BRAIN RESEARCH INSTITUTE

UNIVERSITY OF CALIFORNIA, LOS ANGELES

UNPUBLISHED PRELIMINARY DATA

THIRD ANNUAL REPORT

JULY 1, 1963 TO JUNE 30, 1964

B R A I N R E S E A R C H I N S T I T U T E

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PREFACE

Although the present report describes activities of the Brain Research Institute for the year ending June 30, 1964, a brief account of the history and organization of the Institute is repeated here to orient those readers who are unfamiliar with its background.

Organization of the Institute began in the early 1950's. Under the leadership of Dr. H.W. Magoun, members of many departments with prominent interest in nervous system research were encouraged to develop closer relationships so they might broaden the scope of their investigative activities and extend the effectiveness of their educational efforts through collaborative endeavor.

Following a thorough review of the proposal, Institute status was assigned by the University of California late in 1959. While the proposal was being reviewed by University bodies, plans were completed to erect a building to house the research projects, and in 1958, construction of a structure containing 76,000 square feet of space was begun. Occupancy of the building began in March of 1961, and the official opening of the Brain Research Institute was held October 14 and 15, 1961.

The Brain Research Institute operates under a director and an advisory committee, appointed by the Chancellor upon recommendations made by the Dean of the School of Medicine. Members of the Brain Research Institute are elected by action of the advisory committee and director, in recognition of their established capability in brain research as indicated by research accomplishment. During the period 7/1/63 - 6/30/64 there were 68 members, 10 associate members, 12 visiting members and 5 consulting members of the Institute (see p.3-8) from 14 departments, 12 of which are in the School of Medicine, and two in the College of Letters and Science. In addition, there is active collaborative research with investigators from many other departments in the University. Joint endeavors are undertaken with other institutions as well, among which may be mentioned University of California, San Diego; University of Southern California; regional Veterans Administration Hospitals; and many private organizations.

All members of the Institute must be members of departments. In this capacity, all academic members (appointments at the level of Assistant Professor or higher) of the Institute have teaching responsibilities to undergraduates, medical students, or students in the Graduate Division. Members of the Institute holding professional research appointments also must have departmental assignments, although their teaching responsibilities are less formalized. All members of the Institute, whether on academic or research appointments, devote their main or exclusive research effort to

programs advancing knowledge of the function and structure of the brain, and all have major responsibilities in the preceptoral education of graduate students and postdoctoral fellows for careers in brain research.

The illustration which follows indicates diagrammatically the general structure and function of the Institute.

J W French

In the diagram on the facing page, departments in which Brain Research Institute members have affiliation are oriented vertically and BRI activities are oriented horizontally. Vertical lines denoting departmental boundaries are extended through PROJECT RESEARCH to indicate that laboratory studies of members tend to employ disciplinary techniques appropriate to the field of department interests. However, these lines are seen to dim progressively and finally disappear as they proceed through the five principal divisions of Institute effort suggesting the collaborative or inter-disciplinary nature of other BRI activities. These latter divisions are shown to extend horizontally into other segments of the University of California to indicate broad contacts encouraged by the BRI.

Abbreviations of Colleges: L & S - Letters and Science; Other Col. - Other Colleges

Abbreviations indicating departments are:

Psychol.	Psychology	Ment. Hyg.	Mental Hygiene
Zool.	Zoology	Path.	Pathology
Anat.	Anatomy	Pediat.	Pediatrics
Med. Hist.	Medical History	Pharm.	Pharmacology
Biol. Chem.	Biological Chemistry	Physiol.	Physiology
Biophys. & N.M.	Biophysics and Nuclear Medicine	Psychiat.	Psychiatry
Med. Microb. & I.	Medical Microbiology and Immunology	Surg. Neuro.	Surgery (Neurosurgery)
Medicine, Neuro.	Medicine (Neurology)	Surg. Anes.	Surgery (Anesthesiology)

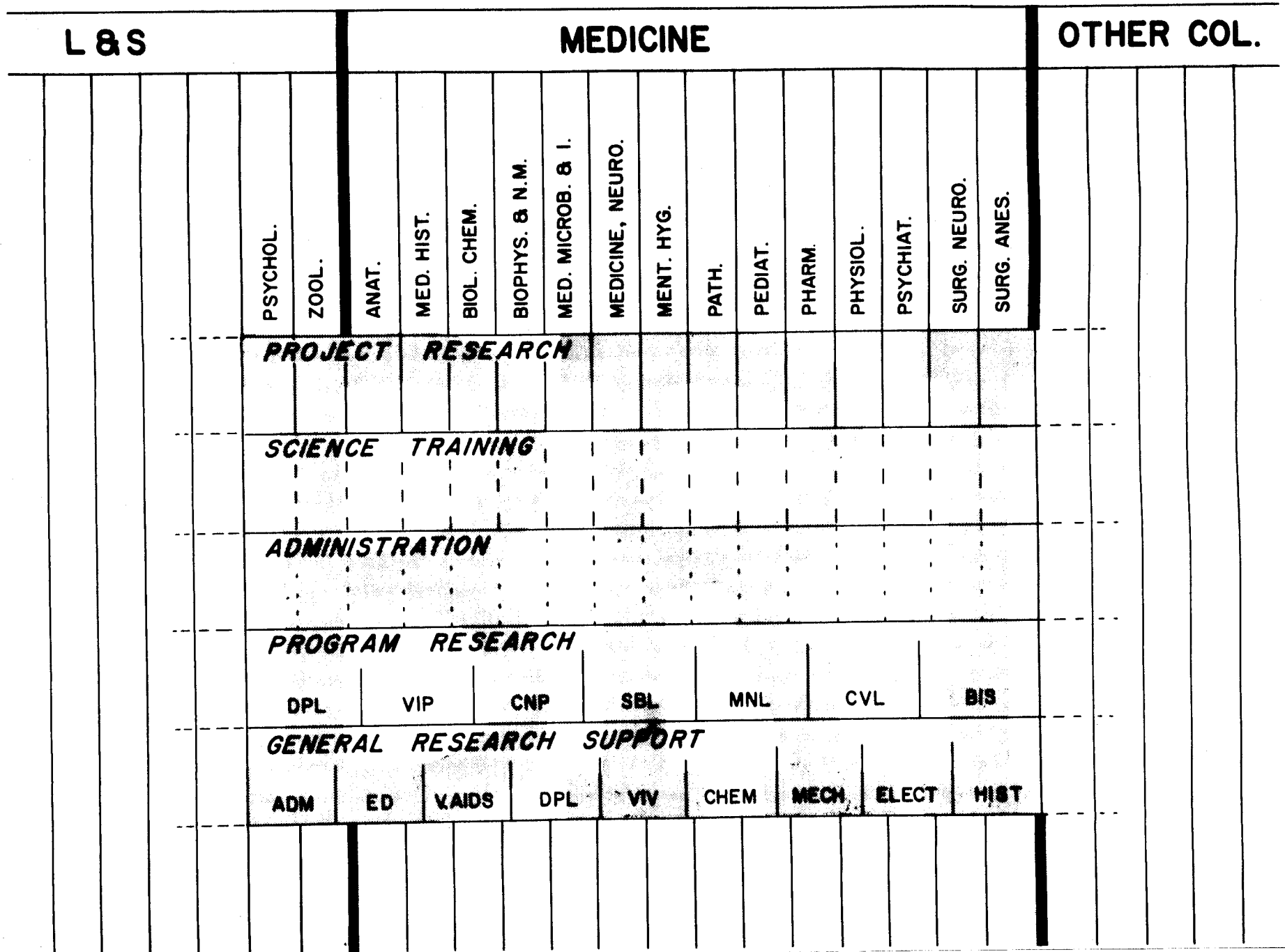
Abbreviations denoting collaborative PROGRAM RESEARCH units are:

DPL	Data Processing Laboratory	MNL	Marine Neurobiology Laboratory
VIP	Visiting Investigator Program	CVL	Cardiovascular Laboratory
CNP	Clinical Neurophysiology Program	BIS	Brain Information Service
SBL	Space Biology Laboratory		

Abbreviations referring to GENERAL RESEARCH SUPPORT activities are:

ADM	Administration	CHEM	Chemistry Laboratory
ED	Editorial Service for Grants and Reports	MECH	Mechanical Laboratory
V. AIDS	Visual Aids	ELECT	Electronic Laboratory
DPL	Data Processing Laboratory	HIST	Histology Laboratory
VIV	Vivarium		

UNIVERSITY OF CALIFORNIA, LOS ANGELES



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B R A I N R E S E A R C H I N S T I T U T E M E M B E R S

CHANGES IN MEMBERSHIP

During the past year a number of changes in membership occurred in the Brain Research Institute. Richard D. Walter, Associate Professor of Medicine (Neurology) was elected to membership. The following were elected as Associate Members:

BECKWITH, William C., Ph.D.	Assistant Professor in Residence and Assistant Research Psychologist (Department of Psychiatry)
BRIDGMAN, Charles F., Ph.D.	Assistant Professor of Anatomy and Art
DOCTER, Richard F., Ph.D.	Assistant Professor of Medical Psychology in Residence (Department of Psychiatry)
FAIRCHILD, Mahlon D., Ph.D.	Assistant Professor of Pharmacology in Residence
HAYWARD, James N., M.D.	Assistant Clinical Professor of Anatomy
HILLIARD, Jessamine, Ph.D.	Associate Research Anatomist
RHODES, John M., Ph.D.	Assistant Research Anatomist
STERMAN, Maurice B., Ph.D.	Assistant Research Anatomist
STUART, Douglas G., Ph.D.	Assistant Professor of Physiology in Residence
WALTER, Donald O., Ph.D.	Assistant Research Anatomist

Twelve visitors, participating in investigations in laboratories of various BRI members were elected as visiting members.

BABU, Sasira K., Ph.D.	Assistant Research Zoologist
BALDWIN, Basil A., Ph.D.	Assistant Research Physiologist
DECIMA, Emilio E., M.D.	NIMH Postdoctoral Trainee

ENGER, Per F., Ph.D.	Assistant Research Zoologist
GELLER, Edward, Ph.D.	Assistant Research Bio-Chemist
HALAS, Edward S., Ph.D.	NIH Postdoctoral Fellow
HOLMES, Eric J., M.D.	Assistant Professor of Medicine in Residence (Neurology)
LEHMANN, Dietrich, M.D.	Assistant Research Anatomist
McILWAIN, James T., M.D.	Postdoctoral Fellow, National Institutes of Health
PINEDA, Anselmo, M.D.	Assistant Clinical Professor of Anatomy
PORTER, Robert, M.D.	Assistant Research Anatomist
RIEHL, Jean L., M.D.	Assistant Professor of Medicine in Residence (Neurology)

Recognizing the important contributions given by professional people of established capability in fields ancillary to brain study, the Advisory Committee of the BRI elected to Consulting Membership the following:

BEAUCHEMIN, Joseph A., M.D.	Assistant Professor of Pathology
DIXON, Wilfrid J., Ph.D.	Professor of Bio-Statistics
KADO, Raymond T.	Associate in Anatomy, Senior Engineer
NORRIS, Kenneth S., Ph.D.	Associate Professor of Zoology
RICH, Sigmund T., D.V.M.	Lecturer in Physiology, Vivarium Administrator

In March, 1964 Dr. J. Eric Holmes, left the BRI to accept a position on the faculty of the University of Southern California.

ABSENCES

Dr. John A. Bevan spent a sabbatical year as a Special Fellow of the United States Public Health Service at the University of London. In March of 1964, Dr. Thelma Estrin returned from a year's leave of absence as a Fulbright Fellow, which she spent at the Weizmann Institute of Nuclear Science, Rehovot, Israel. Dr. Joaquin Fuster continued his Mental Health Institute Investigator Fellowship at the Max Planck Institute, Munich,

Department of Experimental Neurophysiology. Dr. Allan Hemingway was at the University of Otago Medical School, Dunedin, New Zealand from August of 1963 until May, 1964. Dr. Wilfrid F. H. M. Mommaerts spent a sabbatical year at the Centre de Recherches at Strasbourg, France, studying conformational properties of large molecules. Dr. George P. Moore was at MIT from June, 1963 to July, 1964. Dr. Robert D. Tschirgi spent the period July, 1963 to January, 1964 at the University of Hawaii as Project Director of Medical Education Study. On January 1, Dr. Tschirgi became University Dean of Academic Planning at Berkeley.

Sabbaticals in residence were spent by four members, Dr. W. Ross Adey, January, 1964 to July, 1964; Dr. Sidney Roberts, September, 1963 to August 1964; Dr. Augustus S. Rose, July 1963 to September 1963; and Dr. Bernice Wenzel, February 1, 1964 to March 31, 1964 and May 1, 1964 to August 31, 1964.

LIST OF MEMBERS

ADEY, W. Ross, M.D.	Professor of Anatomy and Physiology Director, Space Biology Laboratory
ALLEN, Raymond A., M.D.	Associate Professor of Pathology
BEVAN, John A., M.D.	Associate Professor of Pharmacology
BRADY, Allan J., Ph.D.	Associate Professor of Physiology in Residence Associate Research Biophysicist
BRAZIER, Mary A. B., Ph.D., D.Sc.	Professor in Residence in Departments of Anatomy, Biophysics and Physiology
BROWN, Josiah, M.D.	Associate Professor of Medicine (Endocrinology)
BROWN, W. Jann, M.D.	Associate Professor of Pathology Chief, Division of Neuropathology
BUCHWALD, Jennifer S., Ph.D.	Assistant Research Pediatrician Assistant Professor of Pediatrics in Residence
BUCHWALD, Nathaniel A., Ph.D.	Associate Professor of Anatomy in Residence Associate Research Anatomist
BULLOCK, Theodore H., Ph.D.	Professor of Zoology
CLEMENTE, Carmine D., Ph.D.	Associate Professor of Anatomy Chairman, Department of Anatomy

CRANDALL, Paul H., M.D.	Associate Professor of Surgery (Neurosurgery)
DILLON, John B., M.D.	Professor of Surgery (Anesthesiology)
DITMAN, Keith S., M.D.	Research Psychiatrist and Lecturer Director, Alcoholism Research Clinic
EIDUSON, Samuel, Ph.D.	Associate Professor in Residence, Departments of Biological Chemistry and Psychiatry Chief Research Biochemist, Neuropsychiatric Institute
ELDRED, Earl, M.D.	Professor of Anatomy
ESTRIN, Thelma, Ph.D.	Associate Research Engineer in Anatomy
FRENCH, John D., M.D.	Professor of Anatomy Clinical Professor of Surgery (Neurosurgery) Director, Brain Research Institute
FUSTER, Joaquin M., M.D.	Associate Research Psychiatrist and Lecturer
GEORGE, Robert, Ph.D.	Associate Professor of Pharmacology
GORSKI, Roger A., Ph.D.	Assistant Professor of Anatomy
GREEN, John D., M.D.	Professor of Anatomy
HAGIWARA, Susumu, M.D., Ph.D.	Research Zoologist
HALL, Victor E., M.D.	Professor of Physiology Chairman, Department of Physiology
HARARY, Isaac M., Ph.D.	Associate Professor of Biological Chemistry Associate Professor of Biophysics Associate Research Biochemist
HEMINGWAY, Allan, Ph.D.	Professor of Physiology
HYDE, Jane E., Ph.D.	Associate Research Anatomist
JENDEN, Donald J., M.D.	Professor of Pharmacology
JONES, Margaret H., M.D.	Professor of Pediatrics
KRUGER, Lawrence, Ph.D.	Associate Professor of Anatomy

LAMSON, Baldwin G., M.D.	Professor of Pathology Associate Director of Clinical Labs
LESSE, Henry, M.D.	Associate Professor of Psychiatry in Residence Chief of Research, NPI, California State Department of Mental Hygiene
LINDSLEY, Donald B., Ph.D.	Professor of Physiology and Psychology
MADDEN, Sidney C., M.D.	Professor of Pathology Chairman, Department of Pathology
MAGOUN, Horace W., Ph.D.	Professor of Anatomy Dean, Graduate Division, UCLA
MARKHAM, Charles H., M.D.	Assistant Professor of Medicine (Neurology)
MARSH, James T., Ph.D.	Associate Professor of Psychiatry (Medical Psychology)
MAXWELL, David S., Ph.D.	Assistant Professor of Anatomy
MEAD, James F., Ph.D.	Professor of Biological Chemistry Professor of Biophysics Research Biochemist
MOMMAERTS, Wilfried F.H.M., Ph.D.	Professor of Medicine Professor of Physiology Director, Cardiovascular Research Laboratory
MOORE, George P., Ph.D.	Assistant Professor of Physiology
PEARSON, Carl M., M.D.	Associate Professor of Medicine (Rheumatology)
PEASE, Daniel C., Ph.D.	Professor of Anatomy
PIERCE, John G., Ph.D.	Professor of Biological Chemistry Vice-Chairman, Department of Biological Chemistry
PORTER, Robert W., M.D., Ph.D.	Associate Clinical Professor of Anatomy Assistant Clinical Professor of Surgery (Neurosurgery)
RAND, Robert W., M.D.	Associate Professor of Surgery (Neurosurgery)

RASMUSSEN, A. Frederick, M.D.	Professor of Medical Microbiology & Immunology Chairman, Department of Medical Microbiology & Immunology
ROBERTS, Sidney, Ph.D.	Professor of Biological Chemistry
ROSE, Augustus S., M.D.	Professor of Medicine (Neurology) Chief, Division of Neurology
SAWYER, Charles H., Ph.D.	Professor of Anatomy
SCHEIBEL, Arnold B., M.D.	Associate Professor of Anatomy Associate Professor of Psychiatry
SCHLAG, John D, M.D.	Assistant Research Anatomist Assistant Professor of Anatomy in Residence
SEGUNDO, Jose P., M.D.	Professor of Anatomy in Residence
SELLERS, Margaret I., Ph.D.	Associate Professor of Medical Microbiology & Immunology (Virology)
SJOSTRAND, Fritiof S., M.D., Ph.D.	Professor of Zoology
SLATER, Grant G., Ph.D.	Assistant Research Biological Chemist, Departments of Biological Chemistry & Psychiatry
SLUSHER, Margaret A., Ph.D.	Associate Research Anatomist
SONNENSCHEIN, Ralph R., M.D., Ph.D.	Professor of Physiology
STERN, W. Eugene, M.D.	Professor of Surgery (Neurosurgery) Chief, Division of Neurosurgery
TAYLOR, Dermot B., M.D.	Professor of Pharmacology Chairman, Department of Pharmacology
TIDD, Charles W., M.D.	Professor of Psychiatry
TSCHIRGI, Robert D., M.D., Ph.D.	Professor of Anatomy and Physiology
WALTER, Richard D., M.D.	Associate Professor of Medicine (Neurology)
WENZEL, Bernice M., Ph.D.	Associate Professor of Physiology
WINTERS, Wallace D., M.D., Ph.D.	Associate Professor of Pharmacology in Residence

WOLFGRAM, Frederick J., Ph.D.	Associate Professor of Medicine in Residence (Neurology)
WORDEN, Frederic G., M.D.	Professor of Psychiatry
ZABIN, Irving, Ph.D.	Associate Professor of Biological Chemistry

ASSOCIATE MEMBERS

BECKWITH, William C., Ph.D.	Assistant Professor in Residence and Assistant Research Psychologist (Department of Psychiatry)
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NORRIS, Kenneth S., Ph.D.	Associate Professor of Zoology
RICH, Sigmund T., D.V.M.	Lecturer in Physiology, Vivarium Administrator

INSTITUTE ACTIVITIES

The principal objectives of the Institute in serving the University are:

1. To provide a stimulating environment for independent and collaborative basic research in studies relating to the function and structure of the nervous system.

