zation of the tissue in a solution of sucrose-glycerol-acetone. The isolation made it possible to determine protein, RNA, and DNA content of perikaria. He found a rapid incorporation of C^{14} lysine into nerve-cell proteins.

H. Naruse (Tokyo) discussed the mechanism of carbon dioxide fixation into amino acids and into intermediates of the tricarboxylic acid cycle in nervous tissue. This mechanism might participate in the regulation of carbohydrate metabolism.

S. Hirano (Tokyo) analyzed the mechanism of incorporation of P^{32} from ATP into microsomal proteins. This is the fraction in which Na-K-adenosine triphosphatase is concentrated, and phosphorylation of an unstable intermediate may be a part of the activity of transport adenosine triphosphatase. H. Yoshida (Osaka) reported that calcium binding in brain microsomal and nerve ending particles is accelerated by ATP and magnesium, which suggests a possible role of this reaction in the neuronal excitation-inhibition processes.

J. Axelrod reported the neural regulation of hormonal secretion of the pineal gland. This gland synthesizes and secretes melatonin, which has an inhibitory action on the gonads. The amount of melatonin and the activity of the enzyme which synthesizes it are decreased by continuous light. The effect of light is transmitted to the pineal gland from the eyes by way of the cervical sympathetic nerves. The pineal gland responds to the diurnal change of light and shows the circadian rhythm, being highest at midnight and lowest at noon. Thus the pineal gland may be one of the biological clocks in the body.

R. Takahashi discussed changes in brain ammonia and acetylcholine content caused by electrically induced convulsions in mice. He stressed the close relation between the level of acetylcholine in the brain and the threshold of electric stimulation for convulsions.

O. H. Lowry discussed the major control steps of the various pathways of carbohydrate metabolism in the brain. He analyzed the substrate concentrations and the sequential changes in these concentrations in anoxia. He also discussed mechanisms controlling metabolic rates.

Y. Tsukada reported the incorporation of P^{32} in vitro into highly polymerized RNA in the isolated rabbit retina in which the electrical responses to light stimulation could be recorded. Nuclear RNA was actively labeled in both light and dark conditions although no such incorporation occurred in brain cortex slices. The rapidly labeled RNA was not identical with ribosomal RNA in its sedimentation in sucrose density gradients.

Discussion after formal presentations dealt with the present findings and future possibilities in the relationship between neural function and metabolic regulation in the nervous system. The evidence for the participation of biochemical processes in memory were discussed, and also a possible differentiation between short and long term memory on biochemical grounds.

The topic of the roundtable session was metabolic compartmentation. G. Takagaki, H. Naruse (Tokyo), and A. Lajtha discussed the metabolic compartments of amino acids, especially glutamic acid, in the brain. M. Kurokawa (Tokyo) reported compartments of acetylcholine in brains of normal and epileptogenic mice in the subcellular particles. The discussion centered on the structural basis of these compartments and the compartments of enzymes and substrates. The influence of such compartments on kinetic measurements of metabolic rates was stressed.

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Cerebrovascular Disease

The fifth Princeton Conference on Cerebrovascular Disease was held in Princeton, New Jersey, 5–7 January 1966. Papers were presented by 19 speakers. Clinical and basic scientists, numbering 70, attended the conference and took part in the discussions.

D. Detweiler (University of Pennsylvania) pointed out during a discussion on cerebral atherosclerosis that the most common animal form of this disease can be observed in aged swine. However, there is no correlation between coronary and cerebral atheroscleroses in these animals even though the aorta is always involved.

H. Ratcliffe (Philadelphia Zoological Garden) spoke about ecological factors associated with atherosclerosis in zoo animals. He noted interrelationships between sociosexual environmental factors and atherosclerosis in chickens. It appeared from long-range study at the Philadelphia Zoo that reasonable care had been taken to exclude the effect of diet in the different "population groups" studied.

The fine structure of experimental atherosclersosis, and particularly his own work on the subject, was reviewed by J. Geer (Louisiana State University Medical Center). Geer defined certain of the fine structures he believes to be important in the pathogenesis of atherosclerosis in the laboratory animal. He has observed many of the same findings in early atherosclerosis (intimal streaks in the aorta) in humans.

