

Bulletin of the
University of Minnesota Hospitals
and
Minnesota Medical Foundation



The Temporal Lobe
In Medical Practice

BULLETIN OF THE
UNIVERSITY OF MINNESOTA HOSPITALS
and
MINNESOTA MEDICAL FOUNDATION

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I. THE TEMPORAL LOBE IN MEDICAL PRACTICE

V. Richard Zarling, M.D.
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Introduction

In recent years there has been increased interest in the clinical aspects of function and dysfunction in the area of the cerebral cortex called the temporal lobe. Increasing information related to this area has brought the realization that protean clinical manifestations occur from disordered function or destruction of the temporal lobe and that these clinical phenomena are frequently seen, and unfortunately not well recognized in medical, surgical, and psychiatric clinics.

Electroencephalographic recording over the area of the temporal lobe has shown quite characteristic and frequent abnormal electrical patterns. These patterns show strong correlation with a clinical symptom complex which is identified with an epileptoid state commonly described as "equivalents", "psychomotor epilepsy", or "temporal lobe epilepsy." Such discharges arising from the temporal lobe area have occurred quite frequently in the recordings done in the Electroencephalographic Laboratory of this hospital, and we believe that a review of the clinical and therapeutic aspects of these cases is worthy of consideration by the entire staff.

History

While the various clinical phenomena now known to be rather directly related to the temporal lobe had been described by physicians of the 16th and 17th centuries¹, Hughlings Jackson² provided descriptions of forms of non-convulsive epilepsy, characterized by psychosensory manifestations and coordinated somatic and autonomic nervous motor activities, and he attributed them to a lesion or mechanism in the uncus or neighboring "temporo-sphenoidal gyrus."

The electroencephalographic recording of increased voltages arising from cor-

tical and sub-cortical areas during a convulsive episode, which fulfilled in an objective manner Jackson's definition of epilepsy as "an occasional, abrupt, and excessive discharge of parts of the cerebral hemisphere (paroxysmal discharge)", led to more accurate correlations of certain clinically obscure and often bizarre episodic symptoms, and electrical discharges primarily confined to the temporal lobe. These borderlands of epilepsy have received further identification and classification in recent clinical investigation.^{3,4,5}

Criteria for Selection of Cases

The clinical material on which this paper is based is from a series of 1,006 cases which electroencephalographically had evidence of dysfunction of the temporal lobe alone or in combination with other areas of the cortex. From the total group, 119 cases, in which the electrical dysfunction was confined to the area of the temporal lobe alone, as recorded from the surface of the head, were analyzed for clinical and treatment phenomena. The age of the group varied from 16 to 69.

Anatomic Considerations

In order to keep in mind the multiple manifestations that may occur from a dysfunction of the temporal lobe, a brief consideration of the anatomy of this area of the cortex is necessary. The elaborate and intricate connections of the temporal lobe bring it into contact with all parts of the central nervous system. The current anatomical knowledge has accumulated as a result of anatomical, clinical, and electrophysiological methods. Through evolutionary processes, the temporal lobe has maintained its connections with the primitive, vegetative brain or rhinencephalon. With its gradual enlargement a cortical layer formed in which was invested higher functions of audition, recall, and language. Deep connections to the hypothalamus, thalamus and basal ganglia provide contact with centers involved in visceral control, emotional expression, sleep, and locomotion. The net result of this process has been an area of the brain in which is embraced a most intimate link between high-

er intellectual functions and primitive autonomic functions.

The connections may in brief be summarized as follows:

1. Frontal lobe---via uncinate fasciculus and thalamus.
Parietal lobe---via thalamic connections.
Occipital lobe---via inferior longitudinal fasciculus and thalamic system.
2. To thalamus---via direct connections and via hippocampal-fornix-mamillary system.
3. To hypothalamus---via hippocampal system.
4. To basal ganglia---via thalamic connections to substantia nigra, red nucleus and caudate nucleus.
5. To opposite temporal lobe---via hippocampal system and anterior commissure.
6. Visual system passes through the temporal lobe.

Clinical Phenomena

Aura: Bearing in mind the Jacksonian definition of epilepsy as a sudden excessive discharge of cortical tissue, it would follow that the initial clinical symptoms might well serve to infer localization to a particular area of the cortex. The remarkable complexity of anatomic connections of the temporal lobe would then provide a rich variety of clinical phenomena which may mimic acute or recurrent medical, surgical, or psychiatric illnesses.

Unfortunately, we suspect that the initial symptoms of temporal lobe discharge are either misinterpreted, ignored, or not sought after during the usual clinical examination. A review of the possible initial manifestations or aura might well be in order.