2. To encourage and broaden the education of undergraduate students, graduate students, and postdoctoral fellows from the life sciences and basic medical science departments, as well as of medical students, in fields relating to the nervous system.

3. To encourage and develop the correlation and dissemination of information concerning the brain through such functions as conferences, book publishing, public lectures, public service, etc.

Research activities of the Institute may be considered under two main categories:

1. Independent project research funded by grants assigned to individual investigators is undertaken by each member of the Institute.

2. Collaborative research supported by program grants assigned to the Brain Research Institute or to many investigators from different departments is conducted by groups of investigators.

PROJECT RESEARCH

It is a hallmark of the present era of science that, in pursuing research problems, able investigators frequently utilize methods conventional to disciplines other than those of the department to which the investigator belongs. For this reason, it is useful to review project research of investigators under headings descriptive of the nature of the investigations undertaken in project research, rather than according to departmental affiliation of the investigator. Descriptive information to follow, therefore, is organized according to the general subject with which the research of members deals.

Of necessity, the project descriptions included are so brief as to convey only the general nature of the topic pursued, or at best, a scant mention of results achieved. Brief though they may be, the references provide some index of the scope of effort being expressed in the laboratories of the Brain Research Institute. Additionally, the reviews may serve as a roster of activity ongoing in the Institute to orient the many visitors who come to the Institute yearly so that their personal interests may be expedited by appropriate scheduling of interviews.

MUSCULAR AND NEUROMUSCULAR MECHANISMS

Brady, Allan J.

Laboratory programs continued mostly on the characterization of ion transport particles and relaxing factors in muscle. Continuation of program on heat measurements is directed towards the fundamentals of energetics of muscle contraction.

Bridgman (See Eldred)

Buchwald, J.S. (See Eldred)

Eldred, Earl

Distribution and time relations of pressure relations were measured via a low viscosity oil-filled pressure transducer system attached to a fine hypodermic needle inserted into muscles undergoing stretch, total contraction, contraction of single motor units and directly stimulated contractions of muscle fibers. The findings are considered in relation to a hypothesis advanced by Dr. Bridgman that spindles may in part serve as pressure-sensitive receptors. (with Bridgman)

Dimensions of capsule, bag, and chain intrafusal fibers are being compared from serial histological sections of pairs of muscles differing in respect to stretch, gross contracture, intrafusal fiber contracture, and direct pressure. Purpose of the study is to see if differential effects on the two types of intrafusal fibers occur as is hypothesized to occur from difference in their relations to the spindle capsule. (with Bridgman)

Multiple spike activity at brain sites is being monitored in acute and chronic cats for change in activity following induction of generalized spindle afferent acceleration by intravenous injection of succinylcholine. Several sites of change marking afferent pathways or secondary motor effects are detected; the medial lemniscal system, however, is not influenced. (with J.S. Buchwald and Halas)

The effects on length-frequency curves, phasic and gamma efferent sensitivity of flower-spray and annulospiral ending is being studied in cats with acute and chronic section of all or parts of the Achilles tendon. (with Yellin)

A bibliographic listing on morphology, pathology and intrinsic physiology of muscle receptors was made of 1200 articles published over the last century. (with Gadbois, Sweeney and Yellin)

Hagiwara, Susumu

Found by microinjection and recording techniques that spike potential in the barnacle muscle is due to calcium permeability increase instead of sodium.

Halas (See Eldred)

NEUROANATOMY

Allen, Raymond A.

The study of retinal neurons by means of electron micrographs of consecutive serial sections has been continued. Attention has been directed mainly to the axonal relationships of the middle (bipolar) layer of neurons. Several varieties of these cells have been followed through long series of sections of both guinea pig and human retinas. For an exhibit, one cell, nearly entire, was reconstructed as a three dimensional model, and several others from serial tracings were shown as artists' drawings of entire cells. From these studies, a number of new facts emerged. Mostly they relate to the number and types of synaptic relationships which characterize these cells in different parts of the retina. The cell types of the next order of neurons are presently being studied in an effort to further understanding of the complex neuronal relationships of the inner plexiform layer.

Bridgman (see Eldred)

Brown, W. Jann

Continuing studies of the reflexogenic zone at the bifurcation of the pulmonary artery have demonstrated the relative absence of classic pressoreceptor endings but have suggested the presence of a diffuse afferent system throughout in which focal areas of degenerative and regenerative neural activity are identified. It is suggested that the complexity of the pressoreceptor endings found in the high pressure areas may be a feature of cyclic neural regenerative and degenerative activity.

Eldred, Earl

An atlas of line drawings of the cat's hind limb and lumbosacral region with descriptive text of anatomy and surgical approaches is being prepared for use of experimental neurophysiologists. (with Bridgman and Osterberg)

Hagiwara, Susumu

In gymnotid fish, electroreceptors are seen by electronmicroscopy to be of two kinds. In one, the structure is connected with the surface by a jelly-filled canal. The other is essentially similar except that no canal is present. (with Szabo)

Kruger, Lawrence

Electron microscopic studies of normal glia in fish, reptile and rat were studied; in the rat the response to heavy particle irradiation was studied in the cerebral cortex and silver studies of fiber architecture are being compared with electron microscopic findings.

Maxwell, David S.

Electron microscopy of normal and irradiated rat brains has yielded important information with regard to classifications of non-neuronal (glial) cells, and their role in recovery from brain injury. Some important evidence also has emerged regarding the source for metabolic energy and survival during anoxic periods, and will lead to some biochemical data in the near future.

Scheibel, Arnold B.

Developed new data on circuit relationships in spinal cord. No "Renshaw" cells were found in spinal cord. Found a possible structural substrate of direct inhibition in cord.

Szabo (see Hagiwara)

NEUROCHEMISTRY

Brown, W. Jann

Studies on the stability and activation of hepatic lysosomal phosphomonoesterase suggest that maximal activity depends upon the presence of fully reduced sulphydryl groups and that gradual oxidation to -S-S occurred at pH 6.0 inducing a marked loss of enzyme activity. The absence of a corresponding loss at the particulate fraction suggests that the -SH groups of bound lysosomal acid phosphomonesterase are not easily oxidized.

A spectrofluorometric method for the determination of B-glucuronidase activity in hepatic and neural homogenates was developed. Michaelis and inhibitor constants were determined for the hepatic enzyme. These studies confirmed the particulate nature of the enzyme.

The activation of hepatic and neural lysosomal enzymes by chromotographically pure phospholipase has been demonstrated and found to be dependent upon free calcium (Ca++) ions. The role of calcium in this activation process is under investigation.

Eiduson, Samuel

The concentration of serotonin in specific parts of the developing brain, from embryo to post-natal life, was found to vary considerably from brain part to brain part and from one age to another. Injection of 5-hydroxytryptophan at a very early embryonic age appears to result in a serotonin deficient brain.

Geller, Edward

The biochemical consequences of various stresses, both experimental and "natural" have been demonstrated to differ in the pattern of enzymic activities which result from these stresses. The mechanism for this differentiation may be in activation of secondary response systems more specific to the stress, along with the generalized adrenocortical activation usually observed.

Pearson, Carl M.

Studies have been conducted on the isoenzyme patterns of lactate dehydrogenase and certain other enzymes in both normal muscle and in that affected with certain disease such as muscular dystrophy. Abnormal isoenzyme patterns seem to be characteristic of certain diseases.

Roberts, Sidney

Elucidated the factors which regulate protein synthesis in the brain and steroid biosynthesis in the adrenal cortex. Studied relationship of these to normal and abnormal variations in cerebral and adrenocortical function.

Slater, Grant

Phenylalanine, an essential to health in the rat and in man, can cause the rare brain disease called phenylketonuria (PKU) where the human has a defect preventing its use. In rats fed phenylalanine at a high level altered behavior occurs. We have found in these rats that at least two enzymes in the liver also show changes. Similar studies with isoleucine, another essential amino acid, also revealed liver enzyme changes.

Invented a device to simplify the measurement of one type of enzyme, the decarboxylases.

A system for the high resolution of serum protein has been developed: as many as 30 different proteins can now be observed in normal human serum.

NEUROENDOCRINOLOGY

George, Robert

Found that electrical stimulation of the anterior hypothalamus produced hyperglycemia in normal and adrenal demedullated rabbits. Electrolytic lesions of this area in alloxan diabetic rabbits produced a twentyfold increase in response to the blood sugar levels via some mechanism(s) other than sympathico-adrenal activation.

Gorski, Roger A.

Found that both male and female rats are born with a sexually undifferentiated hypothalamus potentially of the female type. Endogenous testicular activity during the first few days of life induces masculine development of the hypothalamus, but the ovaries are not necessary for female differentiation. The sexual polarity of the hypothalamus determines the nature of pituitary secretion of gonadotropins in the adult.

Hayward, James N.

Identified amygdala and brain stem regulation of anterior pituitary and posterior pituitary functions in the rabbit and monkey.

Heuser, Gunnar

Induced different kinds of seizure activity in monkeys by administering various steroids systemically. Is examining potential influence which steroid distortion may have in human epilepsy.

Induced slow wave and paradoxical sleep by implanting projesterone into preoptic area of cat brain: Clemente has shown that electrical stimulation of this area produces comparable effects. This finding supports the suggestion that neuroendocrine mechanisms participate in sleep states.

Hilliard, Jessamine

Blood levels of pituitary ovulating hormone were determined by a newly developed method based on ovarian steroidogenesis. The patterns of the release of pituitary and ovarian hormones were determined between coitus and ovulation in the rabbit.

Maxwell, David S.

The origin of neurosecretion (and antidiuretic hormone) has been examined and morphologically characterized.

Pierce, John G.

Studied the relationships between the structure and hormonal function of the pituitary hormone, thyrotropin. This hormone stimulates and regulates the activities of the thyroid gland.

Porter, Robert W.

A neural effect upon the metabolism of cholesterol and other serum lipids has been demonstrated. This may be a significant factor in the pathogenesis of experimental atherosclerosis in response to chronic stress. (with Meier)

Sawyer, C.H.

Our laboratory has continued to work on neuroendocrine control of the pituitary gonad axis. Other projects have been concerned with sleep, lactation, and the effects of adrenal steroids on evoked potentials. With Drs. Hilliard and Kanematsu we have found, by stimulation and lesion experiments, that the hypothalamic area activating the release of pituitary ovulating hormone does indeed inhibit the release of prolactin. Hypothalamic lesions resulted in release of prolactin and activated mammary glands. Reserpine activates lactation by a specific action on this region of the hypothalamus. Implantation of estrogen (Kanematsu) into this region of the brain results in ovarian atrophy, failure of synthesis of LH, increased synthesis of prolactin and prevention of the classic effects of castration on pituitary cytology and gonadotrophin content.

With Dr. Kawakami we were able to condition paradoxical sleep in female rabbits under appropriate hormonal conditions, but the reflex was lost as the hormonal status changed and the threshold of the unconditional stimulus rose.

Slusher, Margaret A.

By placement of lesions in specific areas of the brain a differentiation was determined for areas involved in the rat's response to stress and in the normal daily fluctuation of blood corticosteroid levels. Lesions in the periventricular region of the ventral hypothalamus blocked diurnal rise while more posteriorly placed lesions blocked stress-induced rise.

Utilized a new technique for measuring ACTH levels in blood of cats and rats. The method employed injection of test blood into two-hour hypophysectomized rats with analysis of corticosteroid levels of adrenal venous blood. The method permits detection of lower ACTH levels than did former assay procedures utilizing 24-hour hypophysectomized rats.

See also - Sawyer (NEUROPHYSIOLOGY - BEHAVIORAL)

NEUROINFECTION AND IMMUNOLOGY

Rasmussen, A.F., Jr.

Previous work which established the fact that psychological stress increased susceptibility to viral infection in mice has been extended to reveal that this increase in susceptibility is not associated with detectable reduction in antibody response. (with Yamada and Jensen)

Previous work had shown that mice infected with polyoma virus as newborns and subsequently exposed to stress at 4-6 weeks of age showed no increase in polyoma tumors as compared to unstressed controls. Current work shows that in mice inoculated at 2-3 weeks of age and stressed before and immediately after inoculation with polyoma virus, the incidence of tumors is increased. The difference in final incidence of tumors in stressed as compared with control mice was particularly marked in strains of mice genetically resistant to polyoma virus tumors. (with Chang)

In an attempt to explain the difference in susceptibility between stressed and control animals, it has been found that amounts of the virus inhibitory polypeptide, interferon, are greatly reduced in stressed as compared to control mice.

NEUROLOGY

Jones, Margaret H.

Demonstrated improved functional use of the hemiplegic hand in young spastic hemiplegic children in response to sensory story training technique.

Markham, Charles H.

Found LA-1, a Librium analogue, to be an effective anti-convulsant medication for myoclonic seizures.

Pearson, Carl M.

During the past year, observations were made on the genetics and mode of inheritance of muscular dystrophy which have added some fundamental and new knowledge to this field.

Riehl, Jean-Louis

Completed construction of an EEG analog analyzer.

NEUROPATHOLOGY - EXPERIMENTAL STUDIES

Markham, Charles H.

Demonstrated that freezing lesions in the brain produced much more intense edema in the white matter than in the gray and that the reaction at the blood brain barrier in the latter appears to be less.

Pearson, Carl M.

Research on an experimentally induced arthritis in the rat continues to be interesting and many features of this model suggest that it has a resemblance to the human disease, rheumatoid arthritis.

Pease, D.C.

Continued our studies of the damaged neuron system by electron microscopy. Attention was focused upon degenerative phenomena, and more particularly upon regenerative changes.

Stern, W. Eugene

Developed further information of movement of water and electrolytes within brain tissue following cold injuries to brain.

NEUROPATHOLOGY - CLINICAL STUDIES

Allen, Raymond A.

Retinal degenerative diseases form a continuing study, a main basis of which is careful documentation of large numbers of eyes, presumably clinically silent, from autopsy cases at UCLA. Several important blinding diseases have been found to occur far more commonly than hitherto suspected, and important facts relating to familiar occurrence and rate of progression have emerged. One of the most important of these diseases is Lattice degeneration of the retina. This lesion which accounts for at least one third of all cases of retinal detachment affects both sexes, all age periods, is usually bilateral and symmetrical: if recognized early it may be prophylactically treated.

Correlated clinicopathologic studies of early glaucoma continued with members of the Division of Ophthalmology. Selected patients are followed by complete studies of aqueous humor dynamics and of the structures involved in aqueous outflow. In a number of instances where glaucoma has supervened in patients under study, the eyes have been obtained when patients have died from unrelated causes. Such valuable specimens representing early stages of development of idiopathic glaucoma have almost never before been available for study, and have shown changes in the anterior chamber angle structures which appear to characterize the disease.

Brown, W. Jann

Two male siblings exhibited a fatal neurological disorder characterized by spongy degeneration and myelin vacuolization, compatible with Canavan's Sclerosis. A ten fold increase in calcium was noted in the brain. The histological similarity to triethyitin encephalopathy was striking.

Continuing electron microscopic studies of organic mercurial encephalopathy have revealed an early change occurring in the endoplasmic lamellae with vacuolization and dissociation of the RNP particles.