The Framingham research project was described by W. B. Kannel (Heart Disease Epidemiology Study, Framingham, Massachusetts). During this epidemiologic investigation of cerebrovascular disease 90 case histories were studied. The diagnosis was infarction in 63 percent, subarachnoid hemorrhage in 18 percent, embolism in 15 percent, and hypertensive intracerebral hemorrhage in 4 percent. It was reported that the risk was increased fivefold in persons having hypertension and that definite increase in concentration of cholesterol in the plasma before age 40 appeared to be a "poor risk" factor. When hypercholesteremia, hypertension, and electrocardiographic changes were present simultaneously, the risk of focal cerebrovascular disease appeared to be increased eightfold.

A. Lilienfeld (Johns Hopkins University) raised the question of the significance of the relative contribution that each risk factor (increased plasma cholesterol, changes in electrocardiogram, and hypertension) makes in relation to the other risk factors and their individual or combined relation to the cerebral infarction. He interpreted Kannel's data as suggesting that cerebral infarction is a late-in-life manifestation similar to myocardial infarction. The matter of the significance of transient ischemic attacks as "precursor" events to cerebral infarction independently or in relationship to other risk factors was discussed; no satisfactory answers were presented.

The changing pattern of cerebrovascular disease in the United Kingdom was described by P. O. Yates (University of Manchester). His analysis of death certificates (1932 to 1961) showed

an increased occurrence of cerebral infarction and a decreased occurrence of cerebral hemorrhage in the United Kingdom. In retrospective analysis of patterns of diagnosis from hospital autopsy material, Yates does not believe that changing patterns in diagnosis as recorded on death certificates account for the altered trends. He therefore concludes that some environmental factor is responsible for the change in the relationship of the frequencies of cerebral infarction and cerebral hemorrhage.

Although finding a similar pattern in the United States, R. M. Acheson (Yale University School of Medicine) and others suggested that further validation of the accuracy of the death certificate data is necessary. In addition, there were comments concerning the fundamental matter of the pathologic distinction between very hemorrhagic infarction and certain forms of intracerebral hemorrhage.

B. Hood (Göteborgs Universitet, Göteborg, Sweden) noted that the effective medical treatment of systemic hypertension is decreasing the mortality due to intracerebral hemorrhage in Sweden. In the period 1948 to 1949, 48 percent of the deaths caused by cerebrovascular disease were due to hemorrhage, compared to only 32 percent of similar deaths in the period 1960 to 1961. Studies by R. W. Gifford, Jr. (Cleveland Clinic, Cleveland, Ohio), show an increased number of patients with hypertension in 1962 and 1963 as contrasted to 1950 and 1951. However, in the former years there were less than half as many deaths from cerebral hemorrhage as in the latter. Many of the epidemiologists made constructive criticisms concerning the design of such studies and suggested ways of further investigating this important issue.

S. Katsuki (Kyushu University, Fukuoka City, Japan) and R. Stallones (University of California, Berkeley) discussed the current concept of the frequency of cerebral hemorrhage and cerebral infarction in Japan. Katsuki noted that the age-adjusted death rates for cerebrovascular disease per 100,000 population revealed that, in 1951 in Japan, hemorrhage was 29 times as common as cerebral infarction; in 1956, 12 times as common; in 1962, 4 times as common; and, in a most recent autopsy study, 1.1 times as common. Preliminary reports concerning observations made in a population study being conducted at Hasihama, Japan, where autopsies were performed for every death in 1965, show that cerebral infarction is twice as common as cerebral hemorrhage.

A. Heyman (Duke University Medical Center) described the use of thermography in the diagnosis of extracranial occlusive cerebrovascular disease. The technique may be valuable in screening patients for such structural arterial lesions. M. H. Sajid (University of Oregon Medical School, Portland) said that direct skin-temperature recordings were a simpler but effective way of obtaining results similar to those produced by thermography. Others did not agree with this conclusion.