Motor phenomena: There may be local-

ized movements, simple and restricted in nature; there may also be complex motor movements, such as orienting movements, straightening movements, or movements resembling ambulation or flight; gestures made in response to the sensory and sensorial or mental manifestations which may be simultaneously occurring, such as bringing the hand to the heart, the forehead or stomach; scratching of the alae nasi or of the eyes accompanying abnormal sensations in this area, and scraping of the throat accompanying abnormal sensations in the pharynx, etc.

Sensory phenomena: Gustatory, olfactory, auditory, vertiginous, visual and somesthetic sensations (numbness, tingling, sensations of movement, creepy, crawling, quivering, buzzing feelings, increases in size of extremity, heat, warmth, burning, coldness). The somesthetic sensations are particularly important in view of the fact that they are often disregarded in spite of their frequent occurrence.

Autonomic or visceral phenomena: Abdominal or epigastric sinking or rising sensations, cardiovascular sensations of palpitation or pain, and syncopal sensations. Miscellaneous sensations such as pulse slowing and acceleration, skin color changes, sweating, pilo-erection, pupillary changes, vomiting, and micturition.

Mental phenomena: Perceptual illusions, such as macropsia, microacusia, macroacusia, distortion of one's own image, metamorphopsia, deja vu, jamais vu, incoherence, strangeness, depersonalization, etc. Fear and terror, anger and joy. Automatism and amnesia. Hallucinations, sudden disturbances of thought or appearance of an interfering idea, and panoramic memory. Assaultive or aggressively hostile thoughts, which are probably hallucinatory. Aphasic phenomena.

General body sensations, cephalic sensations, or phenomena such as yawning.

In our series of cases, only 35 had documented evidence of aura. We feel that this lies in frailty of clinical examination rather than to absence of

the various manifestations. The accompanying table (Table 1) is a tabulation of the various aura which were noted. The higher percentage of vertiginous and abdominal aura is of interest.

Table 1.

Relative frequency of recognized auras in temporal lobe lesions

Ictal phenomena: Should the localized excessive discharge remain confined to a small area of the cortex, there may be only a prolongation of the aura, which then becomes the ictal manifestation also. If, however, adjacent or anatomically related areas, through complex physiological processes, also discharge excessively, the ictal phenomena may go on to eventuate in the most easily recognized convulsive manifestation, the "grand mal" seizure episode. Between these two extremes, all manner of clinical states may occur. In our analyses, it is in this area that the clinical descriptions of the ictal phenomena are, if possible, more incompletely reported. This is, of course, due to the fact that the clinician seldom personally witnesses the convulsive episode and anamnesis on the part of the patient and relatives, usually untrained and usually extremely frightened individuals, is almost always inadequate. As a generalization, if the entire cortex is excessively discharging, a major or "grand mal" episode occurs. If deep midline projection systems become selectively involved, the clinical manifestations are usually called "petit mal." Local and adjacent motor cortex discharge produces localized ictal motor phenomena. If only autonomic centers are involved, the ictus is usually called syncopal. With increased sophistication on the part of the examiner, and with ictal manifestations confined chiefly to visceral sensations, the ictus is called a diencephalic seizure. The most striking clinical seizure, and perhaps most characteristic of temporal lobe discharge, is a disturbance but not absence of consciousness, accompanied by masticatory and/or adersive or searching movements, and occasionally, but unfortunately not infrequently, assaultive behavior, and is called a psychomotor seizure.

All of these may not occur in a pure form, and in fact it is rather the rule,

<u>Type of Aura</u>	<u>No. of Cases</u>	<u>Per Cent</u>
1. Motor phenomena	6	18
2. Sensory		
Auditory	0	0
Gustatory	2	6
Olfactory	1	3
Visual	0	0
Vertiginous	7	20
3. Autonomic		
Abdominal	13	37
Cardiovascular	6	18
Syncopal	2	6
Pilo and sudomotor	2	6
4. Psychical		
Perceptual illusions	4	11
Fear and terror	2	6
Automatism	2	6
Hallucinations	0	0
Assault	2	6
5. Cephalic sensations	3	8
Total	35	

that more than one type of manifestation will be present at various times. The accompanying table (Table 2) will indicate the findings as we were able to obtain them from the clinical data. In the entire group of 119 cases, there were 15 in which no seizures had been noted. We would feel that this is chiefly a matter of time. The discrepancy in the totals is due to the presence of more than one type of seizure in the same individual.

Miscellaneous observations: We have found, as have others, that the temporal lobe seizure phenomena is a clinical syndrome of the younger age group. It is a syndrome of later adolescence and the second and third decades. In this age group, it approximates 30 to 80 per cent of all types of epilepsy.