Pathologic studies of familial dysautonomia in two siblings revealed a combination of medullary, pontine reticular and dorso-longitudinal tract demyelination.

Clinical and animal experiments have confirmed the existence of an acute cerebellar syndrome consisting of nystagmus, truncal ataxia, slurred and scanning speech induced by 5-Fluorouracil.

NEUROPHARMACOLOGY

Bevan, John A.

Spent the year as a Special Fellow of the USPHS on sabbatical leave working with Professor Eric Neil, University of London. Acquired new skills and techniques needed to record electrically the afferent activity of single neurons in the vagus nerve, in particular those originating from the pulmonary vascular bed. These techniques will be used to study the pharmacological sensitivity of vagal sensory neurones.

Decima, Emilio

Studies were done at the spinal cord level to elucidate the mechanisms involved in the production of tremor by oxotremorine (a powerful tremorogenic agent). Rhythmic firing of the motoneuron pool was found not to be dependent upon the integrity of the stretch reflex loop; i.e. synchronous firing was due mainly to a central mechanism. (with Rand)

Dillon, John B.

Evaluated non-addicting analgesic Pentazocine (WIN20,228) as substitute for conventional opiate type addicting drugs.

Ditman, Keith S.

Did a study that showed that imipramine (Tofranil) was an effective treatment for control of childhood enuresis.

Continued studies on the drug LSD-25 as a psychotherapeutic agent.

Found that chlordiazepoxide (Librium) and diazepam (Valium) caused transient nocturnal enuresis in adults.

Evaluated cyproheltadine (Periactin) as a treatment for alcoholics and found that chlorprothixene (Taractan) could inhibit ejaculation in the male.

Eiduson, Samuel

Commonly used tranquilizer (radioactively tagged Mellaril) injected into rats from birth to adulthood, showed different amounts of radioactivity in different parts of the developing brain. The greatest concentration of radioactive tranquilizer appears to reside in the pituitary gland.

Jenden, Donald J.

A continuing study of the mechanism of tremor production by the drug oxotremorine has resulted in the localization of certain sites within the central nervous system at which the effect was exerted, and in the partial elucidation of the chemical mechanisms involved. Analogs of oxotremorine have been discovered which are capable of inhibiting tremor and spasticity.

Ling, George

Injected cholinergic agents into the caudate nucleus of cats during lever pressing behavior. Found that behavior is inhibited indicating that inhibition induced by electrical stimulation of this same region is cholinergic in nature.

Rand, Robert W.

Further electrophysiological studies on tremors induced by oxotremorine administration in the experimental animals have been carried out. Rhythmic firing of the motoneuron pool was found not to be dependent upon the integrity of the stretch reflex loop. It was concluded therefore that individual rhythmicity was primarily a central mechanism. (with Decima)

Taylor, Dermot B.

Studies on synaptic transmission at the neuromuscular junction were continued. Additional evidence was obtained that transmitter substances penetrate the post-junctional membrane and that the South

American arrow poison acts by blocking this penetration. The work is being extended to other synapses. Work also continued on pharmacologically active plant extracts.

Winters, W.D.

The drug gamma-hydroxybutyrate was shown to produce generalized non-convulsant seizures in animals--rather than normal sleep and anesthesia as reported in the literature.

Studies in young chicks, which have an immature barrier to the passage of drugs, indicate that norepinephrine produces sedation, serotonin produces sedation, and dopamine produces an initial excitation or akinesia followed by sedation. The interrelationships of the phenothiazines and reserpine tranquilizers with these biogenic amines has led to a clearer understanding of the mode of action of these agents.

See also - Wenzel (NEUROPHYSIOLOGY - BEHAVIORAL)

NEUROPHYSIOLOGY - BEHAVIORAL

Adey, W. Ross

Studied patterns of discharge of single thalamic cells in Pavlovian conditioning. (with McIlwain and Kamikawa)

Baldwin, Basil

It was shown that a short period of acute cerebral ischaemia, administered less than one minute after the learning trials, did not prevent the acquisition of a classical conditioned defensive motor response in goats. (see Wenzel)

Buchwald, Jennifer S.

In studying the role of sensory input in learning, it has been found that deletion of all sensory inflow from the cat's hindleg by dorsal root section prevents the development of a conditioned flexion response in that leg. However, if a small amount of sensory innervation remains, conditioned responses are developed in the partially innervated limb. (with Halas)

Complete paralysis (flaxedil) during chronic training of cats blocks the development of a conditioned motor response as determined by testing in the unparalyzed state. Subsequent training of the same animal in the unparalyzed state, however, results in a more rapid development of the conditioned response than in controls. These results suggest an important role in motor learning for the conditioned sensory inflow from muscle spindle-circuits, blocked during flaxedil paralysis. (with Halas)

A technique has been developed for recording and integrating multiple-unit activity from brain sites simultaneously with EEG recordings from the same sites in unrestrained, chronic cats. A survey of brain sites showing changes in multiple-unit activity during behavioral conditioning is in progress.

Buchwald, Nathaniel A.

Demonstrated the ability to use stimulation of the caudate nucleus as a signal (conditioned stimulus). (with Soltysik, Horvath, and Romero-Sierra)

Demonstrated the pathways by which EEG rhythmic activity tripped by stimulation of parts of the brain (thalamus or caudate nucleus) reach the opposite side of the cortex. (with Soltysik and Horvath)

Demonstrated rhythmic EEG activity associated with reward. (with Horvath, Wakefield, and Wyers)

Demonstrated a receptor mechanism for ionizing radiation located within the head and probably in the region of the olfactory bulb. This system is sensitive to remarkably small (10 milliroentgens) doses of radiation. (with Garcia and Hull)

Docter, Richard F.

Studies have been conducted of the so-called fear-reducing effects of alcohol through evaluation of the behavior of cats subjected to approach-avoidance conflict situations. It was found that response rates (bar pressing) increased with alcohol ingestion but that neither rates nor latencies of response to conditioned suppression stimuli were modified by the drug suggesting that the effect in cats is one of motor facilitation rather than fear suppression. (with Goldman)

Fairchild, M.D.

Demonstrated that brain areas concerned with general excitation and inhibition are capable of markedly influencing the rate of locomotion in the cat. These two systems also interact at this level of central nervous system function since stimulation of one antagonizes the effect of the other.

Halas (See Buchwald, J.)

Lindsley, Donald B.

In monkeys trained to respond consistently to a brief (5 msec.) visual discrimination task, the introduction of a second (masking) flash less than 40 msec. after the test flash reduced discrimination to a chance level. The site of the interference introduced by the masking flash is to be investigated neurophysiologically by depth electrode studies. (with Adkins and Fehmi)

Cats trained in a differential conditioning situation were tested while recruiting responses were being elicited. The recruiting response was blocked by a negative but not by a positive stimulus. Blocking of recruitment, therefore, may serve as an index of inhibition and is being used to study conditioning and attention in the cat. (with Weinberger and Velasco)

McIlwain (See Adey)

Porter, R.W.

Showed that stimulation of the gastrointestinal tract could be made to serve as a conditional stimulus modifying behavior and in influencing the firing of units in the sensory cortex of monkeys. (with Adam)

Sawyer, Charles H.

With Drs. Chambers and Freedman found that adrenal steroids are essential for normal conduction of evoked potentials from midbrain to cerebral cortex in the cat.

With Dr. Khazan, found that rabbits deprived of paradoxical sleep for 24 hours by a white noise regained the lost complement within the next 24 hours.

Walter, Donald O.

Studied EEG traces recorded during training of cats. Observations upon internal and external hippocampal wave transmission have demonstrated a difference of phase angles relating hippocampus to entorhinal cortex, as between correct and incorrect responses by the cat.

Wenzel, Bernice M.

We had previously shown that pigeons with a lesion in one optic tectum learned a complex visual discrimination more rapidly than normal controls. Their learning of a simple brightness discrimination, however, does not seem to be improved.

Addition of small amounts of potassium or thiopental to the brain's blood supply in goats causes an interruption in performance of a learned task. At the same time, increased potassium produces no visible changes in the EEG but with thiopental occasional bursts can be noted of spindle activity that is characteristically associated with light stages of barbiturate anesthesia.

Gross reduction in the number of sympathetic neurons in mice has no effect on their ability to learn avoidance responses or food-getting responses. The latency of avoidance responses, however, is greater than that of control mice.

See also - Sawyer (NEUROENDOCRINOLOGY)

NEUROPHYSIOLOGY - CLINICAL

Adey, W. Ross

Found evidence that epileptic temporal lobe tissue has different impedance characteristics from normal brain tissue. (with Porter and Kado)

Brazier, Mary A.B.

In the Clinical Neurophysiology Program, the series of patients with temporal lobe epilepsy in whom electrodes have been implanted for diagnostic purposes has now reached 13 in number. In these cases there have usually been 8 or more electrodes inserted by the neurosurgeons deep in each temporal lobe, as well as a number fixed to the skull for recording of cortical potentials. In this laboratory, recordings on analog tape have been taken of: the resting rhythms at each electrode site; the response of each to visual stimulation (flash); to auditory stimulation (click); and electrical stimulation at each deep point.

The recordings have been subjected to a variety of computer analyses, including autocorrelation, power density spectral analysis, cross-correlation, averaging of evoked responses and tests for variance; testing has begun of a program for prediction of epileptic discharge from the occurrence of spiking in given sites, and for the prediction of EEG changes in scalp electrodes caused by electrical changes in depth. The individual reactivity of these deep sites to anesthesia and the independence of these from cortical changes are also being studied by computer analysis.

Dillon, John B.

Tested new electronically designed ear oximeter for "Apollo Project" to be utilized to monitor astronauts' blood %O_2 saturation during space travel.

Tested psychomotor performance of drug interaction using a complex coordinator. This project is designed to evaluate the effect of drugs on airmen proficiency during operation of aircraft or other high performance vehicles.

Docter, Richard F.

In studying effect of alcohol on humans found that the EEG tracing exhibits not only the alpha slowing known to exist, but, additionally, a diffusion of alpha activity and an increase of alpha amplitude. (with Naitoh)

Jones, Margaret H.

Demonstrated the progressive decrease from birth through first year of life of the number and amplitude of refixations of eyes in following target. (with Dayton)

Kado (See Adey)

Lindsley, Donald B.

In human perceptual studies, a patterned test flash is enhanced in brightness when followed in 100 msec. by a second flash but masked when the second flash is applied within 30 msec. of the first. EEG recorded responses evoked in the visual area by these two flashes (averaged by computer analysis) coalesce during enhancement while, during masking, the first response is displaced by the second response. (with Donchin, Haider, Spong, and Wicke)

The electrophysiological correlates of vigilance were studied by exposing human subjects to a background series of light flashes interspersed among which were randomly distributed dimmer flashes to which the subject must respond. It was found that as performance deteriorated with fatigue, responses evoked from the visual area (averaged by computer analysis) became reduced in amplitude. Additionally, detected responses correlated with higher amplitude of the evoked response. (with Donchin, Haider, Spong, and Wicke)

Within the period of effectiveness of Bloch's law, namely 100 msec., the product of luminance and duration was held constant while these parameters were varied reciprocally, as well as individually. These studies have contributed to our understanding of the factors which are of significance in the average visual evoked response. (with Donchin, Haider, Spong, and Wicke)

Porter, Robert (See Adey)

Walter, Donald O.

Verified an older suggestion to the effect that in many human individuals there is a transversely oriented generator in the alpha-wave band, with functional correlates different from alpha waves. The relation of this transverse generator to the alpha generator is non-linear, and contains no linear component. An additional new conception resulting from this same kind of computer analysis suggests that the alpha wave itself consists not only of the visually obvious waves usually described, but also of side-bands, of so little intensity as to be invisible to the eye. According to the coherence analysis, these side-bands are just as well shared as are the carrier waves.

Walter, Richard D.

Continued investigation of the character of electrical abnormalaties in the depth of the brain in patients with temporal lobe epilepsy, and studied the effects of brain stimulation. As a result of these studies, focal sites within the hippocampus and hippocampal gyrus were demonstrated that have an exceedingly low threshold for electrical stimulation, and appeared to be related to the seizure symptomatology reported by the patients.

See also - D. Walter - **(NEUROPHYSIOLOGY - GENERAL)**

NEUROPHYSIOLOGY - GENERAL

Adey, W. Ross

Found evidence of regional changes in impedance of brain tissue during learning and habituation. (with McIlwain)

Buchwald, Jennifer S.

The effect of repeating a stimulus, such as the US shock stimulus in conditioned avoidance training, on efferent unit reflex discharge has been studied in acute spinal and non-spinal cats. Progressive changes in reflex response to a repeated, constant stimulus were found to occur even when 45 sec. intervals separated the stimulations. Both progressive diminution and progressive enhancement of reflex responses were found to develop. (with Halas)

Buchwald, Nathaniel A.

Employed sagetally transected brain preparations to study pathways by which visual information is sent to the cortex bilaterally. (with Lyubimov)

Bullock, T.H.

Completed a two volume treatise on "Structure and function in the nervous systems of invertebrates", co-authored by G.A. Horndge, published by W.H. Freeman and Co., San Francisco.

Clemente, Carmine D.

Research programs have centered on the brain mechanisms operant in sleep behavior and on the electrical correlates of internal inhibition. Stimulation of the basal forebrain synchronizing area of the cat induces the behavioral and electroencephalographic manifestations of sleep. By pairing such stimulation with a neutral auditory stimulus we were able to evoke electroencephalographic synchronization and sleep preparatory behavior to the presentation of a tone, and to temporal factors associated with the conditioning procedure.

Eldred, Earl

Proprioceptive contributions to shivering were studied. Analysis of peripheral sensory and mechanical factors and central regulations of shivering tremor in man and cats has been followed, largely at the Long Beach VA Hospital. (with Stuart and Ishikawa)

Estrin, Thelma

Developed a computer communication system which enables direct data transfer between Dr. Brazier's EEG laboratory and the Data Processing Laboratory. EEG data is digitized in the laboratory and sent via cable to the computer for processing. A scope display in the laboratory permits observation of the computed data within seconds after it has been recorded.

Studied voltages recorded from depth electrodes as a function of their size, placement, impedance and reference. The aim was to optimize the amount of information obtainable from a depth implantation.

Halas (See Buchwald, J.S.)

Hyde, Jane E.

Studied patterns of response to simultaneous stimulation of pairs of sites in the brain which produce head movements in opposite directions.

Studied effect of varied stimulus parameters applied to single sites in the brain, which produce changes in movement with or without changes in respiration and heart rate.

Lehmann, Dietrich

Studied repetitive responses evoked in cat cortex by electrical optic nerve stimuli as modified by respiratory cycles. Found that amplitude of evoked responses varied consistently with different periods of respiration with maximal amplitudes occurring between peak inspiration and peak expiration. This observation suggests that neuronal excitability may fluctuate rapidly in association with physical changes occurring during ventilation. (with Knauss)

Lindsley, Donald B.

Two components of the response evoked by light flashes, separated in time during maturation of the nervous system in newborn kittens, were found to coalesce in forming the adult configuration. Lesions in the superior colliculus and pretectal region, interrupting influences transported by way of the reticular formation, block the earliest developing (4 days) long latency response suggesting that it is of non-specific origin. The later developing (10-15 days)

short latency response is blocked by lesions in the lateral geniculate body hence may be considered as a specific component of the mature response. Manipulation of these two components in early life is being studied as they may relate to perceptual behavior in later life. (with Rose, Guenter)

Blocking or desynchronization of thalamically mediated EEG recruitment induced by repetitive stimulation of a variety of peripheral and central sites has been subjected to investigation. Such recruitment blocking can be eliminated by lesions placed in the midbrain tegmentum suggesting that blocking is a function of the ascending reticular system. (with Weinberger and Velasco)

The electrical characteristics of early responses and later after-events evoked in the cortical EEG by sensory stimulation are being studied particularly as they may relate to recruiting and augmenting mechanisms. These studies elucidate the nature and distribution of thalamic projection systems and provide opportunity to examine their behavioral manifestations. (with Weinberger and Velasco)

McIlwain (See Adey)

Marsh, James T.

Demonstrated that auditory evoked potential variation due to acoustic input variation could be controlled by delivery of sound directly to the ear. Using this control, demonstrated habituation of cortical evoked potentials to repeated clicks. Showed correlation of evoked potential amplitude with state of cortical synchrony. (with Worden)

Rhodes, John

Due to results of work done in this laboratory, there was a shift in concepts about dream sleep in human and infra-human primates. This work pointed out the importance of deep temporal lobe structures during dreaming and other stages of sleep.

Schlag, John D.

Studied the properties of pyramidal neurons of the motor cortex. Found that the long period of depression which follows the firing of pyramidal cells is due, at least partly, to inhibitory cells in the cortex. Spontaneously, this inhibition terminates by a late response which is a rebound. But an appropriate stimulation can interrupt the inhibition and thus induce the rebound (response by disinhibition). A cyclic pattern of firing due to the succession inhibition-rebound occurs at the rate of spindling. The cortical inhibition seems topographically organized as a lateral inhibition.

Sonnenschein, Ralph R.

Relations among blood flow, oxygen consumption, work output of skeletal muscle, and state of the microcirculation were characterized.

Basic characteristics of circulation in reptiles were investigated.

Sterman, Maurice B.

