA PATHOLOGICAL SOCIETY MEETING; "The Morphological Responses to Certain of the Sympathomimetic Amines"; *Mr. William M. King;* Owre Amphitheater; 8:00 P.M.

November 27 ——SPECIAL LECTURE; "The Role of the Liver and Medical History"; *Dr. C. J. Watson,* Professor and Head, Department of Medicine, University of Minnesota Medical School; Room 100, Mayo Memorial; 8:00 P.M.

November 29——JACK FRIEDMAN LECTURE; "The Detection of Minimal Disease by Periodic Roentgen Examination"; *Dr. Leo G. Rigler,* Professor and Head, Department of Radiology, University of Minnesota Medical School; Mayo Memorial Auditorium; 8:15 P.M.

December 6-8 ——Continuation Course in Physical Medicine for Specialists

January 3-5 ——Continuation Course in Urology for General Physicians

WEEKLY CONFERENCES OF GENERAL INTEREST

Physicians Welcome

Monday,	9:00 to 10:50 A.M.	OBSTETRICS AND GYNECOLOGY Old Nursery, Station 57 University Hospitals
	12:30 to 1:30 P.M.	PHYSIOLOGY- PHYSIOLOGICAL CHEMISTRY 214 Millard Hall
	4:00 to 6:00 P.M.	ANESTHESIOLOGY Todd Amphitheater, University Hospitals
Tuesday,	12:30 to 1:20 P.M.	PATHOLOGY 104 Jackson Hall
Wednesday,	7:45 to 9:00 A.M.	PEDIATRICS McQuarrie Pediatric Library, 1450 Mayo Memorial
Friday,	8:00 to 10:00 A.M.	NEUROLOGY Station 50, University Hospitals
	9:00 to 10:00 A.M.	MEDICINE Todd Amphitheater, University Hospitals
	1:30 to 2:30 P.M.	DERMATOLOGY Eustis Amphitheater, University Hospitals
Saturday,	7:45 to 9:00 A.M.	ORTHOPEDICS Powell Hall Amphitheater
	9:15 to 11:30 A.M.	SURGERY Todd Amphitheater, University Hospitals

For detailed information concerning all conferences, seminars and ward rounds at University Hospitals, Ancker Hospital, Minneapolis General Hospital and the Minneapolis Veterans Administration Hospital, write to the Editor of the BULLETIN, 1342 Mayo Memorial, University of Minnesota, Minneapolis 14.