In the interictal period, the incidence of moderate to severe personality disorders is noteworthy. In the largest series reported to date⁶, 48 per cent of the group with electroencephalographic abnormalities confined to the temporal lobe have been diagnosed as having an associated psychiatric disorder. It has been facetiously said that the dividing line between neurology and psychiatry is the Sylvian fissure. To a limited extent this has been our observation. Eighteen of this group had a psychiatric diagnosis alone. Of this group it is of interest that three were in prison for offenses of a major type and characterized chiefly by episodic aggressive behavior. In the total group, there were two murderers, and both of these murders were unplanned, impulsive crimes.

Table 2

Frequency of seizure types encountered in 112 cases of temporal lobe E.E.G. abnormalities. In entire study of 119 cases, seizures were not found in 15 cases. Discrepancy in figures due to presence of more than one type seizure in some individuals.

Seizure Type	No. of Cases	Per Cent
Grand Mal	40	35
Psychomotor	38	33
Petit Mal	12	10
Syncopal	12	10
Focal	6	5
Diencephalic	4	3
Total	112	

Electroencephalographic Manifestations

In all of the patients under consideration, it has been mentioned that the interictal electroencephalogram showed abnormal electrical discharges confined to the area overlaying the temporal lobe. The initial impetus to the study of tem-

poral lobe clinical manifestations was with the description of a rather specific wave which was confined to the tip of the temporal lobe, under certain conditions of recording, and the rather constant association with a clinical syndrome which was called psychomotor epilepsy. This was the presence of a "spike", confined to the tip of the temporal lobe. By definition, this is a wave of 1/15th of a second or less, and which has a higher amplitude than the general background pattern. This discharge might occur unilaterally, bilaterally, asynchronously or bilaterally synchronously. (Examples of such discharges are shown on the accompanying slide.) With more extensive study, it has been noted that this is not entirely characteristic, and that multitudinous wave forms may occur. Sharp waves, a wave with an abruptly rising front and prolonged falling phase, with variable frequency, and slow waves of various frequencies may occur. In general, all these wave forms occur in a random manner, rather than having a rhythmic characteristic. The particular wave form may not appear as an isolated type, but there may be a mixture of forms. (An example of these types is seen in the accompanying slide.) The frequency of the various wave types and localization is indicated in Table 3.

Table 3

Wave type and laterality in 119 cases of temporal lobe "discharge"

Spikes, left	32%
Spikes, right	20%
Slow, left	14%
Slow, right	4%
Spikes, bilaterally	14%
Slow, bilaterally	7%
Sharp, left	3%
Sharp, right	1.7%
Diencephalic	.9%

It should be noted that the wave form does not definitely indicate the size, acuteness, or chronicity of the dysfunctioning area. Only inexact empiric relationships can be inferred as to these factors. From a clinical standpoint,

however, these discharges limited to the temporal lobe are, in our experience, only rarely unaccompanied by some type of clinical symptomatology. In the cases mentioned without a history of seizures, it is to be remembered that for the most part only a minimal number of clinical contacts have occurred, and a complete clinical follow-up has rarely been accomplished.

The specificity of localization does have treatment significance. As will be indicated later, a discharging site limited to a single temporal tip, has the most favorable prognosis as to treatment.

In the ictal phase, about one-half of all patients show a rhythmic 4-6/second flat-topped wave pattern, one-fourth will show generalized fast activity or diffuse rhythmic discharges of variable frequency, and another fourth will show no change or diffuse flattening or suppression of activity.

Pathogenesis

The etiology of 48 cases of this series was available from clinical studies and from surgery. The accompanying table (Table 4) will indicate the established etiologies. These etiological factors were correlated with the onset of the clinical seizures. The total

Table 4

Analysis of etiologies
obtained in 48 cases

Etiology	No. of Cases
Trauma	15
Encephalitis	10
Neoplasms	6
Vascular	5
Congenital defects	3
Degenerations	2
Miscellaneous	7
Total	48

series is excessively weighted by the material available from those cases which have undergone surgery, and thus is not a true sampling of the group. The incidence of neoplasms has been perhaps the most arresting observation in our limited series.

Treatment

The patients with this electro-encephalographic disorder have been referred from almost every adult clinic in this hospital, a healthy sign of general awareness of this problem on all clinical services. Possibly, however, some of these patients have presented difficult enough diagnostic problems so that, in desperation, the electro-encephalogram was finally employed. When these specific electroencephalographic findings have been reported, there has not necessarily been complete cognizance of the clinical possibilities involved.