The frequency of occurrence of cervical bruits and the prognostic significance of this phenomenon were discussed by F. McDowell (Bellevue Hospital, New York, New York), who concluded that such bruits are very common and are not an ominous prognostic sign. R. Burton (Mayo Clinic) believes that significant cervical bruits are much less common than McDowell's (Cornell) group reported and are significant as signs of underlying arterial pathology. There was considerable difference of opinion about the validity of any scheme for grading bruits. There was also a difference of opinion about whether an arterial operation was warranted when the sole indication was the detection of a cervical bruit.

S. Hilal (Columbia-Presbyterian Medical Center, New York, New York) described the densitometric evaluation of cerebral angiograms. Details were given concerning the mathematical basis of the method, its calibration, results of measurement of flow in the carotid arteries in human subjects, and the application of the method to blood flow in smaller intracranial arteries. No significant decrease in internal carotid artery blood flow was noted unless there was a 50-percent decrease in the size of the lumen. There were questions concerning the precision of certain technical aspects of the method as well as further delineation of the exact function of the flow which is measured by this technique.

The new techniques for recording cerebral blood flow and metabolism in subjects with cerebrovascular disease, described by J. S. Meyer (Wayne State University) included: (i) automatic recording of cerebral blood flow by the nitrous oxide method without blood loss and (ii) a method similar to the one utilizing the inhalation of nitrous oxide but in which the nitrous oxide is replaced by molecular hydrogen. Among the advantages of the former are: there is no blood loss; the cerebral blood-flow determination can be repeated many times in the same patient; and the automatic features essentially eliminate human error in determining the values for multiple samples. In the hydrogen method, 2.5 percent hydrogen in air is inhaled by the subject as the inert gas. Hydrogen electrodes monitor the partial pressures of hydrogen in arterial and venous blood in cuvettes. One of the most important advantages of this method is that the hydrogen curves for arterial and venous blood are available within less than 20 seconds after arteriovenous equilibration, which occurs after only about 3 minutes of breathing the inert gas. A disadvantage of the technique is the delicacy of the electrode-sensors and the matter of working with a combustible gas. S. S. Kety (National Institute of Mental Health, Bethesda, Maryland) reviewed various modifications in the nitrous oxide method and summarized the advantages of using an inert gas for the estimation of cerebral blood flow. Further discussion concerned the interpretation of some of the values obtained. The question was raised as to whether the electrode described actually measures the partial pressure of hydrogen.

Agents which affect blood sludging and blood volume and increase serum osmolarity were described by L.-E. Gelin (Göteborgs Universitet, Sweden). Dextran of low molecular weight has a variety of beneficial effects on tissue reactions, particularly of platelets, to injury. Comments were made concerning the use of dextran in clinical situations in which there is blood sludging and altered blood volume. C. A. Owen, Jr. (Mayo Clinic) summarized knowledge concerning mechanisms of the initial phases of platelet aggregation and thrombosis. He indicated the potential role of an agent, such as low-molecular-weight dextran, in the pathogenetic mechanisms under consideration.

A. G. Waltz (Mayo Clinic) reported on the modification of cortical microcirculation following occlusion of the middle cerebral artery and how such changes are influenced by the agents discussed by Gelin. As significant changes, he noted focal pallor, "aggregations" of platelets, and segmental arterial constriction, the latter be-

ing interpreted as arterial spasm. Significant species differences were noted in the rhesus monkey, squirrel monkey, and cat. Hemodilution produced transient favorable change of the processes, followed by worsening. T. Sundt (Mayo Clinic) described the experimental procedure. He reported that the size of the infarct produced in cats by occlusion of the middle cerebral artery was significantly reduced by the intravenous administration of a mixture of concentrated serum albumin, low-molecular-weight dextran, and urea. J. S. Meyer (Wayne State University) commented on the significance of the changes observed by Waltz in the corticomicrovasculature. The possibility was mentioned that the segmental arterial narrowing could be a form of artifact. Since the agents used by Sundt were administered before the artery was occluded, it appeared that his observation might not be relevant to cerebral infarction in the human.