We have determined that the various electrophysiologic patterns generated by the CNS of a cat during a 24 hour cycle are stable in terms of percentage of occurrence. This provides a statistical basis for evaluating CNS manipulations.

Showed that the parts of the brain concerned with exciting the whole nervous system for efficient action and those concerned with inhibiting brain function, as in sleep, work antagonistically to one another, their balance at any time determining the general state of the animal.

Stuart, Douglas G.

Studies on the nervous control of shivering revealed that, while the initiation and maintenance of the tremor are controlled by the hypothalamus, the frequency-amplitude characteristics of the tremor are an intrinsic property of the spinal cord itself with proprioceptive inputs exerting a modulating influence on the rhythmicity.

Winters, Wallace D.

Using gross behavior, brain electrical activity and brain responses to sounds (clicks) it was possible to determine that "dream" sleep is not a deep sleep but rather occurs in a transition zone between wakefulness and sleep.

Worden, Frederic G.

Developed earphones which can be worn by unanesthetized cats to provide control of acoustic stimulus characteristics. Demonstrated effect of stimulus characteristics (intensity, rate or presentation) or evoked potentials. Demonstrated relationships between background activity and evoked potentials at cortex.

See also - Adey (NEUROPHYSIOLOGY - BEHAVIORAL)
Buchwald, J. (NEUROPHYSIOLOGY - BEHAVIORAL)

NEUROPHYSIOLOGY - MICRO

Bullock, Theodore H.

It has been found that the variance of interval length in impulse trains from spontaneously active neurons in the isolated crayfish abdominal cord changes with mean frequency in the train. Comparison of the standard deviation of interval with the mean interval, for (a) many units all under standard conditions, and (b) single units with frequency varied due to altered conditions, shows that in both cases the relationship is approximately $s.d.=k\ (mean\ int.)^2$. This supports the hypothesis that "spontaneous activity" in this preparation is largely due to pacemaker activity of individual units, and is not driven by synaptic input. Serial correlation coefficients show the existence in many units of long- and short-term oscillatory mechanisms. Of particular interest is the pairing tendency of the caudal photo-receptor neuron, which is currently being studied in greater detail. (with Biederman)

Experiments with a digital program simulating the real nerve net of primitive nervous systems now deal with the effect of temporal pattern of arriving impulses. Significant differences have been found in the distance to which excitation can spread depending on the pattern of stimulation at the same average frequency. (with Fehmi)

A new and more complex, more realistic program for a simulation of nerve nets has been written and de-bugged, and is now being experimented upon. This incorporates electrotonic spread of subthreshold synaptic activity, more than 19,000 synapses, facilitation, etc., but no inhibition or real time. Experiments show a very complex behavior, with incremental spread, fluctuating spread, gross asymmetries and lacunae. These are being compared with actual responses of corals and the like. (with Liu)

Decima, Emilio

Intracellular recordings in the motoneuron and IA fibers of the cat spinal cord were carried out studying changes occurring during post-tetanic potentiation. (with Green)

Enger, Per S.

The neural mechanism underlying the rhythmic discharge of electric organ pulses has been investigated in fish. Also, the sense organs perceiving the minute electric currents generated by the fish itself has been studied, as well as the neural integration of sensory impulses in the central nervous system. The results show how the fish can detect moving objects of different sizes and conductivities. (with Hagiwara and Szabo)

Green, John D.

Made intracellular studies in the spinal cord of cats. During post-tetanic potentiation changes were found in the conduction velocity of presynaptic fibers which correlated with the amplitude of the presynaptic response. There was no change in the sensitivity of the post synaptic membrane following intracellularly delivered tetanic stimuli nor was conductance change sustained in the post synaptic membrane during post-tetanic potentiation. This investigation is designed to enhance understanding of mechanisms in the presynaptic fiber which cause it to release more transmitter substance during post-tetanic potentiation.

Hagiwara, Susumu

Electrophysiological study has revealed three kinds of receptors which function in orienting mechanisms of the electric eel and of gymnotid fish. One type responds to electrical field stimulation, one type to mechanical stimulation, and one type to both.

Found that the pacemaker of the electric organ in gymnotid fish resides in the medulla. It consists of a functional syncitium of nerve cells which fire synchronously.

Peripheral conduction from electroreceptors of weakly-electric fish is position coded. However, central neurons in the medulla and lateral lobe respond either to position or to movement of objects in the environment.

Kruger, Lawrence

An analysis of retino-tectal topography by electrophysiological means was completed in a reptile and 5 species of fresh water fish. Tectal unit activity and its modification by visual stimuli was initiated.

Scheibel, Arnold B.

Revealed new data on functional nature of reticular cells including their habituation patterns, and cycles of activity for many of them which allow them to operate now in one neural domain, now in another.

Segundo, Jose P.

The consequences of inhibitory or excitatory synaptic input between pacemaker neurons were predicted mathematically and through digital computer simulations, and the predicted behavior was found to occur in abdominal ganglia of Aplysia and in stretch receptors of Procambarus. Discharge patterns under conditions that do not involve interneuronal feedback are characteristic and self-

stabilizing. Paradoxically, increased arrival rates of inhibitory input can increase firing rates, and increased excitatory input rates can decrease firing rates.

Studied firing of units in the vestibular nuclei of cats. Found that rate of discharge was a function of the position or tilt of the animal. However, the firing rate characterizing each tilt level frequently varied according to the direction from which the animal was moved into position.

NEURORADIOLOGY

Clemente, Carmine D.

Research has related to the effects of ionizing radiations in retarding myelinization and in impairing differentiation in the formation of oligodendroglia in the central nervous system of neonatal and adult animals. Subsequent enzyme biochemical studies on such animals is expected to help clarify mechanisms involved in the formation of myelin.

Crandall, Paul H.

Developed new radioisotopic scanning device for the diagnosis of brain tumors.

See also - Buchwald, N. (NEUROPHYSIOLOGY - BEHAVIORAL)
Kruger (NEUROANATOMY)
Maxwell (NEUROANATOMY)

NEUROSURGERY

Crandall, Paul H.

Studied the temporal lobe clinically and pathologically in patients with temporal lobe epilepsy.

Rand, Robert W.

One of the major accomplishments of this past year has been the development of a surgical technique of freezing the pituitary gland, either partially or totally, for such conditions as metastatic mammary or prostatic cancer, diabetic retinopathy, malignant uncontrolled ex-ophthalamus, and small tumors of the pituitary gland. The operation has been performed on some 30 patients up to the present time.

PROGRAM RESEARCH

A number of broadly interdisciplinary research activities involving investigators from more than one to as many as fourteen separate departments are being pursued by members of the Institute. Prominent among these programs are the Brain Information Service, the Cardiovascular Research Laboratory, the Clinical Neurophysiology Unit, the Data Processing Laboratory, a Marine Biology Laboratory, the Space Biology Laboratory, and the Visiting Scientists Program. Currently pending, needed, or in preparation, are grant requests to support a primate center, an instrument development laboratory, a basic research unit to study mental retardation, a general research support facility, an information storage and retrieval program, and a considerable extension of the Space Biology Laboratory and the Data Processing Laboratory.

The history, organization, and research goals of all of the laboratories mentioned above were described in previous progress reports, and reference may be made to those reports if clarification of the review to follow is necessary or desirable.

BRAIN INFORMATION SERVICE

With the financial support of the National Institute of Neurological Diseases and Blindness, there has been established at UCLA a Brain Information Service which it is hoped will shortly make available to the research workers of the BRI a complete modern bibliographic service. The Service is a joint effort by the Biomedical Library, the School of Library Service and the BRI. It is directed by an executive committee consisting of Miss Louise Darling, Dr. R. M. Hayes and Dr. V. E. Hall. There is also an advisory committee of neurologists (Drs. Magoun, French, Brazier, Rose and D. Walter), librarians (Mr. Vosper and Dr. Horn), and a computer expert (Dr. Melkanoff).

The Service is now engaged in preparation of a glossary of neurological terms, development of indexing procedures for the neurological literature, preparing specifications for the mechanization of literature storage and retrieval, and experimenting with methods by which information specialists can best serve as intermediaries between scientists and the machines.

A current awareness service has been put into operation whereby BRI members receive promptly photocopies of the tables of contents of each number of such journals as they request.

Two "area groups", consisting of the research workers in the fields of neuroendocrinology and sleep respectively, have had assigned to each an information specialist, a member of the library staff, who is now providing conventional bibliographic services and who will later serve as intermediaries with the mechanized aspect of the Service. They will also play a major role in the indexing of the literature of interest to the field of their group of neurologists.

CARDIOVASCULAR RESEARCH LABORATORY

The Cardiovascular Research Laboratory located on the "A" floor of the Brain Research Institute continued its program of studies of muscle cellular and subcellular mechanisms. The Director, Dr. Wilfried F.H.M. Mommaerts, spent a sabbatical year at the Centre de Recherches at Strasbourg, France, studying conformational properties of large molecules.

The research program in the laboratory here continued studies of the chemistry of actin, the calcium pumping activity and ATPase activity of extracts of muscle reticulum and heat evolution by active cardiac and skeletal muscle. Studies of muscle mechanics included further definition of the active state in cardiac muscle and the relation between membrane electrical activity and the development of tension in ion deficient solutions.

Dr. Orville Weddle completed a Ph.D. dissertation on the mechanism of ion distribution in normal and rigor muscle.

Personnel

ALLSTON, Nola J.	Laboratory Helper
BRADY, Allan J.	Associate Professor in Residence
CULBERTSON, Diana D.	Typist Clerk
DENNY, Norma N.	Administrative Assistant
DUBKIN, Charles	Laboratory Technician III
FLOUD, Pat R.	Principal Clerk
FRANKE, Christa M.	Laboratory Technician I

FURUMOTO, Jane S.	Laboratory Technician II
GIBBS, Colin L.	Research Fellow
MERETSKY, Dianne	Laboratory Technician I
MUMMERY, Merrilee	Typist Clerk
REPKE, Doris	Laboratory Technician I
RICCHIUTI, Nicholas V.	Laboratory Technician IV
RUBEL, Ronda K.	Typist Clerk
SCHILLING, Myron O.	Senior Engineer IV
SERAYDARIAN, Krikor H.	Assistant Research Biochemist IV
SLATER, Marilyn K.	Research Assistant II
STENSAAS, Suzanne S.	Laboratory Technician II
SZALAY, Klara	Laboratory Technician II
TAN, Swee T.	Laboratory Technician II
VALENTINE, Deborah C.	Laboratory Helper
WALLNER, Alfred	Laboratory Technician III

CLINICAL NEUROPHYSIOLOGICAL LABORATORY

On June 30, 1964, this program representing the principal effort of Institute members and colleagues to investigate the human brain completed its fourth year of activity. The subjects in the study are all patients suffering from some movement, epileptiform or painful disorder, for which studies by means of electrodes implanted acutely or chronically into different regions of the brain are required in evaluating the possible effectiveness of medical and surgical treatment. Coincidental to this therapeutically oriented study are assessments of brain mechanisms which are under taken by large numbers of investigators skilled in both clinical and basic science methodologies.

No major personnel changes occurred during the year. Dr. Robert Porter, the clinical neurophysiologist, undertook the responsibility of coordinating all activities relating to the testing of patients electrophysiologically and the treatment of data so developed.

Program facilities have included three main centers of activity: the operating theater where electrodes are implanted and where acute studies are made; the Clinical Neurophysiology Laboratory, a suite of two rooms and shielded recording room in the Neuropsychiatric Institute where electrophysiological and other observations are made on patients with implanted electrodes; and the basic research laboratories of the Brain Research Institute. The principal difficulty encountered by the study has been the lack of an independent operating theater which, freed from other surgical commitments, could prepare and study a larger number of the considerable backlog of patients requiring assessment in the unit.

Work on the revision of the new operating theater was commenced during the year and is still in progress. The adaptation procedures are of major proportions, and are not scheduled for completion until fall of 1964.

Operational maturity of the Data Processing Laboratory in the "C" floor of the Brain Research Institute made possible a greater utilization of these facilities for the processing of data derived from electrophysiological study of patients. In particular, methods of averaging evoked responses, of auto correlation, and cross correlation analysis, and of frequency spectral analysis, have been the most prominently utilized. Techniques for on-line analysis of data or for assessing information recorded on magnetic tape have been extended. Increased use of the IBM 7094 computer system of the Health Sciences Computer Facility has made possible an extension of these studies, because of the rapid processing of information possible on the larger machine.

The test laboratory of the Clinical Neurophysiology Unit was made fully operational under the leadership of Dr. Porter. Use of the facility was found to approach saturation when two patients with implanted electrodes were available for study concurrently. In general, the facility was constantly in use throughout the day, and frequently, patient studies were continued overnight during prolonged assessment of record changes during sleep.

Drs. Rand and Markham refined use of the Lee and Linde Cryoprobes on the basis of animal experimentation, which showed that lesions of optimum size could be made when the tissue was cooled to a level of -170°C to -180°C.

The development of a stimulator safe for use in connection with human subjects and of high quality to enable the precise behavioral and electrophysiological observations required was completed by Dr. Porter, based upon former models designed by Dr. Adey. The instrument incorporated controls for applying stimuli at a wide range of pulse durations, pulse amplitudes, and repetitive rate.

Additionally, during the period, further refinements of the electrodes were made to permit lesions to be made in patients with chronically implanted electrodes, rather than, as in the past, only when acute studies were made in the operating room.

Dr. Adey, with the association of Mr. Kado and Dr. Porter, developed a method of measuring impedance in brain tissue, providing an entirely new dimension in which to study the functional capacity of neural tissue. Having been used extensively in animals, the method was used during the past year in assessing brain function of patients where, in general, comparable responses were obtained.

During the past year, 75 patients were selected for study and operative attack upon the thalamus in treatment of movement disorders. The large proportion of these procedures resulted in improvement of the symptoms for which the operations were made. Additionally, considerable information was obtained concerning: the characteristic electrical activity displayed by different structures in the depth of the brain; the effects of exciting these structures upon the

scalp EEG; the effects upon behavior of stimulating these deep structures. In two patients with chronically implanted electrodes, there appeared to be some synchronization between the tremor and the electrical activity recorded from a specific part of the thalamus which when destroyed results in clinical improvement.

Three additional patients were studied for periods up to six weeks with electrodes implanted in various temporal lobe structures bilaterally. Experiences with these patients confirmed the observation that only by prolonged detailed observation of chronically prepared patients, could the laterality of a lesion responsible for the patient's temporal lobe seizures be correctly incriminated and treated surgically. Frequently it was possible to see a storm of electrical activity in temporal lobe structures which did not extend to other areas from which recordings were being made, and which on occasion did not correlate with any detectable change in the patient's behavior. Contrastingly, in other patients studied, stimulation in one or more sites in the temporal lobe resulted in re-experiencing by the patient of a brief epoch of past experience.

Of particular interest were results which made possible correlations between mental activity and changes induced in the electrical activity of deep brain structures by stimuli such as light flashes. The electrical responses evoked by light signals, for example, changed when the subject learned to react to the signal. Responses evoked by other stimuli were changed in appearance when emotional agitation was induced in the patient. Such observations have considerable importance in understanding brain mechanisms which underlie human behavior.

Pharmacological observations showed that doses of metrazol and LSD below those generally associated with clinical alterations appeared to activate electrical abnormalities in deep structures of the temporal lobe.

In the neuroendocrine studies, observations made in association with Dr. Mandell showed that stimulation of a temporal lobe nucleus, the amygdala, caused considerable increase in plasma levels of adrenal steroids elaborated during the stress reaction, whereas stimulation of the nearby hippocampus caused a reduction in steroid circulation.

During the year, a small unit was established in the neuropathology section designed to study serial sections of the resected temporal lobes. As a result, it was possible to section completely the eight temporal lobes accumulated, and prepare them for detailed examination, now being undertaken. Other brain material which accumulates from this study also will be prepared for examination by this unit.

The principal scientific personnel involved in the program were: Drs. Adey, Brazier, Brill, Chapman, Crandall, Markham, R. Porter, Rand, Rose, Scheibel, Stern, and R. Walter.

Additional Personnel

ARREGUI, Miguel E.	Senior Electronics Technician
BRINZA, Kenneth C.	Postgraduate Research Pathologist
CARR, Everett M.	Laboratory Technician IV
GUIBORD, Diane M.	Laboratory Technician I
HAYASHI, Setsuko	Secretary-Stenographer
HUBER, Karoly G.	Associate Engineer
KADO, Raymond T.	Associate in Anatomy, Senior Engineer
ROSS, Sally N.	Electroencephalographic Technician
SPENCER, Judith G.	Senior Typist Clerk
WIESENTHAL, Lillian A.	Secretary

DATA PROCESSING LABORATORY

The Laboratory continued to function under the direction of a committee composed of Drs. Brazier, Chairman; Adey, Bullock, Dixon, Estrin, Melkanoff, Moore, and Segundo. Lack of adequate space continued to be a principal difficulty encountered in the activities of this rapidly expanding resource.