It is now almost axiomatic that the medication in a convulsive disorder is a matter of individual adjustment over a prolonged period of time. Though results of careful medication adjustment are almost uniformly satisfactory to the patient and to the doctor, this status is least often achieved in those individuals with electrical dysfunction confined to the temporal lobe. The causes of this are still entirely obscure.

The unsatisfactory status of medical management is reflected in the clinical data on these patients. There has been more shifting of regimes of drug therapy in this group than in any other comparable group. We were able to find no individual who had achieved complete elimination of convulsive manifestations for over a period of longer than 6 months. In the total group, there were only 17 individuals who had their convulsive episodes reduced to less than 25 per cent of the pre-medication frequency. In cases with multiple seizure types, the medication has succeeded in reducing one seizure type or another, but not all manifestations. The psychomotor episodes are the most refractory to any type of

treatment.

It should be mentioned that these indifferent treatment responses do not indicate a completely nihilistic approach to the problem. The best results in our series have occurred with the use of a combination of mebaral and dilantin. Phenurone was originally developed as a specific drug for psychomotor episodes, but though it does occasionally prove quite efficacious when no other therapy has been effective, liver damage is a constant possibility; and personality disorganization is not an infrequent and sometimes severe complication.

The relative ineffectiveness of medical management led to the consideration of surgical intervention, with the idea of removal of the cortex with the discharging lesion.⁷ Initial investigation of this type treatment with removal of only restricted areas of cortex on the lateral and superior surface of the temporal lobe was encouraging to a limited extent. Electrographic records at the time of operation while occasionally showing a limited area of discharge, more often showed widespread or multiple areas of abnormal cortex. The existence of perviously undetected pathology, by diagnostic techniques other than electroencephalography, was also surprisingly frequent. Total resection or amputation of temporal lobe was undertaken with much more gratifying results.

Surgical therapy on selected cases was undertaken at this hospital by Doctor Lyle French. In two cases, resection of the superior temporal gyrus was done. In twelve cases, resection of 6 to 9 cm. of the temporal lobe was done. The age of these patients ranged from 15 to 49 years. All patients had grand mal, petit mal, and psychomotor clinical manifestations. Five individuals had assaultive behavior during the ictal episode. Twelve of the 14 had personalities characterized as being suspicious, irascible, hostile, paranoid, or psychopathic. All had focal discharges confined to one temporal lobe, and a few had minimal diffuse abnormalities. At

the time of surgery, the corticograms revealed focal abnormalities in the temporal lobe. After resection, no electrographic abnormalities were evidence in the remaining cortex. The extent of electrographic abnormality at times was used as a guide for the extent of resection of more medial structures.

Pathological examination of the excised cortex showed three neoplasms, two oligodendrogliomas, and one astrocytoma. Five cases showed non-specific degenerative changes. Postoperatively one patient died of an extra-dural hematoma. Eight patients have been seizure free during a period of 6 to 39 months follow-up. Four have had a reduction to very infrequent convulsive episodes, i.e., one seizure in 3 to 4 months. Thus at the present time, for selected patients, with focal and chiefly unilateral electroencephalographic temporal lobe foci, surgery is a promising palliative and possibly curative procedure.

Conclusions

1. The temporal lobe has widespread anatomic connections, and lesions in this area may produce protean clinical manifestations, which are likely to be seen in all clinical divisions.
2. Electroencephalographic studies of individuals with episodic visceral, autonomic, neurological, and psychiatric disorders may aid in separating out those patients with these symptoms as a manifestation of a convulsive disorder.
3. Medical therapy, while not as effective as desired, should be initiated and the combination of dilantin and mebaral would appear to be the most effective.
4. Selected cases, and particularly those with a unilateral electroencephalographic focus, may be almost completely relieved of convulsive episodes by resection of the anterior 6 to 9 cm. of the temporal lobe.

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II. MEDICAL SCHOOL NEWS

Coming Events

- May 17 - 22 Continuation Course in Proctology for General Physicians
May 20 Medical Six O'Clock Dinner; Main Ballroom, Coffman Memorial Union;
6:30 p.m.
June 3 Luncheon for Senior Medical Students sponsored by the Minnesota Medi-
cal Alumni Association; Junior Ballroom, Coffman Memorial Union;
12:30 p.m.

* * *

Minnesota Medical Foundation Luncheon

The annual Luncheon Meeting of the Minnesota Medical Foundation will be held on Monday, June 7, at 12:00 noon in the Arrowhead Room, Hotel Duluth, Duluth, Minnesota. This luncheon, which is regularly held during the meeting of the Minnesota State Medical Association, has always been a most pleasant occasion. This year's speaker will be Dr. Clarence Dennis, formerly Professor of Surgery at the University of Minnesota and currently Professor and Chairman, Department of Surgery, State University of New York College of Medicine, New York City. All members of the Foundation are urged to reserve this date. Tickets may be obtained from Dr. Wesley W. Spink, Foundation Secretary-Treasurer, for \$2.00.