Controlled evaluation of cerebral vasodilator drugs in the progressive stroke patient was discussed by J. Gilroy (Wayne State University). Patients said to have progressing stroke were randomly assigned to experimental groups after certain basic criteria were satisfied. In a group of 70 patients, 34 received 500 mg of papaverine intravenously, in a treatment pattern of 8 hours of treatment followed by 8 hours of rest, for 10 days. Thirty-six patients were treated only with the usual careful attention to diet, nursing care, and other symptomatic measures. Improvement was noted in 25 of the 34 patients receiving papaverine and in 24 of the 36 not receiving papaverine. Although there was no significant difference in the number of deaths between the groups, Gilroy believed that a complex rating scale for the recording of neurologic function showed that the treated group improved more than the group not receiving papaverine. Some problems were encountered with phlebothrombosis, hypertension, drowsiness, and apprehension in the treated group. Another group of 51 patients received acetazolamide; 41 patients were in the control group that did not receive the drug.

The dosage schedule was the same as for papaverine. Once again, there was no significant difference in the results as far as numbers of patients improved or dying were concerned. However, there appeared to be more recovery of neurologic function in the treated group than in the group not receiving acetazolamide. O. M. Reinmuth (University of Miami) raised questions concerning the validity of the scoring method, the experience of the individuals performing the various examinations, and the meaning of the increased jugular oxygen tensions which have been thought to show increased utilization of oxygen.

L. C. Clark, Jr. (University of Alabama Medical Center) presented data concerning differences in arteriovenous oxygen in the protection of cerebral tissue during decreased cerebral blood flow. Although 142 patients had been studied, no specific conclusions could be reached. The discussion included some difference of opinion concerning the significance of a change in jugular oxygen tension. It was undecided whether an increase means that significant regions of brain are performing metabolically in normal fashion or are simply receiving adequate support for normal function. Most of the participants agreed that there is no given venous-oxygen tension value which invariably denotes cerebral dysfunction. However, in almost all instances a value below 20 mm-Hg will be associated with loss of consciousness.

The cases of more than 5000 patients with subarachnoid hemorrhage have been reviewed in a cooperative study of subarachnoid hemorrhage and ruptured aneurysm. A. L. Sahs (State University of Iowa) reported for the various institutions cooperating in the study; he stated that aneurysm had been demonstrated in 51 percent of the patients, arteriovenous abnormalities in 6 percent, and aneurysm plus arteriovenous abnormality in 0.7 percent. Forty-three percent of the patients might be said to have unexplained subarachnoid hemorrhage. Autopsies were performed for more than 250 patients in the last group; it appeared that the most important factors associated with a subarachnoid hemorrhage were hypertension and atherosclerosis. A. Richardson (Atkinson Morley's Hospital, London, England) revealed that in his own experience about 20 percent of patients with subarachnoid hemorrhage actually had primary intracerebral hematoma. It became apparent that the data presented by the cooperative study group actually include primary hypertensive intracerebral hemorrhage under the general category of subarachnoid hemorrhage. This would probably account for the distortion of the data related to the cause of subarachnoid hemorrhage. Richardson commented that, in his experience with more than 4000 patients with subarachnoid hemorrhage, aneurysm was demonstrated in 55 percent, arteriovenous abnormality in 7 percent, and intracerebral hematoma in 20 percent, leaving 18 percent in the category "unknown cause."

W. S. Fields (Baylor University College of Medicine) presented a progress report from the cooperative study of extracranial arterial occlusive disease. Among hundreds of patients undergoing four-vessel angiography, complication rates are currently: death, 0.6 percent; minor complications, 12.7 percent; and grave complications, 0.7 percent. These data do not include complications which occurred before completion of the angiographic inspection of all four vessels. Among the many institutions participating in the cooperative study, the mortality from surgical reconstruction of cervical arteries varied from 2.8 to 38 percent.