Early in the year it became apparent that the computing system of the Data Processing Laboratory had become totally inadequate to the requirements imposed upon it by members of the Brain Research Institute. Utilization of the 160A computer had increased rapidly until by late 1963 over 20 investigators actively used the facility, which had become overloaded by at least a factor of two. The machinery was in use over two shifts a day, seven days a week, and in spite of the elimination of all new programming activities, the backlog of data processing requests had built up to intolerable levels. For this reason, the BRI Computer Committee authorized a thorough analysis of the problem and asked Mr. Dan Brown, responsibly involved in laboratory activity, to chair a group authorized to make the study. Their report, submitted in the spring, recommended that the 160A computer be replaced by a Scientific Data Systems 920 computer, itself to be replaced later in the year by the SDS 930 when this instrument becomes available commercially. The capabilities of the 930 system will include a 1.75 microsecond cycle time; 12,228 words (24 bit) of magnetic core memory; and four buffered communications channels. While the 160A acted as a buffer and format converter for the separate Airborn Instrument Laboratories analog-to-digital converter, the SDS computer incorporates its own ADC hardware which operates exclusively under software control. It was planned that the AIL analog-to-digital converter would be retained for use for digitizations not requiring a buffer memory.

As a result of this intended change, the development of programs for the CDC 160A ceased abruptly at about midyear and, while the instrument continued to be used to capacity, full attention by the staff was focused upon planning for the use of the new SDS 920-930 systems.

The major uses of the earlier DPL equipment were to convert analog information into a form acceptable to the large IBM computers on campus, and to produce graphical displays from the output of these computers. All work that did not require access to analog systems was run on the large computer. The new medium sized computer facility would extend this capability of DPL to serve members and would make possible uses in two additional primary configurations. Extensive communication, both with research environments and with the Center for Health Sciences 7094 computer would provide an opportunity for on-line computer control and "quick-look" analysis of electrophysiological experiments in several laboratories simultaneously. Additionally, an experimental tie-in with the HSCF computer would make possible a composite system merging the production and on-line systems into a multi-computer environment.

Because of the impending change in hardware, the programs for the CDC 160A, prepared under the direction of Mr. Brown and Mr. Whittlesey, were replaced by equivalent routines on the IBM 7094 and the SDS 920-930 systems. Several hundred programs and routines were written for these machines. In general terms, those for the 7094 were concerned with spectral analyses, general evoked response detection, contour mapping, filter design, and estimation of mutual information. SDS 920-930 programs included analog-to-digital conversion, data display, interval detection, and search and control.

At present there are well over a score of scientists regularly using the facilities established in the Data Processing Laboratory. Among the many new findings developed by these investigators during the past year may be mentioned the following which illustrate the contribution which computer analysis is making in clarifying the relationship between basic behavioral states and electrical activity of the brain.

Much analysis has been performed on activity of single cells in central and peripheral neuronal systems. These analyses of interspike interval characteristics have provided the basis for models of neuronal pacemaking characteristics in "forward-feed" systems, in studies by Drs. Moore, Perkel and Segundo.

Studies in implanted chimpanzees, directed by Dr. Adey, with comparable deep electrode placements have provided useful comparisons of sleep patterns, mechanisms of alerting and emotional arousal with similar records from human subjects. Continuous spectral density analysis has revealed that there is an enormous increase in energy levels in parts of the spectrum below 5 cycles per second at the onset of sleep, but that the high frequency components are relatively little affected. Similarly, it has been possible to detect by equivalent-noise bandwidth-duration technique sharp differences in the characteristics of the waking cortical surface records and records made during "paradoxical" or dream phase of sleep. The similarity on visual inspection of EEG records from these two states has long presented difficulty to the clinical observer in their reliable separation.

Studies of scalp records in man, led by Dr. D. Walter, have identified a longitudinal orientation in the main alpha rhythm generators, on the basis of cross-spectral analysis, including calculation of coherence functions. Additional transversely oriented generators, at, or close to, the frequencies of the main generators, have also been identified. The latter do not show flexible responsiveness to changing states of focused attention exhibited by the longitudinal generators.

Application of these techniques of cross-spectral analysis to patients with motor disorders, such as Parkinsonism has permitted detection of interrelations between the peripheral tremor process and the scalp EEG from centroparietal regions of the contralateral hemisphere with a reliability and accuracy not previously available.

In the work on patients with temporal lobe epilepsy computer aid has proved essential in the attempts being made in Dr. Brazier's laboratory to establish an index of probability of correlation beweeen the seizure discharges, present in the hippocampus and amygdala of these patients, with changes in the scalp recordings which are ordinarily the only EEG information available for interpretation. Usually no change in the scalp recording is visible to the unaided eye even when electrical discharges of considerable severity are occurring in depth structures. A program has therefore been written by which the computer recognizes the occurrence of spiking the recordings from deep structures and then automatically triggers the computation of the power spectra of the scalp EEG for chosen periods preceding and following the spike event. A marked change in the power spectra has been observed in the cases so far analyzed by this method and, as a consequence, the goal of establishing an index of probability for use in those cases where only scalp EEG's are available, seems plausible.

In summary, it may be said that DPL development has proceeded to the point where two broad streams of research endeavor have evolved. The first includes the preparation and testing of efficient, reliable computing codes having wide application to massive amounts of data now being acquired in appropriate formats by many investigators in the Brain Research Institute. The second area is one in which new techniques are being developed and tested at the frontiers of the computing and applied mathematical arts. It is in the latter area that the staff hopes to sustain a sense of mission, and an awareness that new knowledge of a fundamental kind about brain mechanisms necessarily requires a substantial and continuing confrontation with these more difficult and more challenging problems.

Additional Personnel

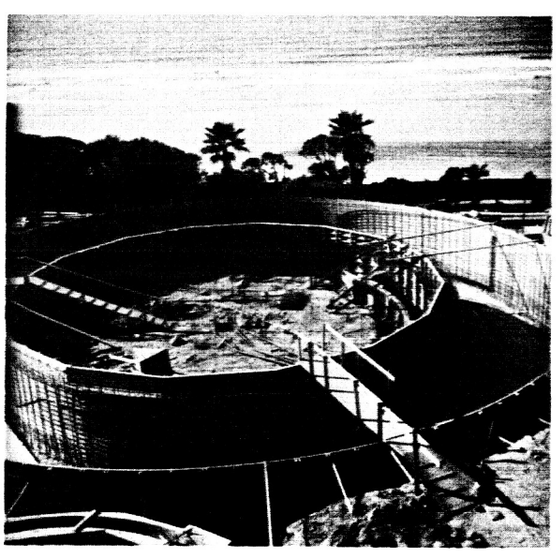
BARLOW, Joseph J.	Coder
BETYAR, Laszlo	Programmer II
BILLER, Leo F.	Digital Computer Operator

BREDE, Stephen K.	Sr. Electronics Technician II
BROWN, Daniel	Programmer IV
CAMPBELL, John	Coder
CHASE, Kenneth	Coder
COOTZ, Joyce	Programmer II
FITZGERALD, Naureen	Senior Typist Clerk
FOUST, Vern	Digital Computer Operator
FOX, Allen	Coder
GUGGENASTER, Carolyn	Key Punch Operator II
HAMNER, Lois K.	Typist Clerk
HORNBECK, Margaret L.	Programmer I
HUSAR, Joe P.	Senior Electronics Technician
JOHNSTON, Richard M.	Programmer I
LEE, Wesley A.	Senior Digital Computer Operator
MacQUARRIE, Ronald H.	Principal Electronics Technician
MASON, Jerry R.	Programmer II
McGILL, William F.	Programmer I
OSTERBERG, Gary L.	Programmer II
PAYNE, Carolyne H.	Key Punch Operator II
PHATAK, Vishvanath V.	Engineering Aid
POBUDA, John A.	Engineering Aid
RELLER, Janet M.	Secretary
ROVNER, Lionel D.	Associate Engineer
SAMUELS, Myron D.	Programmer II
SEELEY, Margaret J.	Coder
SHARP, Jon R.	Engineering Aid
THRASHER, Susan	Typist Clerk
WYMAN, Hal H.	Programmer II

MARINE NEUROBIOLOGY PROGRAM

In August of 1962, an award of $240,000. to the Brain Research Institute by the National Science Foundation climaxed two years of planning with members of the Scripps Institution of Oceanography at La Jolla for establishing a major facility at La Jolla to permit study of the brain and behavior of sea forms. An earlier award by the National Sciences Foundation to Professor P. F. Scholander of Scripps had provided funds to build a large, modern laboratory ship capable of sailing to any part of the globe and a land based facility designed to study phenomena other than those associated with the central nervous system. The increment in funding made available through the award to the Brain Research Institute provided a significant enlargement to the facility to accommodate neurobiology. The entire installation has been entitled "The Physiological Research Laboratory" and that part of it which relates to the nervous system we have elected to call "Marine Neurobiology Laboratory."

Ground-breaking for the construction of the facility occurred in early July of 1964, and the completion date is estimated to be in April of 1965. Even though the structure to house this effort is



Construction of the Physiological Laboratory at La Jolla, in which the Brain Research Institute will have association, is progressing rapidly and completion is anticipated by July 1, 1965.

still some distance in the future, much planning and preliminary investigative activity has been ongoing in preparation for activation in the completed facility late next spring.

The initial financial structure of the Marine Neurobiology Laboratory has been assured by an award of three grants. One of these was assigned to Drs. Kruger and Schwassmann from the National Science Foundation. A second was awarded to Drs. Norris and Turner from the National Institutes of Health, while NASA provided Dr. Bullock with funds to equip one of the laboratories to be utilized by him and Dr. Hagiwara.

Research studies to be centered in the new facility have been active in many locations. Laboratories of the Brain Research Institute and the Department of Zoology have been used to conduct many of the studies, particularly those relating to sensory neurophysiology in fish. Drs. Norris and Turner have been studying the behavior of porpoises in a temporary tank located in a distant corner of the UCLA campus. A somewhat unusual but highly productive study site was established by Dr. Schwassmann in Belem, Brazil, where, for a period of about four months in the spring, a series of investigators from UCLA and the Brain Research Institute conducted investigations at a fevered pitch of activity. During this period, Drs. Schwassmann, Kruger, Bullock Hagiwara, Lissmann, Chichibu and Szabo, spent varying periods in the laboratory studying such things as:

1) visual mechanisms in the four-eyed fish;
2) orienting phenomena in the electric eel and other electric fish;
3) the brain anatomy of the river dolphin (never studied before);
4) behavioral response of the electric eel to electrical stimuli applied to the water in which the eel was swimming;
5) the growth and development of the electric organ in fish.

Planning for the installation of programs in the new facility has reached a relatively mature phase. Dr. Schwassmann will occupy one of the laboratories and Dr. Kruger will work with him on a commuting basis. They will study the neurophysiology of the visual system in marine animals; cyclic and rhythmic behavior in fish; and the cortical receiving areas in the dolphin. Drs. Hagiwara and Bullock plan to establish a program devoted to a study of the orienting mechanisms of the electric fish, and to microneuronal studies on the nature of the electrical impulse in single fibers in fish and invertebrate sea animals. Both of these investigators will conduct research in La Jolla on a commuting basis but they plan to attract an investigator with capabilities in these areas of research for resident activity in the program. Dr. Turner will occupy the facility on a resident basis and Dr. Norris will commute for studies on the behavior of the dolphin, with particular relation to echo-location. An additional laboratory is planned for visitor use by distinguished investigators who might come to La Jolla for a sabbatical period to conduct research.

The above-mentioned preparations promise to assure a vigorous program of research for the new facility when it is completed. All concerned are enthusiastic about the opportunities for collaborative investigations which the laboratory promises to make available.

SPACE BIOLOGY LABORATORY

The Space Biology Laboratory was established in 1959 under sponsorship by the United States Air Force. Activities of the laboratory continue to enjoy the support of the Air Force and in addition, have received substantial assistance from the National Aeronautics and Space Administration. Activities of the Laboratory are under the direction of Dr. W. Ross Adey.

The principal goal of the Laboratory is to develop basic information concerning function of the brain, particularly as such function is influenced by the hostile environmental distortions posed by the invasion of outer space. In the past, emphasis has been placed upon analyses of such effects as induced by the application of simulated stresses individually applied in ground-based laboratories. It is anticipated, however, that the Space Biology Laboratory will have the opportunity to study the combined effects of space environments upon brain function, hence upon performance and cognitive behavior, in animals exposed to actual space flight. At present, two programs, one involving chimpanzees and one utilizing nemestrina monkeys (pigtail macaques), are reaching the stage of flight capability.

In addition to the main campus-based facility located on the "C" floor of the Brain Research Institute, the Laboratory continues to occupy space elsewhere, and enjoys valued collaboration with other institutions in the area. Dr. John P. Meehan, Professor of Physiology, has cooperated in making available for acceleration studies, the human centrifuge at the University of Southern California. Dr. R.W. Porter, a member of the Brain Research Institute and Director of Research at Long Beach Veterans Administration Hospital, has contributed importantly to work clarifying visceral reflex phenomena, chronic stress evaluation in laboratories located in the latter institution. Certain basic studies are also conducted in laboratories available through the courtesy of the nearby Los Angeles Veterans Administration Center, and the Harbor General Hospital. At the last named institution, studies are under the direction of Dr. Abraham T. Cockett, Chief of Urology, and Assistant Professor of Urology at the University of California at Los Angeles.

Although basic biological research is the principal interest of the Laboratory, intensive effort is applied to technical developments designed to retrieve and analyze physiological data, often under challenging circumstances. Among such devices are microminiaturized amplification systems, developed earlier, but tested extensively during the past year under a variety of conditions including high

acceleration stresses, vibration, temperature extremes, etc. A helmet which incorporates contact electrodes and pre-amplification systems has been perfected and tested successfully in the laboratory, and in pilots flying high-performance aircraft. A significant achievement during the year has been the development of a new biotelemetry system with Mr. R. T. Kado, using combined frequency and amplitude modulation in a multiplex system. While requiring refinements, this system has been tested in both animals and man with gratifying results. When completed, it will be capable of transmitting a variety of biological signals, including the electroencephalogram in freely-moving subjects completely unhampered by connections with recording devices.

Another development of considerable significance has been the development by Mr. D. Olsen of a new technique for transducing impedance changes in brain tissue with the use of coherent microwave sources at wavelengths around 7.8 millimeters. It is considered that this technique will open some important new windows in transducing from neural tissue, including for example, a determination of free ion concentrations that relate directly to excitability states in the brain.

Another development of the laboratory, made in association with the Manned Space Flight Center in Houston, has been the initiation of a program designed to record and analyze EEG data from a large number of normal subjects (members of the Apollo training program) under identical circumstances. In this program, the EEG's and much other autonomic and cardiovascular data of different subjects are recorded during a test period in which the different subjects receive and respond to identical cues delivered from a console operated by a standard taped protocol. Responses of the individual are tape recorded and carefully marked to permit their equation with concurrent EEG activity. The outputs from this study are subjected to a variety of computer programs for analysis. A broad baseline equating thought processes and behavior with the EEG will make possible later comparisons with similar EEG data retrieved under the abnormal environmental circumstances of space.

The principal scientific goals of SBL are to develop basic information on the capacity of the central nervous system to process and store information, and integrate behavior. Such information will provide essential baseline data of particular relevence to analyses of the ability of highly organized mammalian systems such as those of man to operate effectively in space. Some of the principal areas of investigation are described briefly below.

1. In studies on cats, Dr. McIlwain found that a small dark object moving in the periphery of the visual field can alter radically the responsiveness of central retinal receptors, stimulated simultaneously by a small flashing light. This new

work emphasizes the complexity of intra-retinal integration in determining the information sent on to higher visual centers. The study may be considered to eliminate completely the older view that the retina is merely a screen on which the visual image is deposited in a point-to-point fashion.

A second area of study in cellular neurophysiology primarily undertaken by Dr. Elul, has explored cellular mechanisms giving rise to the rhythmic electrical activity which characterize the electroencephalogram. It has been found that the penetration of the membrane of a nerve cell by a micropipette is associated with the sudden appearance of a rhythmic EEG record not detected in records immediately prior to the penetration of the cell membrane. It is concluded, therefore, that the EEG arises in more remote parts of the cell, possibly in dendritic structures. Since firing of the cell occurs irregularly without particular relation to the degree of depolarization of the cell, the data suggest a differential sensitivity of the nerve cell membrane to the direction of approach of the pre-synaptic volleys in the determination of cell firing.

These two studies appear to shed important new light on the underlying mechanisms by which information is transmitted and transacted in peripheral sensory mechanisms on the one hand and on the complex patterns of central neural activity on the other.

2. Major attention has been directed toward an analysis of basic mechanisms involved in normal sleep and in alert wakefulness. In the cat, structures located in the brain stem are known to be implicated in a most interesting and important state of sleep called paradoxical sleep, during which dreaming occurs. By contrast, SBL studies in the monkey and chimpanzee indicate that the temporal lobe nucleus, the amygdala, functions importantly in higher primates, and presumably in man, in this stage of sleep. Other evidence has prompted Dr. Adey and his associates to conclude that the dream phase of sleep has affinities with consciousness and should not be considered a stage of deep unconsciousness.

3. In a former study, SBL investigators found that widespread "driving" of brain rhythms occurred when monkeys were subjected to vibration frequencies of 11 to 15 cycles per second in an analysis of vibration profiles to be expected during the booster phase of space flight. Since functional capabilities of animals and man are seriously impaired during this state of artificial stimulation, it has become most important to determine the cause of this phenomenon so that it can be prevented or averted. The problem is being approached in a group of monkeys by sectioning the vestibular nerves, thereby rendering functionless that portion of the inner ear which contributes so importantly to the orientation of man in an environment of one G.