* * *

State Society Meeting

The 101st annual meeting of the Minnesota State Medical Association will be held this year in Duluth from June 7 to 9. An interesting scientific program has been planned and many worthwhile demonstrations and exhibits will be on display. Mr. R. R. Rosell, Executive Secretary of the Minnesota State Medical Association, has extended to all students, interns, fellows, and staff members who are not members of the Association a most cordial invitation to attend the meeting as Association guests. Guest cards may be obtained from Mr. Ray Amberg's office.

* * *

Dr. Cameron Joins Clinical Faculty

Dr. Dale C. Cameron, who was recently appointed Medical Director, Minnesota Department of Public Welfare, has been named Clinical Professor in the Department of Psychiatry and Neurology effective May 1, 1954. It is a real pleasure to welcome Dr. Cameron to our clinical faculty.

* * *

Faculty News

Dr. Wesley W. Spink, Professor, Department of Medicine, will participate in the dedication ceremonies of the Kresge Medical Research Building at the University of Michigan Medical School, Ann Arbor, on May 15. Dr. Spink will speak on "The Epidemiology and Treatment of Brucellosis."

Miss Katharine J. Densford, Director, School of Nursing, received the Hamline University Centennial Award on May 1 as one of Minnesota's outstanding women. Miss

Densford, along with Rena Boyle, Myrtle H. Coe, Isabel Harris, Peulah Gautefald, Cecelia Lediger, Kathryn Schaaf, Alma Sparrow, Dorothy Titt, and Joan Williams, attended the recent convention of the American Nurses' Association which was held in Chicago.

Dr. Frederic J. Kottke, Professor and Head, Department of Physical Medicine and Rehabilitation, recently visited the rehabilitation centers in Rochester and New York City, New York, and Orange, New Jersey, to study the organization of their programs.

The Department of Bacteriology and Immunology was recently host to Dr. B. Hofman, Jr., Research Fellow, Institute for Preventive Medicine, Leiden, The Netherlands.

* * *

Publications of the Medical School Faculty

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III.

UNIVERSITY OF MINNESOTA MEDICAL SCHOOL

WEEKLY CALENDAR OF EVENTS

Physicians Welcome

May 17 - 22, 1954

Monday, May 17

Medical School and University Hospitals

- 9:00 - 9:50 Roentgenology-Medicine Conference, L. G. Rigler, C. J. Watson and Staff; Todd Amphitheater, U. H.
- 9:00 - 10:50 Obstetrics and Gynecology Conference; J. L. McKelvey and Staff; W-612 U. H.
- 10:00 - 12:00 Neurology Rounds; A. B. Baker and Staff; Station 50, U. H.
- 11:30 - Tumor Conference; Doctors Hitchcock, Moore and Stenstrom; Todd Amphitheater, U. H.
- 11:30 - 12:30 Physical Medicine Seminar; O. T. and P. T. in Treatment of Hemiplegia; M. Lepley, M. Mundele, and R. Rabideau; Heart Hospital Auditorium.
- 12:15 - Obstetrics and Gynecology Journal Club; Staff Dining Room, U. H.
- 12:30 - 1:30 Physiology Seminar; The Preparation of Graded Collodion Membrane for Separations of Small Molecules; Charles Carr; 214 Millard Hall.
- 1:30 - 2:30 Pediatric-Neurological Rounds; R. Jensen, A. B. Baker and Staff; U. H.
- 1:30 - 3:30 Dermatology Hospital Rounds; H. E. Michelson and Staff; Dermatology Histopathology Room, M-434, U. H.
- 4:30 - Infectious Disease Rounds; Station 43, U. H.
- 4:30 - Public Health Seminar; 15 Owre Hall.
- 5:00 - 6:00 Physiology-Surgery Conference; Todd Amphitheater, U. H.
- 5:00 - 6:00 Urology-Roentgenology Conference; C. D. Creevy, O. J. Baggenstoss, and Staff; Eustis Amphitheater.

Ancker Hospital

- 8:30 - 10:00 Tuberculosis and Chest Conference; Auditorium.
- 2:00 - 3:00 Surgery Journal Club; Classroom.