R. Bauer (Wayne State University) carried on a randomized control study of the surgical treatment of occlusive cerebrovascular disease. In this series of patients, treatment was determined by a random selection method; 89 patients were treated surgically and 94 patients were not operated on. Surgical complications included a death rate of 13.5 percent, serious worsening in 4.0 percent, and transient complications in 12.3 percent. At the end of 24 to 42 months, Bauer reported that in the surgically treated group 34 percent were improved, 23 percent were unchanged, 11 percent were worse, and 30 percent were dead. Of the nonsurgical patients, 34 percent were improved, 33 percent were unchanged, 11 percent were worse, and 21 percent were dead. E. J. Wylie (San Francisco, California) noted that there were nine deaths among 16 patients who had cerebral infarction due to acute occlusion of the internal carotid artery and who were operated on 48 to 72 hours after the acute occlusion. Eight of these nine had hemorrhagic infarction at autopsy. A study by O. C. Julian (Chicago, Illinois) with cervical arterial surgery extends to 506 patients, with a surgical mortality of 9 percent. General discussion included many comments regarding the need for precision concerning the diagnostic categories of patients submitted to operation, difference of opinion about the definition of "acute" in the term "cerebral infarc-

tion due to acute occlusion of the internal carotid artery," pathogenetic mechanisms in patients having neurologic complications soon after operation, and the specific recommendations for vascular surgery in cervical arterial occlusive disease.

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Forthcoming Events

May

15–18. American Inst. of **Chemical Engineers**, 59th annual mtg., Columbus, Ohio. (The Institute, 345 E. 47 St., New York 10017)

16–17. **Plant Growth**, conf., New York, N.Y. (J. F. Frederick, Dodge Chemical Co., Research Labs., 3425 Boston Rd., Bronx, N.Y. 10469)

16–18. **Aerospace Electronics**, 18th natl. conf., Dayton, Ohio. (J. M. Mayer, 4525 Fernbrook St., Kettering, Ohio 45440)

16–18. Society of German **Engineers**, conf., Berlin. (The Society, Postfach 10 250, 4 Düsseldorf 10, Germany)

16–18. Institute of Electrical and Electronics Engineers, Group on **Microwave Theory and Technique**, symp., Palo Alto, Calif. (L. Young, Stanford Research Inst., Menlo Park, Calif. 94025)

16–18. **Power Instrumentation**, 9th natl. symp., Detroit, Mich. (R. C. Austin, Detroit Edison Co., 2000 Second Ave., Detroit 48226)

16–18. American Assoc. for **Thoracic Surgery**, Vancouver, B.C., Canada. (A. Henvey, 311 Carondelet Bldg., 7730 Carondelet Ave., St. Louis, Mo.)

16–19. **Biomedical Sciences Instrumentation**, 4th natl. symp., Anaheim, Calif. (T. B. Weber, Beckman Instruments, Inc., 2500 Harbor Blvd., Fullerton, Calif. 92632)

16–20. American Soc. of **Civil Engineers**, Denver, Colo. (W. H. Wisley, 345 E. 47 St., New York, N.Y. 10017)

16–20. **Disposal of Radioactive Wastes** into the Seas, Oceans, and Surface Waters, symp., Intern. Atomic Energy Agency, Vienna, Austria. (IAEA, 11 Kärntnerring, Vienna 1)

16–20. American **Industrial Hygiene** Assoc., Pittsburgh, Pa. (A. D. Hosey, 1014 Broadway, Cincinnati, Ohio 45202)

16–20. **Water Resources Engineering**, conf., American Soc. of Civil Engineers, Denver, Colo. (W. H. Wisley, The Society, 345 E. 47 St., New York 10017)

17–19. **Fast Breeder Reactors**, intern. conf., London, England. (H. C. Dunn, British Nuclear Energy Soc., Risley, Warrington, Lancashire, England)

18–20. **Operations Research** Soc. of America, 29th natl. mtg., Santa Monica, Calif. (J. E. Walsh, System Development Corp., 2500 Colorado Ave., Santa Monica)

18–25. **Warm-Water Pond Fish Culture**, world symp., U.N. Food and Agriculture Organization, Rome, Italy. (T. V. R. Pillay, FAO, Via delle Terme di Caracalla, Rome)