4. Studies investigating the nature of orienting phenomena have continued to utilize isolated monkeys raised in darkness from birth to the age of four years. It was found that these animals routinely utilized tactile impressions in the face, tongue and hands in exploring all unfamiliar objects, even in an illuminated environment, indicating that such sensory inputs had been substituted in the absence of light. It was found also that the animal exhibited much irrational and ritualistic behavior with violent and rapid slapping of the face and biting of the arms and legs. This study will continue by observing these animals sociologically when exposed to others and by subjecting them to a series of visual, perception and learning tasks employing EEG recordings from surface and depth structure.

5. A major effort has continued in analyzing the electrical activity of the deep structures of the chimpanzee's brain while the animal is performing skilled acts and during sleep. This study, undertaken in association with Dr. John Rhodes, has taken advantage of extensive application by Dr. D. O. Walter of the techniques of cross-spectral analysis with the use of continuous spectral density displays and of plots of contours of coherence allowing the display of very large amounts of EEG data in a reduced form. Early findings show, among other things, a slowing of the average frequency taken from the over-all power spectra during discriminative performances by comparison with resting states. Particular attention has been directed to the evaluation of sleep states in these animals, with comparison of surface and deep records in parallel studies in man. The study appears to enhance materially the value of the EEG as a potential monitor of behavioral states of man and chimpanzees in space environments.

6. Publication of the atlas prepared in association with Major Milton DeLucchi of the deep structures of the chimpanzee brain is anticipated soon. The volume has progressed to page proof.

7. Dr. Hoshizaki and Dr. Coulter continue to collaborate in a study designed to examine the effects of space environments upon endogenous rhythms, so-called circadian rhythms, displayed approximately every 24 hours by all earth-bound biological systems. Plants were exposed to alternate light and dark environments in attempts to determine if there are separate timing components associated both with the initiation and extinction of light. An electronic device is being developed by which the plant itself may turn environmental lights on and off, permitting one to investigate the capacity of the plant to compensate for any inaccuracies in its clock mechanisms. Studies continue on the "zero gravity" simulator, and its effect upon rhythmic processes. Remarkable distortions in these rhythmic mechanisms as well as in the conformation of the growing plant have been found. In all of these studies, the investigators are fortunate to have the association and guidance of Professor K. C. Hamner, Professor, Botany and Plant Biochemistry.

8. Close working relationships have been established by SBL with the Harbor General Hospital laboratories where Dr. Abraham T. Cockett has been examining renal and vascular phenomena which it is believed will be significantly distorted in prolonged space flight. Disturbances in vascular pressure gradients will account for some of the distortions anticipated, while others will stem from disturbed neural mechanisms, in particular those related to physical and psychological stress.

9. An analysis of the effects of stress continues to command the attention of investigators in SBL. In a study by Dr. W. D. Winters, the concurrent alterations in EEG activity and in steroid excretions are equated in animals subjected to stressful environments, including vibration, centrifugation and isolation. In other studies conducted by Dr. R. W. Porter at affiliated Long Beach laboratories, the effects of chronically imposed stress upon steroid metabolism is being examined. It seems evident that severe acute stresses may have long-term or even permanent consequences, just as it seems likely that chronic stress is productive of irreversible changes in the organism. Of particular interest in this study has been the problem of cholesterol metabolism with reference to the development of atherosclerotic changes.

Additional Personnel

BRADY, Cheryl L.	Typist Clerk
BURT, Nicola C.	Typist Clerk
CAMPEAU, Eugene, Jr.	Laboratory Technician II
COMPORT, William J.	Animal Caretaker
EAGLETON, Robert C.	Laboratory Helper
FITZMORRIS, Neil T.	Assistant Engineer
FOSSENIER, Patricia E.	Laboratory Technician I
GOVAERTS, Agnes M.	Typist Clerk
GROVER, John M.	Programmer II
HERMAN, Jack M.	Laboratory Assistant I
JACKSON, Keith E.	Senior Electronics Technician
JACOBSON, Sandra	Senior Typist Clerk
JORDON, William D.	Animal Caretaker
KITTINGER, Alice L.	Laboratory Technician II
KOWTA, Hiroko	Senior Draftsman
KVAM, Merrilyn L.	Laboratory Technician I
LEONARD, Donald W.	Laboratory Assistant I
LEWIS, Karen R.	Senior Typist Clerk
LINDSTROM, Allan J.	Laboratory Business Officer
LUCERO, Joe J.	Laboratory Technician II
LUTHER, William N.	Senior Laboratory Mechanician
McGEE, Burrell	Senior Animal Technician
MILLER, James C.	Laboratory Assistant I
NOGUCHI, Stanley K.	Laboratory Assistant I
ODOM, Bobby M.	Senior Electronics Technician
OKADA, Harold I.	Junior Engineer

OLSEN, David E.	Junior Engineer
PARADY, Sandra L.	Senior Typist Clerk
PARMELEE, Arthur H.	Coder
PEPPMULLER, Archie A.	Animal Caretaker
POSTHUMUS, Donald L.	Laboratory Assistant I
PUTNAM, Robert L.	Laboratory Assistant I
RIEDELL, Robert J.	Laboratory Technician I
RINGLER, Robert A.	Laboratory Technician I
ROBERTS, Alan P.	Laboratory Technician I
RUDDICK, James M., Jr.	Animal Caretaker
SCOTT, Charlie	Animal Caretaker
SEEBACH, Rolf W.	Senior Electronics Technician
SMITH, Erik D.	Laboratory Helper
SNIVELY, Elizabeth A.	Laboratory Technician I
SUNG, Joyce S.	Laboratory Assistant I
TILLSON, Harry A.	Senior Laboratory Mechanician
WESLEY, Murry O.	Animal Caretaker
WHITAKER, Carolyn A.	Typist Clerk
WILFONG, Harold D.	Laboratory Assistant IV
VALDEZ, Anthony F.	Senior Electronics Technician
ZWEIZIG, John R.	Assistant Engineer

THE VISITING SCIENTISTS GRANT AND THE INDEPENDENT SCIENTIST PROGRAM

As in past years, a large number of mature and distinguished investigators from UCLA and elsewhere conducted independent research activities or joined programs of local scientists for extended periods. Some of these investigators, particularly those from foreign countries, returned to their home laboratories after conducting research in the Institute. Others remained as associates of BRI members for prolonged periods, or even permanently as resident investigators in Institute programs. In the latter category may be mentioned prominently Dr. John Schlag, Assistant Professor of Anatomy in Residence, who has been awarded a Career Development Fellowship by the National Institutes of Health and will remain indefinitely as a member of the Institute. Additionally, Dr. Gunnar Heuser has been appointed Assistant Professor of Medicine in Residence, and Assistant Research Anatomist.

In the past, support for visiting investigators has stemmed from three principal sources: 1. Fellowship awards from agencies outside the University of California; 2. Unassigned salaries for professional staff included in project and program grants to BRI members; 3. Funds provided by the National Institutes of Health in program grant NB-00611. The last named grant was awarded initially in 1953 to provide programmatic support during the early formative years of the Institute for investigators interested in problems relating to neuronal mechanisms, the neurophysiology of basic behavioral states, learning and emotion, neuroendocrine mechanisms, and visceral regulatory phenomena. Later, as the Institute matured and

programmatic support for basic research increased in magnitude, the original grant was used primarily as a vehicle providing for the needs of visiting investigators. Since in practice it had changed status, therefore, it was agreed with the National Institutes of Health that the grant should be phased out and other methods of financing visiting investigator programs should be emphasized. As a result the grant was terminated during the past year.

The list of visiting investigators included in this section of the report contains the names of 53 scientists with which Institute members have enjoyed association during the past year. The investigations of these visiting scientists have been described in that section of this report which has reviewed project and program research.

Name of Visitor	Home Affiliation	Location
*ADAM, G.	University of Budapest	Hungary
AMBO, K.	Tohoku University	Sendai, Japan
BALDWIN, Basil A.	Royal Veterinary College	England
BEYER, Carlos	University of Mexico	Mexico City
BALVIN, R.	L.A. State College	Los Angeles
BRAVO-REY, Maria	Universidad de Medicina	Madrid, Spain
CHANG, Sheuh-Shen	National Taiwan University	Taipei, Formosa
CHATELIER, G.	Centre de Medecine Aeronautique	Paris, France
CHICHIBU, Shiko	Tohoku University	Sendai, Japan
CHO, Arthur K.	University of California, Los Angeles	California
DEWHURST, B.	College of Technology	Liverpool, England
ELUL, R.	Weizmann Institute	Israel
ENDROCZI, Elmer	University of Pecs	Hungary
ENGER, Per	University of Olso	Norway
FAIR, Charles M.	Yale University	New Haven, Connecticut

*Supported by Grant NB-00611

Name of Visitor	Home Affiliation	Location
FAIRHURST, Alan S.	Liverpool University	England
FENDER, D.H.	California Institute of Technology	Pasadena
FRIEDEN, Edward H.	Tufts University	Medford, Massachusetts
FUJITA, Y.	Brain Research Institute	Tokyo, Japan
HALAS, Edward S.	Texas Technological College	Lubbock
GROSSMAN, Richard C.	Harvard University	Cambridge, Massachusetts
HAYWARD, James N.	University of Rochester	New York
*HEUSER, Gunnar	University of Montreal	Canada
HIRSCH, Hilde E.	University of California, Berkeley	California
HORVATH, F.E.	University of Michigan	Ann Arbor
HULTIN, E.	University of Stockholm	Sweden
IZQUIERDO, Ivan	University of Buenos Aires	Argentina
JENSEN, Marcus M.	Univerisity of California, Los Angeles	California
KAWAMURA, Hiroshi	University of Yokohama	Japan
KHAZAN, Naim	Hadassah University	Jerusalem
LEHMANN, D.	University of Freiburg	Germany
*LING, George M.	University of British Columbia	Vancouver, Canada
LISSMANN, H. W.	Cambridge University	England
LYUBIMOV, N. N.	Institute of the Brain	Moscow, Russia
*MANCHANDA, Surendra K.	All India Institute of Medical Sciences	New Delhi
NICHOLSON, Paul	University of London	England

Name of Visitor	Home Affiliation	Location
PORTER, Robert	University of Oxford	England
*RADULOVACKI, M.	University of Belgrade	Yugoslavia
RAMIREZ, Victor Domingo	University of Santiago	Chile
SANDEMAN, David	St. Andrews University	Scotland
SATO, Takawi	Kurume University	Tokyo, Japan
*SOLTYSIK, S. Stefan	Yagiellonian University	Poland
STERN, Ralph H.	College of Physicians and Surgeons	San Francisco, California
SZABO, Thomas	Centre National de la Recherche Scientifique	Paris, France
TAN, Ek-Sheng	University of Indonesia	Djakarta
UCHIDA, Koki	University of Hokkaido	Sapporo, Japan
UYEDA, A.A.	University of California, Los Angeles	California
VARTANIAN, G.	Institute of Experimental Medicine	Leningrad, Russia
*WEISS, Tomas	Czechoslovakia Academy of Science	Prague
WYRWICKA, Wanda	Nencki Institute	Poland
YAMAZAKI, J.N.	Marquette University	Milwaukee, Wisconsin
YOKOYAMA, Akira	University of Nagoya	Japan
ZOMZELY, Claire	Harvard University	Cambridge, Massachusetts

RESEARCH TRAINING

A second principal goal recognized by the Brain Research Institute is the training of investigators for independent careers in research. Research aspirants at both pre and postdoctoral levels of development are subjected to the same combination of departmental and interdisciplinary experience which characterizes the research

activities of the Institute. A curriculum of courses is sponsored by the Institute which emphasizes interdisciplinary science education. These presentations include both departmental courses approved by the Graduate Division for credit and less formal seminars and lectures.

Training activities of the Brain Research Institute center around a program entitled "Interdisciplinary Program of Research Training in Basic Sciences Related to Mental Health", supported by grant 5TI MH-6415 from the National Institutes of Mental Health. Twenty-two predoctoral and 14 postdoctoral research trainees participated in this program during the past year. The principal training activities included tutorial research work and extensive laboratory experience, trainees participating in ongoing projects under supervision and also conducting original research. Twenty-five formal course offerings were given, primarily for an audience of research trainees (Appendix III). Informal research discussion groups designed primarily for trainee instruction continued during the year in the following areas of interest: physiology of the central nervous system (Dr. John Schlag); neurophysiology (Dr. J. P. Segundo); human behavior (Drs. Gurney, Holmes, Wenner). These luncheon meetings placed considerable responsibility on the research trainees with regard to both organization and content. A member of the faculty (indicated above) served to provide resource leadership for each group. Additionally a seminar for postdoctoral trainees was established which is operated entirely without supervision of the faculty. The purpose of this seminar is to provide continuing communication among postdoctoral trainees and to give them a free hand in structuring communications among themselves regarding such research activities as they may choose to discuss.

As in the past, the weekly series of formal seminars sponsored by the program has provided the central forum of the BRI where all students and faculty can assemble together to hear and discuss the presentation of some visiting or resident investigator, usually of senior status and distinguished accomplishment (Appendix III).

The Committee on Trainee Education is assigned the responsibility of coordinating trainee education in the program with departmental requirements to which trainees recognize a prime responsibility. The Committee is composed of the following members:

DOCTER, Richard F., Chairman
BROWN, W. Jann
CRANDALL, Paul H.
EIDUSON, Samuel
PARMELEE, Arthur H., Jr.
SEGUNDO, Jose P.
SELLERS, Margaret I.
VERZEANO, Marcel
WALTER, Richard D.
WENNER, Waldemar

WENZEL, Bernice M.
WHALEN, Richard E.
WINTERS, Wallace D.

The Committee has been especially concerned with establishing standards and procedures for appointment to the program, with problems of curriculum including the development of new courses and seminars, and with methods of increasing awareness of all trainees of certain research problems pertaining to mental health.

During the past year the Committee implemented plans to review the applications for postdoctoral appointments and develop training plans for postdoctoral trainees now subject to systematic review by the Committee. This procedure enables all members of the Committee to become fully aware of the capabilities and needs of all postdoctoral trainees in the program.

Largely through the initiative and energy of Mr. Raymond T. Kado, the instrumentation course for the training program has been reorganized. This course includes both lecture and laboratory procedures designed to acquaint the trainees with the fundamentals of electronics and various application of instrumentation in research.

GRADUATE EDUCATION

Interest is centered prominently upon graduate students who are candidates for the Ph.D. degree of which 93 engaged in training acitivies in Institute laboratories during 1963-64. Much of this educational activity is organized departmentally and all graduate degrees are awarded by departments. However, generous interdepartmental experience is provided for most graduate students, many of whom are trainees supported by NIMH training grant 5TI MH-6415, through preceptors' participation in collaborative research, as well as by means of presentation of the series of broadly interdisciplinary seminars and lectures indicated above.

Candidate	Degree	Preceptor(s)	Department
ADKINS, Joel W.	Ph.D.	Lindsley	Psychology
AITKEN, Judith	Ph.D.	Gorski	Anatomy
ALBRITTON, David	M.D.	Gorski	Anatomy
*ALPERN, Ann	Ph.D.	Lindsley	Psychology
*BARCEVAC, Betty	Ph.D.	Brazier	Biophysics
*BARFIELD, Ronald J.	Ph.D.	Sawyer	Anatomy

*Mental Health Training Program Trainee

Candidate	Degree	Preceptor(s)	Department
BELL, Curtis C.	Ph.D.	Segundo	Anatomy
*BENNETT, Marvin H.	Ph.D.	Green	Physiology
*BENOR, Daniel J.	M.D.	Ditman	Psychiatry
*BIEDERMAN, Marguerite A.	Ph.D.	Bullock	Zoology
BODEY, Norma J.	Ph.D.	Kruger	Anatomy
*BOGUCKI, Betty	Ph.D.	Roberts	Biological Chemistry
BONNET, Carol	M.D.	Jones	Pediatrics
BURNS, Beverly	Ph.D.	Moskowitz	Psychiatry
*CALEY, David	Ph.D.	Maxwell	Anatomy
*CALDERONE, Julius G.	Ph.D.	Rasmussen	Med. Micro. & Immun.
CANTY, Timothy	M.D.	Brown	Pathology
CAPER, Robert A.	M.D.	Brown	Pathology
CASE, Roger	Ph.D.	Taylor	Pharmacology
CHASE, Michael	Ph.D.	Clemente/Sterman	Anatomy
DELWICHE, Roger	M.D.	Jones	Pediatrics
DiBERNARDO, Rosario L.	M.D.	Roberts	Biological Chemistry
*DONGIEUX, Gerald	Ph.D.	Rasmussen	Med. Micro. & Immun.
DOYLE, Katharine	M.S.	Pease	Anatomy
*ELLSWORTH, Orval T.	Ph.D.	Lindsley	Physiology
FITZMORRIS, Neil	Ph.D.	Adey	Physiology
*FUNK, Glenn	Ph.D.	Rasmussen	Med. Micro. & Immun.
*GALBRAITH, Gary C.	Ph.D.	Lindsley	Psychology