Minneapolis General Hospital

- 9:30 - Pediatric Rounds; Richard Raile; Station K.
- 10:30 - 12:00 Medicine Rounds; Thomas Lowry; Station F.
- 11:00 - Orthopedic and Fracture Rounds; Drs. John Moe and Arthur Zierold; Station B.
- 11:00 - Pediatric Seminar; Erling Platou; Classroom, Station M.
- 12:30 - Surgery Grand Rounds; Dr. Zierold; Station E.

Monday, May 17 (Cont.)

Minneapolis General Hospital (Cont.)

- 1:30 - 2:30 Tuberculosis Conference; J. A. Myers; Station M.
2:00 - Pediatric Rounds; Stations I and J.

Veterans Administration Hospital

- 9:30 - Infectious Disease Rounds; Drs. Hall, Zinneman, Lubin and Sherman.
1:30 - Cardiac Conference; Drs. Berman, Smith, Hoseth, Simonsón, and Wexler; Conference Room, Bldg. I; Rounds immediately following conference.

Tuesday, May 18

Medical School and University Hospitals

- 9:00 - 9:50 Roentgenology-Pediatric Conference; L. G. Rigler, Irvine McQuarrie and Staffs; Eustis Amphitheater, U. H.
12:30 - 1:20 Pathology Conference; Autopsies; J. R. Dawson and Staff; 102 Institute of Anatomy.
12:30 - 1:30 Bacteriology Seminar; 214 Millard Hall.
3:30 - Pediatric Seminar; Reports of Meetings; Staff Members; Sixth Floor, U.H.
3:30 - Biophysics-General Physiology Seminar; 323 Zoology Building.
4:00 - 5:00 Pediatric Rounds on Wards; Irvine McQuarrie and Staff; U. H.
4:30 - 5:30 Clinical-Medical Pathological Conference; Todd Amphitheater, U. H.
5:00 - 6:00 X-ray Conference; Presentation of Cases from Minneapolis General Hospital; Drs. Lipschultz and Gundersen; Eustis Amphitheater, U. H.

Ancker Hospital

- 9:00 - 10:00 Medical X-ray Conference; Auditorium.

Minneapolis General Hospital

- 9:30 - Pediatric Rounds; Elizabeth Lowry; Station J.
10:00 - Psychiatry Grand Rounds; R. W. Anderson; Station H.
11:30 - 12:30 Neurology-Neurosurgery Conference; Classroom, Station M.
12:30 - 2:30 Dermatology Rounds on Clinic; Carl W. Laymon and Staff.
12:30 - ECG Conference; Boyd Thomes and Staff; 302 Harrington Hall.
1:00 - Tumor Clinic; Drs. Eder, Coe, and Lipschultz; Classroom.
3:30 - Pediatric-Psychiatry Rounds; Jack Wallinga; Station I.

Veterans Administration Hospital

- 7:30 - Anesthesiology Conference; Conference Room, Bldg. I.
8:45 - Surgery Journal Club; Conference Room, Bldg. I.
9:30 - Surgery-Pathology Conference; Conference Room, Bldg. I.
10:30 - Surgery-Tumor Conference; L. J. Hay, J. Jorgens and Donn Mosser; Conference Room, Bldg. I.

Tuesday, May 18 (Cont.)

Veterans Administration Hospital (Cont.)

- 1:00 - Review of Pathology; Pulmonary Tuberculosis; Conference Room, Bldg. I.
- 1:30 - Combined Medical-Surgical Chest Conference; Conference Room, Bldg. I.
- 2:00 - 2:50 Dermatology and Syphilology Conference; H. E. Michelson and Staff; Bldg. III.
- 4:00 - Thoracic Surgery Problems; Conference Room, Bldg. I.

Wednesday, May 19

Medical School and University Hospitals

- 8:00 - 9:00 Roentgenology-Surgical-Pathological Conference; Paul Lober and L. G. Rigler; Todd Amphitheater, U. H.
- 11:00 - 12:00 Pathology-Medicine-Surgery-Pediatrics Conference; Todd Amphitheater, U. H.
- 12:30 - 1:20 Radioisotope Seminar; Underground Cobalt Unit, U. H.
- 12:30 - 1:30 Physiology 114C--Respiration; E. B. Brown; 214 Millard Hall.
- 1:00 - 2:00 Dermatology Clinical Seminar; F. W. Lynch; 300 North Clinic.
- 1:30 - 2:30 Physiology 114B--Transport Seminar; Nathan Lifson and M. B. Visscher; 271 Lyon Laboratories.
- 1:30 - 3:00 Pediatric Allergy Clinic; Albert V. Stoesser and Lloyd Nelson; W-211, U. H.
- 3:30 - 4:30 Dermatology-Pharmacology Seminar; 3rd Floor Conference Room, Heart Hospital.
- 4:30 - 5:50 Dermatology-Infectious Disease Seminar; J. D. Krafchuk; 3rd Floor, Conference Room, Heart Hospital.
- 5:00 - 5:50 Urology-Pathological Conference; C. D. Creevy and Staff; Eustis Amphitheater, U. H.
- 5:00 - 6:00 Residents' Lecture; Diskography; Jack Friedman; Todd Amphitheater, U.H.
- 5:30 - 7:30 Dermatology Journal Club and Discussion Group; Hospital Dining Room.
- 7:30 - 9:30 Dermatology Seminar; Review of Interesting Slides of the Week; Robert W. Goltz; Todd Amphitheater, U. H.

Ancker Hospital

- 8:30 - 9:30 Clinico-Pathological Conference; Auditorium.
- 12:30 - 1:30 Medical Journal Club; Library.

Minneapolis General Hospital

- 9:30 - Pediatric Rounds; Henry Staub; Station I.
- 10:30 - 12:00 Medicine Rounds; Thomas Lowry and Staff; Station D.
- 12:00 - Surgery-Physiology Conference; Arthur Zierold and E. B. Brown; Classroom.

Wednesday, May 19 (Cont.)

Minneapolis General Hospital (Cont.)

- 12:30 - Pediatric Staff Meeting; Classroom; Station I.
- 1:30 - Pediatric House Staff Seminar; Erling Platou; Station I.
- 1:30 - Pediatric Rounds; Erling Platou; Classroom, Station I.

Veterans Administration Hospital

- 8:30 - 10:00 Orthopedic X-ray Conference; E. T. Evans and Staff; Surgical Conference Room, Bldg. 43.
- 8:30 - 12:00 Neurology Rehabilitation and Case Conference; A. B. Baker.
- 9:00 - Gastro-Intestinal Rounds; Drs. Wilson, Zieve, Hay, Frakel, Nesbitt and O'Leary.
- 11:00 - Gastroenterology Conference; Conference Room, Bldg. I.
- 12:30 - Medical Journal Club; Doctors' Dining Room.
- 12:30 - X-ray Conference; J. Jorgens; Conference Room, Bldg. I.
- 1:30 - 3:00 Metabolic Disease Conference; Drs. Flink, Schultz and Brown.
- 3:30 - Urology Pathology Slide Conference; Dr. Gleason; Conference Room, Bldg. I.
- 7:00 - Lectures in Basic Science of Orthopedics; Conference Room, Bldg. I.

Thursday, May 20

Medical School and University Hospitals

- 9:00 - 11:50 Medicine Ward Rounds; C. J. Watson and Staff; E-221, U. H.
- 11:00 - 12:00 Cancer Clinic; K. Stenstrom, A. Kremen and B. Zimmermann; Todd Amphitheater, U. H.
- 12:00 - 1:00 Medical Journal Club; Calcium and Phosphorus Metabolism; Jim Donaldson; 116 Millard Hall.
- 12:30 - Physiological Chemistry Seminar; Review of Federation Meetings; C. P. Barnum; 214 Millard Hall.
- 1:30 - 4:00 Cardiology X-ray Conference; Heart Hospital Theatre.
- 5:00 - 6:00 Radiology Seminar; Presentation of Cases from Heart Hospital; Joseph Asta; Eustis Amphitheater, U. H.

Ancker Hospital

- 8:00 - 10:00 Medical Grand Rounds; Auditorium.

Minneapolis General Hospital

- 9:30 - Neurology Rounds; Heinz Bruhl; Station I.
- 9:30 - Pediatric Contagion Rounds; R. B. Raile; Station K.
- 10:00 - Psychiatry Grand Rounds; R. W. Anderson and Staff; Station H.
- 11:30 - 12:30 Clinical Pathological Conference; John I. Coe; Classroom.
- 12:30 - 2:30 Dermatology Rounds and Clinic; Carl W. Laymon and Staff.
- 1:00 - Fracture - X-ray Conference; Drs. Zierold and Moe; Classroom.
- 1:00 - House Staff Conference; Station I.

Thursday, May 20 (Cont.)

Veterans Administration Hospital

- 8:00 - Surgery Grand Rounds; Conference Room, Bldg. I.
- 8:00 - Surgery Ward Rounds; Lyle Hay and Staff; Ward 11.
- 8:30 - Hematology Rounds; Drs. Hagen and Fifer.
- 11:00 - Surgery-Roentgen Conference; J. Jorgens; Conference Room, Bldg. I.
- 1:30 - 4:30 Infectious Disease Conference and Rounds; Wesley W. Spink; Conference Room, Bldg. I.