Candidate	Degree	Preceptor(s)	Department
GARDINER, Martin	Ph.D.	Brazier	Biophysics
GREENFIELD, Richard	Ph.D.	Ditman	Psychiatry
*HAAKE, Margot A.	Ph.D.	Roberts	Biological Chemistry
HANIN, Israel	Ph.D.	Jenden	Pharmacology
*HELMY, Jo Ann	Ph.D.	Lindsley	Psychology
HERIC, Thomas M.	Ph.D.	Kruger	Anatomy
HOISMAN, Nancy	Ph.D.	Lindsley	Psychology
HOLSCHER, Carl	M.D.	Dillon	Anesthesiology
*HOWELL, John N.	Ph.D.	Jenden	Pharmacology
*JACOBSON, Allan	Ph.D.	Clemente	Anatomy
JUNGE, Douglas	Ph.D.	Moore/Hagiwara/ Segundo	Physiology
KANEMATSU, Shigeto	Ph.D.	Sawyer	Anatomy
KITZES, Leonard	Ph.D.	Moskowitz	Psychiatry
KNAUSS, Tom	Ph.D.	Clemente/Sterman	Anatomy
LEBOVITZ, Robert	Ph.D.	Wenzel	Physiology
LOTTI, Victor J.	Ph.D.	George	Pharmacology
*LUNER, Stephan J.	Ph.D.	Simmons	Biophysics
*MARTIN, Don R.	Ph.D.	Sellers	Med. Micro. & Immun.
McINTYRE, T. W.	Ph.D.	Brady	Physiology
MIZES, David	M.D.	Ditman	Psychiatry
*NADLER, Ronald D.	Ph.D.	Lindsley	Psychology
OGLE, Marilyn	Ph.D.	Ditman	Psychiatry
NAKAYAMA, Ken	Ph.D.	Lindsley	Psychology
*NEDERGAARD, Ove A.	Ph.D.	Taylor	Pharmacology

Candidate	Degree	Preceptor(s)	Department
*O'NEILL, Ynez V.	Ph.D.	O'Malley	History of Medicine
PALKA, John	Ph.D.	Bullock	Zoology
*PALKA, Yvonne	Ph.D.	Bullock/Sawyer	Zoology
*POSNICK, Edward	Ph.D.	Ross	Biophysics
*PRICE, William M.	Ph.D.	Hemingway	Physiology
QUINTON, Elton	Ph.D.	Lindsley	Psychology
RAWITCH, Allan B.	Ph.D.	Pierce	Biological Chemistry
RICCHIUTI, Nicholas V.	Ph.D.	Mommaerts/Jahn	Zoology
RIPLEY, Robert	Ph.D.	Pease	Anatomy
ROBERTS, Alan	Ph.D.	Bullock	Zoology
RODNICK, J.E.	M.D.	Roberts	Biological Chemistry
*ROSE, Anthony L.	Ph.D.	Docter	Psychiatry
*ROSE, Guenter	Ph.D.	Lindsley	Psychology
*ROSENBERG, Jay	Ph.D.	Segundo	Physiology
ROTH, Sidney	Ph.D.	Lindsley/Clemente	Psychology/ Anatomy
SCHULMAN, Joseph	Ph.D.	Bullock	Zoology
*SELMONT, Richard M.	Ph.D.	Buchwald, N.	Anatomy
SHEU, Ying-Shiuh	Ph.D.	Jenden	Pharmacology
*SIECK, Michael H.	Ph.D.	Wenzel	Physiology
*SIEVER, Dan	Ph.D.	Taylor	Pharmacology
SKINNER, James E.	Ph.D.	Lindsley	Psychology
SLATER, Marilyn	Ph.D.	Mommaerts	Zoology
*SMITH, William R.	Ph.D.	Brazier	Biophysics

Candidate	Degree	Preceptor(s)	Department
*SOMMERS, Sally R.	Ph.D.	Moskowitz	Psychology
SPONG, Paul	Ph.D.	Lindsley	Psychology
STEINFELDT, Stephen	M.D.	Jones	Pediatrics
STENSAAS, Larry J.	Ph.D.	Scheibel	Anatomy
STOCKENBERG, Donald	Ph.D.	Rasmussen	Med. Micro. & Immun.
SU, Che	Ph.D.	Bevan	Pharmacology
TARBY, Theodore	Ph.D.	Adey	Anatomy
THORSON, John	Ph.D.	Bullock	Zoology
TOM, Ho Yet	Ph.D.	Hall	Physiology
TRACHTENBERG, Michael	Ph.D.	Buchwald, N.	Anatomy
ULRICH, Rene	Ph.D.	Slusher	Anatomy
VAUGHN, James	Ph.D.	Pease	Anatomy
*WANG, Howard H.	Ph.D.	Hall	Physiology
WAPNER, Michael	Ph.D.	Moskowitz	Psychology
WEDDLE, O. H.	Ph.D.	Brady	Physiology
WEHRFRITZ, Julius	M.D.	Ditman	Psychiatry
*WICKE, Jerry D.	Ph.D.	Lindsley	Psychology
HO, Yiu-Kee	M.D.	Brown	Pathology

POSTDOCTORAL EDUCATION

Major activity has been established also in postdoctoral research instruction of trainees, and 68 participants with either the Ph.D. or M.D. degress have been occupied in Institute laboratories during the current year. Much of the experience offered these scientific aspirants is preceptoral in structure, although most participated in interdisciplinary courses and seminar presentations.

Fellows and Trainees	Institution Rec'd Degree	Principal Investigator(s)
*ABRAHAM, Frederick D., Ph.D.	University of Indiana	Marsh
ATKINSON, Roland, M.D.	Stanford University	Ditman
*AKIYAMA, Yoshio, Ph.D.	University of California, Los Angeles	Parmelee
*AMACHER, Melchior P., Ph.D.	University of Washington	O'Malley
BABU, Sasira K., Ph.D.	Sri Venkateswara University Tirupati, India	Bullock
BAILEY, Joseph, M.D.	University of Geneva	Ditman
*BERNAL, Martha E., Ph.D.	University of Arizona	Docter
*BINGGELI, Richard, Ph.D.	University of California, Los Angeles	Wenzel
*BREMNER, Frederick, Ph.D.	University of Massachusetts	Worden/Marsh
*BRINZA, Kenneth, M.D.	Ohio State University	Stern
*BRUNER, Alfred, Ph.D.	University of Indiana	Wenzel
CARPENTER, Sterling, M.D.	Temple Medical School	Brown
CHERNETSKI, K., Ph.D.	University of California, Los Angeles	Bullock
*CHING, Clayton, M.D.	University of Southern California	Rand/Stern
COHEN, David H., Ph.D.	University of California, Berkeley	Wenzel
CREANGE, J. E., Ph.D.	University of California, Los Angeles	Roberts
DAVIDSON, P. Waverly, M.D.	Louisiana State University	Ditman
*DECIMA, Emilio E., M.D.	University of Buenos Aires, Argentina	George/Rand
DONCHIN, Emanuel, Ph.D.	Hebrew University, Israel	Lindsley
DUBROVSKY, B. O., M.D.	University of Buenos Aires, Argentina	Buchwald, N.

*Mental Health Training Program Trainee

Fellows and Trainees	Institution Rec'd Degree	Principal Investigator(s)
EBERLE, Elizabeth D., M.D.	Duke University	Jones
ELISON, Christian, Ph.D.	University of California, San Francisco	Jenden
*EVANS, John W., M.D.	Cornell University	Chapman
FOOS, Robert Y., M.D.	University of California, Los Angeles	Allen
FREEDMAN, Steven, Ph.D.	Rutgers University	Sawyer
*FROMER, Robert, M.D.	Yale University	Buchwald, N.
GIBBS, Colin L., Ph.D.	Sydney University, Australia	Brady
*GIOLLI, R. A., Ph.D.	University of California, Berkeley	Kruger
GLOBUS, Albert, M.D.	Northwestern University	Scheibel
*GOETINCK, Paul F., Ph.D.	University of California, Davis	Pierce
GOLDMAN, Lawrence, Ph.D.	University of California, Los Angeles	Bullock
*GOLDMAN, Patricia S., Ph.D.	University of California, Los Angeles	Docter
*GRANGE, Kathleen M., Ph.D.	University of California, Los Angeles	O'Malley
HOGINO, Nobuyoshi, M.D.	University of Jikei, Tokyo, Japan	Gorski
HUGHES, Trevor, M.D.	Manchester University, England	Bevan
ISHIKAWA, Koichi, M.D., Ph.D.	Chiba University, Japan	Stuart
KAR, Nirmal C., Ph.D.	University of Bombay, India	Pearson
KATZ, Arnold, M.D.	Harvard Medical School	Mommaerts
*KOKKA, Norio, Ph.D.	University of California, San Francisco	George

Fellows and Trainees	Institution Rec'd Degree	Principal Investigator(s)
LINDER, Jerry, M.D.	University of California, Los Angeles	Dillon
McILWAIN, James T., M.D.	Tulane University	Adey
MEIER, Rita, M.D.	University of Vienna, Austria	Porter, R.W.
MURPHY, Terence, M.D.	Liverpool University, England	Bevan
NAMEROW, Norman, M.D.	University of California, Los Angeles	Markham
NATHANIEL, Edward, M.D.,Ph.D.	University of California, Los Angeles	Pease
POUSSAINT, Alvin F., M.D.	Cornell University	Ditman
ROMERO-SIERRA, C., M.D.	University of Zaragoza, Spain	Buchwald, N.
SACHS, Eugene, Ph.D.	University of Rochester	Adey
SCHOENBRUN, Richard, M.D.	Harvard School of Medicine	Adey
*SCHULTZ, Marvin R., M.D.	University of Wisconsin	Mosier
SCHWARTZ, Melvin, M.D.	Northwestern University	Ditman
SCHWASSMAN, Horst O., Ph.D.	University of Wisconsin	Kruger
*SENGSTAKE, Cord B., Ph.D.	University of Oregon	Wenzel
SLUCKI, Henry, Ph.D.	University of California, Los Angeles	Porter
*SMITH, John W., M.D.	Howard University	Rasmussen
*SPOONER, Charles E., Ph.D.	University of California, Los Angeles	Winters
STERMAN, M. D., Ph.D.	University of California, Los Angeles	Clemente
*THOMAS, Karla, Ph.D.	University of California, Berkeley	Beckwith

Fellows and Trainees	Institution Rec'd Degree	Principal Investigator(s)
TOCZEK, Stanislaw, M.D.	University of Wroclaw, Poland	Stern
*TURNER, Ronald, Ph.D.	University of California, Los Angeles	Lindsley/Norris
VELASCO, Marcos, M.D.	National University of Mexico	Lindsley
WEINBERGER, Norman M., Ph.D.	Western Reserve University	Lindsley
WOOD, Fae D., Ph.D.	University of California, Berkeley	Pearson
WRIGHT, David L., Ph.D.	University of California, Los Angeles	Sonnenschein
YOSHIDA, Noriyoshi	Kurume University School, Tokyo	Brown
ZANE, Murray, M.D.	University of Toronto	Ditman
ZOLLMAN, James F., Ph.D.	University of California, Berkeley	Wenzel/Beckwith
ZUNIN, Leonard, M.D.	University of California, Los Angeles	Ditman

FOREIGN STUDENTS AND INVESTIGATORS IN THE BRI

The magnitude and international flavor of all BRI training and research activities are indicated by the fact that, in addition to visiting participants from the United States, investigators from many countries joined in training and research programs of the Institute during the past year. Of 214 students, fellows and investigators who studied in Brain Research laboratories during 1963-64, 61 came from 24 foreign countries (see rosters, pages 48-60). Some were senior scientists of distinguished accomplishment who contributed importantly to research undertaken in collaboration with members of the Institute. Others were students in an early stage of training who, after one to three years of experience, returned home and established new research activities in fields undeveloped in their own universities. All these visitors stimulated Institute programs and provided instructive information concerning foreign scientific developments. While these research and training dividends accruing from the foreign visitor program are substantial, humanistic rewards may be equally great. Scientific associations of this kind provide a medium for exchanging ideas and encouraging understanding which avoids suspicions and antagonisms often implicated in social or political contacts.

S E R V I C E

The third principal goal of the Brain Research Institute relates to its activities in serving the University and, through it, the social and scientific community by developing many fields of brain study and by disseminating information regarding brain function. These activities take many forms, and it will be feasible here to review only a few of them illustratively.

CONFERENCES

A prominent commitment of the Institute relates to the development and dissemination of information regarding the brain by holding conferences and symposia at the University of California, Los Angeles. In the past, between two and four conferences have been held each year under sponsorship of the Brain Research Institute, and during 1963-64 three such conferences were sponsored.

CONFERENCE ON SPEECH, LANGUAGE AND COMMUNICATION. Sponsored jointly by the United States Air Force Office of Scientific Research and the Brain Research Institute, November 10-13, 1963. (Participants from other institutions, UCLA, and the Brain Research Institute listed below.)

Other Institutions

de AJURIAGUERRA, Julian	Bel-Air Psychiatric Clinic, University of Geneva, Switzerland
DENES, Peter B.	Bell Telephone Laboratories, Inc., Murray Hill, New Jersey
ERVIN, Susan M.	Department of Speech, University of California, Berkeley
FERGUSON, Charles A.	Center for Applied Linguistics of the Modern Language Association of America, Washington, D.C.
GARVIN, Paul L.	Thompson Ramo Woolridge, Inc., TRW Computer Division, Canoga Park, California
GESCHWIND, Norman	Aphasia Research Section, Veterans Administration Hospital, Boston, Massachusetts

Other Institutions

HARDY, William G.	The Speech and Language Center, The Johns Hopkins Hospital, Baltimore, Maryland
de HIRSCH, Katrina	Pediatric Language Disorder Clinic, Columbia Presbyterian Medical Center, New York
HIRSH, Ira J.	Central Institute for the Deaf, St. Louis, Missouri
JAKOBSON, Roman	Department of Slavic Languages and Linguistics, Harvard University, Cambridge, Massachusetts
LAMB, Sydney M.	Department of Linguistics, University of California, Berkeley
LENNEBERG, Eric H.	Speech Resesrch Laboratory, The Children's Hospital Medical Center, Boston, Massachusetts
LOUNSBURY, Floyd G.	Professor of Anthropology, Yale University, New Haven, Connecticut
MASLAND, Richard L.	National Institute of Neurological Diseases and Blindness, National Institutes of Health, Bethesda, Maryland
OSGOOD, Charles E.	Institute of Communications Research, The University of Illinois, Urbana, Illinois
ROBERTS, Lamar	Teaching Hospital and Clinics, University of Florida, Gainesville, Florida
ROMNEY, A. Kimball	Department of Anthropology, Stanford University, Palo Alto, California
SAVELY, Harvey E.	Director of Life Sciences, Air Force Office of Scientific Research, Office of Aerospace Research, United States Air Force, Washington, D.C.
WEPMAN, Joseph M.	Department of Surgery, The University of Chicago, Illinois

From UCLA

APPLEGATE, Joseph	Department of Near Eastern and African Languages
BRIGHT, William O.	Department of Anthropology and Sociology
CARTERETTE, Edward C.	Department of Psychology
GARFINKEL, Harold	Department of Anthropology and Sociology
GOODHILL, Victor	Department of Surgery, School of Medicine
HOIJER, Harry	Department of Anthropology and Sociology
LADEFOGED, Peter	Department of English
MARSCHAK, Jacob	Western Management Science Institute
MELKANOFF, Michel A.	Computing Facility
PUHVEL, Jaan	Center for Research in Languages and Linguistics
SHEEHAN, Joseph G.	Department of Psychology
STOCKWELL, Robert P.	Department of English

From UCLA

VERZEANO, Marcel	Department of Biophysics and Nuclear Medicine
VON LEDEN, Hans	Department of Surgery, School of Medicine

From the Brain Research Institute

BRAZIER, Mary A. B.
HALL, Victor E., Editor
LINDSLEY, Donald B.
MAGOUN, H. W., Chairman

CONFERENCE ON NEUROBIOLOGICAL BASIS OF BEHAVIOR. Jointly sponsored by Institute for Brain Research, University of Tokyo, and the Brain Research Institute, UCLA. Held at the Center for East-West Studies, Honolulu, Hawaii, May 1-4, 1964, under the asupices of the Joint U.S.-Japan Committee on Scientific Research. (Participants from other institutions and from the Brain Research Institute listed below.)

Other Institutions

APRISON, M. H.	Institute of Psychiatric Research, Indiana University Medical Center, Indianapolis
INOUE, Eiji	Institute of Brain Research, University of Tokyo, Japan
KATSUKI, Shibanosuke	School of Medicine, University of Kyushu, Japan
KATSUKI, Yasuji	School of Medicine, Tokyo Medico-dental College, Japan
KILLAM, Keith	Department of Pharmacology, Stanford University School of Medicine, Palo Alto, California
KUMAGAI, Hiroshi	School of Medicine, University of Tokyo, Japan
LILLY, John C.	Communication Research Institute, Coconut Grove, Miami, Florida
MASLAND, Richard L.	Director, National Institute of Neurological Diseases and Blindness, National Institutes of Health, Bethesda, Maryland
MOTOKAWA, Koichi	School of Medicine, Tohoku University, Japan
OGAWA, Teizo	School of Medicine, Juntendo University, Japan
PRIBRAM, Karl H.	Department of Psychiatry, Stanford University School of Medicine, Palo Alto, California
SHIRAKI, Hirotsugu	Institute of Brain Research, University of Tokyo, Japan
SWEET, William H.	Neurological Surgery, Massachusetts General Hospital, Boston

Other Institutions

TOKIZANE, Toshihiko, Co-Chairman	Institute of Brain Research, University of Tokyo, Japan
TSUKADA, Yasuzo	School of Medicine, Toho University, Japan
UEKI, Komei	Brain Research Institute, Niigata University, Japan
UTENA, Hiroshi	School of Medicine, Gumma University, Japan
WALKER, A. Earl	Division of Neurological Surgery, The Johns Hopkins Hospital, Baltimore, Maryland
YOSHII, Naosaburo	School of Medicine, University of Osaka, Japan
ZIMMERMAN, H. M.	Montefiore Hospital, New York

From the Brain Research Institute

ADEY, W. Ross
FRENCH, John D., Co-Chairman
MAGOUN, H. W.