Friday, May 21

Medical School and University Hospitals

- 8:00 - 10:00 Neurology Grand Rounds; A. R. Baker and Staff; Station 50, U. H.
- 9:00 - 9:50 Medicine Grand Rounds; C. J. Watson and Staff; Todd Amphitheater, U. H.
- 10:30 - 11:50 Medicine Rounds; C. J. Watson and Staff; Todd Amphitheater, U. H.
- 10:30 - 1:50 Otolaryngology Case Studies; L. R. Boies and Staff; Cut-Patient Department, U. H.
- 11:00 - 12:00 Vascular Rounds; Davitt Felder and Staff Members from the Departments of Medicine, Surgery, Physical Medicine, and Dermatology; Eustis Amphitheater, U. H.
- 11:45 - 12:50 University of Minnesota Hospitals Staff Meeting; Use of Social Workers in a Medical Education Program; Fred Gross; Powell Hall Amphitheater.
- 1:00 - 2:50 Neurosurgery-Roentgenology Conference; W. T. Peyton, Harold O. Peterson and Staff; Todd Amphitheater, U. H.
- 1:30 - 2:30 Dermatology Grand Rounds; Presentation of Cases from Grouped Hospitals (University, Ancker, General and Veterans) and Private Offices; H. E. Michelson and Staff; Eustis Amphitheater, U. H.
- 2:30 - 4:00 Dermatology Hospital Rounds; H. E. Michelson and Staff; Begin at Dermatological Histopathology Room, M-434, U. H.
- 3:00 - 4:00 Neuropathological Conference; F. Tichy; Todd Amphitheater, U. H.
- 3:30 - 4:30 Dermatology-Physiology Seminar; 3rd Floor Conference Room, Heart Hospital.
- 4:00 - 5:00 124 Advanced Neurophysiology Lecture; Werner Koella and Ernst Gellhorn, 111 Owre Hall.
- 4:30 - 5:20 Ophthalmology Ward Rounds; Erling W. Hanson and Staff; E-534, U. H.
- 5:00 - Urology Seminar and X-ray Conference; Eustis Amphitheater, U. H.

Ancker Hospital

- 1:00 - 3:00 Pathology-Surgery Conference; Auditorium.

Friday, May 21 (Cont.)

Minneapolis General Hospital

- 9:30 - Pediatric Rounds; Elizabeth Lowry; Station J.
10:30 - Pediatric Surgical Conference; Tague Chisholm and B. Spencer; Classroom, Station I.
12:00 - Surgery-Pathology Conference; Dr. Zierold, Dr. Coe; Classroom.
1:00 - 3:00 Clinical-Medical Conference; Thomas Lowry; Classroom, Station M.
1:30 - Pediatric Contagion Rounds; L. Wannamaker; Station K.

Veterans Administration Hospital

- 10:30 - 11:20 Medicine Grand Rounds; Conference Room, Bldg. I.
1:00 - Chest Pathology Follow-up Conference; E. T. Bell; Conference Room, Bldg. I.
2:00 - Clinicopathological Conference; Conference Room, Bldg. I.

Saturday, May 22

Medical School and University Hospitals

- 7:45 - 8:50 Orthopedic X-ray Conference; W. H. Cole and Staff; M-109, U. H.
9:00 - 10:30 Pediatric Grand Rounds; Eustis Amphitheater, U. H.
9:00 - 11:50 Medicine Ward Rounds; C. J. Watson and Staff; Heart Hospital Amphitheater.
9:15 - 10:00 Surgery-Roentgenology Conference; L. G. Rigler, J. Friedman, Owen H. Wangenstein and Staff; Todd Amphitheater, U. H.
10:00 - 11:30 Surgery Conference; Todd Amphitheater, U. H.
10:00 - 12:50 Obstetrics and Gynecology Grand Rounds; J. L. McKelvey and Staff; Station 44, U. H.
11:30 - Anatomy Seminar; The Development of Myofibrils; Richard Hibbs; 226 Institute of Anatomy.

Ancker Hospital

- 8:30 - 9:30 Surgery Conference; Auditorium.

Minneapolis General Hospital

- 8:00 - Urology Staff Conference; T. H. Sweetser; Main Classroom.
9:00 - Psychiatry Grand Rounds; R. W. Anderson; Station H.
9:30 - Pediatric Rounds on all Stations; R. B. Raile.
11:00 - 12:00 Medical - X-ray Conference; O. Lipschultz, Thomas Lowry and Staff; Main Classroom.

Veterans Administration Hospital

- 8:00 - Proctology Rounds; W. C. Bernstein and Staff; Bldg. III.
8:30 - Medical X-ray Conference; Conference Room, Bldg. I.