AIR FORCE CONFERENCE ON NEUROLOGICAL RESPONSES TO EXTERNAL ELECTROMAGNETIC ENERGY (A Critique of Currently Available Data and Hypotheses). Co-sponsored by the Air Force Systems Command, USAF, and the Brain Research Institute, UCLA, July 11, 1963. (Participants from other institutions and the Brain Research Institute listed below).

Other Institutions

ALEXANDER, Harold S.	Life Sciences Department, North American Aviation, Torrance, California
ALMASI, Joseph	General Electric Research Laboratories, Schenectady, New York
BACH, L. M. N.	Department of Physiology, Tulane University, New Orleans, Louisiana
BAKER, Lee P.	Department of Physiology, Baylor University College of Medicine, Waco, Texas
BANGHART, Frank W.	University of Virginia School of Medicine, Charlottesville
BEISCHER, Dietrich E.	U.S. Naval School of Aviation Medicine, Pensacola, Florida
CHRISTMAN, Raymond J.	Human Engineering Laboratory, Griffiss AFB, Rome, New York
FLICKINGER, Don D.	Brigadier General, USAF, MC (Ret), Research Consultant, Washington, D.C.
FREEMAN, Walter J.	Department of Physiology, University of California, Berkeley
FREY, Allen W.	Institute for Research, State College, Pennsylvania
FRY, William J.	Biophysical Research Laboratory, University of Illinois, Urbana

Other Institutions

GLASER, Donald A.	Miller Institute for Basic Research in Science, University of California, Berkeley
HARTMAN, Bryce W.	USAF School of Aerospace Medicine, Brooks AFB, Texas
HETHERINGTON, Albert W.	Office of the Assistant for Bioastronautics Headquarters, Air Force Systems Command, Andrews AFB, Washington, D.C.
HOEFT, Lothar O.	Biophysics Laboratory, Wright-Patterson AFB, Ohio
MAURO, Alexander	Rockefeller Institute for Medical Research, New York
MORRELL, Frank	Division of Neurology, Stanford University, Palo Alto, California
PATTON, Dennis D.	Biomedical Group, Planning Research Corporation, Los Angeles, California
PINNEO, Lawrence R.	Delta Regional Primate Research Center, Tulane University, Covington, Louisiana
PRIBRAM, Karl H.	Department of Psychiatry, Stanford University, Palo Alto, California
REYNOLDS, Orr E.	Office of Space Sciences, NASA, Washington, D.C.
SAVELY, Harvey E.	Air Force Office of Scientific Research, Washington, D.C.
SCHMITT, Otto H.	School of Physics, University of Minnesota, Minneapolis
SCHWANN, Herman P.	Electromedical Division, Moore School of Engineering, University of Pennsylvania, Philadelphia
TOBIAS, Cornelius A.	Donner Radiation Laboratory, University of California, Berkeley
VAN HARREVELD, Anthonie	Department of Physiology, California Institute of Technology, Pasadena, California
WILLIAMS, Harold L.	Department of Clinical and Social Psychology, Walter Reed Army Institute of Research, Washington, D.C.

From the Brain Research Institute

ADEY, W. Ross
BUCHWALD, Nathaniel A.
CLEMENTE, Carmine D.
DE LUCCHI, Milton R.
GREEN, John D.
HAGIWARA, Susumu
KRUGER, Lawrence
MAGOUN, H. W.
SCHLAG, John
SEGUNDO, Jose P.

PUBLIC INFORMATION

Another Brain Research Institute commitment is served by issuing appropriate information, encouraging members to make general addresses and periodically opening Brain Research Institute laboratories to conducted visits. During the past year, a new method of conducting "visits" was inaugurated, which method employed the use of closed circuit television to "bring" the laboratory to the visitors rather than the reverse. On October 12, 1963 a cinescope of visits to 12 laboratories in the BRI, filmed one week earlier by the Academic Communications Facility, was presented before a large audience of prominent visitors representing the Chancellor's Committee for the UCLA Memorial Activities Center. The showing proved to be of such interest that it was presented again at the UCLA Open House November 17, 1963 and repeatedly thereafter, upon request, to a number of other groups. Among these groups were:

Japanese Psychiatrists Study Team - November 4, 1963

El Camino Physiological Psychology Class - November 13, 1963

Mt. San Antonio College Introductory Physiological Psychology Class - May 1, 1964

Culter Academy (Physiology, Physics and Chemistry classes) - May 21, 1964

Members of the Brain Research Institute also served as hosts to the following meetings:

AMERICAN DOCUMENTATION INSTITUTE, LOS ANGELES CHAPTER, REGULAR QUARTERLY MEETING, October 28, 1963.

Participants

BROWN, Daniel	Data Processing Laboratory, Brain Research Institute, UCLA
COX, James	Circulation Department, Main Library, UCLA
DARLING, Louise	Biomedical Librarian, Biomedical Library, UCLA
DIXON, Wilfrid J.	Professor of Biostatistics and Director, Health Sciences Computing Facility, Health Sciences Center, UCLA
HALL, Victor E.	Professor of Physiology, Health Sciences Center, UCLA
MOORE, Everett T.	Assistant University Librarian, UCLA
REIDY, J.	Chairman, Los Angeles Chapter, ADI

AIR FORCE OFFICE OF SCIENTIFIC RESEARCH - BIOLOGICAL SCIENCES DIVISION ADVISORY PANEL MEETING - January 13 and 14, 1964.

Members Attending

Staff: BROWN, R. V.
SAVELY, H. E.
STOLLER, B. D.

Advisors: BULLOCK, T.
CARLSON, L.
EAGLE, E.
ELKES, J.
HICKAM, J. (Chairman)
RAHN, H.
TEUBER, H.
WALL, P.
ZIMMER, H. (Recording Secretary)

AF Observers: HETHERINGTON, A.
JOHNSON, L.

VISIT OF NATIONAL INSTITUTE OF NEUROLOGICAL DISEASES AND BLINDNESS - NEUROLOGY STUDY SECTIONS A & B - January 17, 1964.

Tour of the BRI

Neurology Study Section "A" Members Attending

BICKFORD, R. G.
BUCHANAN, Douglas
DOW, Robert S.
HARTMANN, J. Francis
HAYMAKER, Webb E.
NEFF, William D.
PLUM, Fred
PRONOVE, Pacita (Executive Secretary)
SAHS, Adolph (Chairman)
SAWYER, Charles H.
WALKER, A. Earl
WHITLOCK, David G.

Neurology Study Section "B" Members Attending

BRAZIER, Mary A. B.
LOWRY, Oliver H.
POPE, Alfred
ROSNER, Burton S.
SNIDER, Ray S.
SWANK, Roy L.

SWEET, William H.
TRUEX, Raymond C.
WARD, Arthur A., Jr.
WARD, James W.

Substitutes

FISHMAN, Ronald
JOHANSSON, Karl
LAMBERT, Edward
MICHALSKI, Joseph

INSTITUTE OF DEFENSE ANALYSIS, AD HOC COMMITTEE FOR SECRETARY OF DEFENSE MacNAMARA, February 19, 1964.

From Other Institutions

CULVER, Dwight	Aerojet Corporation
FLICKINGER, Donald D., General	USAF
HENRY, James	University of Southern California
MEEHAN, Pat	University of Southern California
POLLACK, Herbert	Consultant to DOD and NASA
ROMAN, Captain	X-15 Physiology, Edwards AFB
WAGGONER, James	Garret Corporation

From UCLA

ADEY, W. Ross
BROWN, D.
DELUCCHI, M. R.
KADO, R. T.
RHODES, J. M.
WALTER, D. O.
WINTERS, W. D.

SPECIAL HONORS OR AWARDS

ALLEN, Raymond A. . Exhibit "Ultrastructure of retinal bipolar cells" won:
First prize, annual meeting, American Academy of Ophthalmology-Otolaryngology, New York;

Knapp Award, Scientific Assembly, American Medical Association, San Francisco.

BEVAN, John A.	Invited lecturer at 2nd International Pharmacological Congress, Prague.
BRAZIER, Mary A. B.	Invited lecturer at the Hebrew University Medical School, Jerusalem;
	Invited lecturer of the Hungarian Academy of Sciences;
	Invited lecturer, International Society for Clinical Electroretinography Symposium on Flicker, Amsterdam;
	Invited lecturer at the Weizmann Institute, Rehovoth, Israel.
BULLOCK, Theodore H.	President-Elect, American Society of Zoologists;
	President, UCLA Chapter, Society of Sigma XI;
	Named Alexander Forbes Lecturer, A. M. Grass Foundation, Woods Hole, Massachusetts.
DITMAN, Keith	Chaired a symposium on Psychotherapeutic Drugs: Indications and Complications, held in conjunction with the University of California and the State Department of Mental Hygiene;
	Appointed to do the annual review for the American Journal of Psychiatry.
JONES, Margaret H.	Southern Campus (UCLA Yearbook) Honor, 1964, for service to the University, Community and the Nation, and especially for outstanding teaching.
LINDSLEY, Donald B.	President-Elect, American Electroencephalographic Society.
MOMMAERTS, Wilfried F.H.M.	Honorary membership in Alpha Omega Alpha Honor Medical Society.
PEARSON, Carl M.	Eastman Memorial Lecture, University of Rochester, School of Medicine.

COMMITTEE SERVICE

Institute members serve on a multitude of local, national, and international committees with assignments, not only in science, but in social development and in the humanities as well. They accept countless advisory commitments in the interest of local and national education, defense, international affairs, and health programs.

Consultants or Advisors to State, Federal or International Agencies

International Brain Research Organization
- Council (Brazier, Magoun, Sawyer)

International Council of Scientific Unions
- Committee on Space Research - Mammalian Physiology Panel (Adey)

Joint U.S.-Japan Committee on Scientific Cooperation
- Medical Sciences Panel (Magoun)

National Aeronautics and Space Administration
- Biosatellite Division - Office of Space Sciences - Consultant (Adey)
- Bioscience Program - Office of Space Sciences - Consultant (Lindsley)
- Bioscience Subcommittee of Space Sciences Steering Committee - Consultant (French)
- EEG Committee - Consultant (Rhodes)

National Science Foundation
- Advisory Panel for University Computing Facilities (Brazier)
- Biology and Medicine Advisory Committee Division (Bullock)
- Biological and Medical Sciences Division - Psycho-biology (Lindsley)
- Mathematical, Physical and Engineering Scientists Division - Consultant (Brazier)
- Metabolism Study Section (Roberts)

North Atlantic Treaty Organization
- Avionics Panel of Advisory Group for Aeronautical Research and Development (Brazier)

Pan-American World Health Organization
- Advisory Committee on Research (Magoun)

President's Scientific Advisory Committee
- Panel on Cybernetics (Adey)

State of California
- Department of Mental Hygiene - Consultant (Brown)
- Department of Mental Hygiene Research Team (Lesse)
- Department of Public Health - Consultant in Cerebral Palsy (Jones)

Consultants or Advisors to State, Federal or International Agencies

Universities Council on Space Sciences - Technical Committee (French)
University of California Academic Senate Service
University Wide
Council of the Academic Senate (Rasmussen)
Educational Policy Committee - Chairman (Rasmussen)
Southern Section
Cancer Research Coordinating Committee (Brown)
UCLA
Educational Policy Committee, Chairman (Rasmussen)
Promotion Committees (Brown)

United States Air Force
Office of Scientific Research Advisory Committee on Biology (Bullock)
Scientific Advisory Board - Consultant (Adey)

United States Army Medical Service
Consultant (Mommaerts)

United States Naval Hospital, Long Beach, California
Neurosurgery - Consultant (Stern)

United States Naval Hospital, San Diego, California
Neurology - Consultant (Walter, R.D.)
Neuropsychiatric Research - Consultant (Docter, Walter, R.D.)

Veterans Administration, Brentwood Hospital
Consultant in Neuropathology (Pease)

Veterans Administration, Long Beach Hospital
Consultant (Buchwald, N., Hilliard, Kruger)
Consultant in Neurosurgery (French)
Medical Advisory Panel - Deans Subcommittee (French)

Veterans Administration, Sawtelle Hospital
Consultant (Brown, Green)
Consultant to Neurobiochemistry Laboratory (Eiduson)
Consultant in Neurochemistry (Wolfgram)
Consultant in Neurology (Rose)

Veterans Administration, Sepulveda Hospital
Consultant (Clemente)
Consultant, Psychopharmacology Laboratory (Winters)

Veterans Administration, Washington D.C.
Advisory Committee Psychiatry and Neurology (Rose)

World Commission on Cerebral Palsy (Jones)

Consultants or Advisors to National Institutes of Health

MIT Center Development for Computer Technology in the Biomedical Sciences - LINC Evaluation Board - Consultant (Brazier)

National Pathology Training Grant Committee (Brown)

Division of Research Facilities and Resources - Advisory Council (Adey)

Division of Research Grants
- Neuroanatomy Steering Committee - Neurology Study Section (Sawyer)
- Neurology Study Section (Brazier)
- Pathology Study Section (Madden)
- Physiology Study Section (Green)
- Visiting Scientists Program - Director, West Coast Branch of Neuroanatomy (Sawyer)
- Visual Sciences Study Section (Allen)

National Institute of Mental Health
- Consultant on Grants (Lindsley)
- Research Career Awards Committee (Worden)
- Subcommittee of the Biological Sciences - Consultant (French)

National Institute of Neurological Diseases and Blindness
- Consultant (Brazier)
- Council (Magoun)
- Study Committee Chairman - Evaluation of Therapy in Multiple Sclerosis (Rose)

Consultants or Advisors to National Academy of Sciences - National Research Council

Atomic Bomb Casualty Commission (Madden)
Circulation Committee (Mommaerts)
Medical Sciences Committee for Postdoctoral Fellowships (Porter, R.W.)
Neuropathology Subcommittee of Biological Effects of Atomic Radiation (Clemente)
Science and Public Policy Committee (Lindsley)
Undersea Warfare Committee (Lindsley)
Use of Electronic Computers in Life Sciences Committee (Brazier)

Consultants or Advisors to Health Science Organizations

American Academy for Cerebral Palsy (Jones)
American Academy of Microbiology - Board of Governors (Rasmussen)
American Association of Anatomists - Nominating Committee (Sawyer)
American Board of Microbiology - Training Grant Committee (Rasmussen)
American Board of Psychiatry and Neurology - Director (Rose)
American Epilepsy Society - Trustee, Lennox Fund (Markham)

Consultants or Advisors to Health Science Organizations

American Heart Association - Executive Committee - Council Basic Science (Brady)
American Medical Association - Council on Drugs - Consultant (Ditman)
American Physiological Society - Chairman, Education Committee - Membership Committee (Tschirgi)
American Rheumatism Association - Fellowship Committee (Pearson)
American Society of Biological Chemists - Travel Awards Committee (Mommaerts)
American Society for Cell Biology - Council (Mommaerts)
Association for the Advancement of Biomedical Sciences - Executive Council (Magoun)
Association of American Medical Colleges - Committee on Medical Communications (Bridgman)
Association of Medical Illustrators - Board of Governors (Bridgman)
Barrow Neurological Institute - Consultant (French)
Biological Sciences Curriculum Study - Steering Committee (Magoun)
Communication Research Institute - Consultant (Brazier)
Hope for Hearing Research Foundation - Scientific Board (Magoun)
Los Angeles County Department of Nursing - Consultant (Slusher)
Los Angeles County Heart Association - Basic Study Section (Mommaerts, Roberts, Sonnenschein)
Los Angeles County Medical Association - Committee for Improvement of Medical Practice (Rand)
Menninger Foundation - Research Advisory Committee (Magoun)
Muscular Dystrophy Association of America - Medical Advisory Committee (Pearson)
National Association for Retarded Children - Scientific Research Advisory Board (Lindsley)
National Board of Medical Examiners (Sawyer)
National Multiple Sclerosis Society - Chairman, Research Planning and Evaluation Committee (Rose)
National Rehabilitation Association - Board of Directors (Jones)
Oklahoma Medical Research Institute - National Scientific Advisory Committee (Magoun)
Orange State College - Science Advisory Board (Magoun)
Research Society for Parkinson's Disease and Movement Disorders - Board of Directors (Markham)
Southern California Industry - Education Council - Project Guidance and Planning Committee (Magoun)
Spinal Cord Research Foundation - Scientific Advisory Board (Porter, R.W.)
United Cerebral Palsy Association - Chairman, Clinical Advisory Committee (Jones)
United Cerebral Palsy Association - Research Advisory Committee (Brazier)
University of Kansas Medical Communications - Consultant (Bridgman)
Weizmann Institute, Israel - Medical Electronics and Biocomputing (Estrin)

Consultants or Advisors to Scientific Publications

American Journal of Medicine
Associate Editor (Pearson)

American Journal of Physiology
Editorial Board (Hemingway)
Referee (Roberts)
Referee Editor (Sawyer)

Annual Review of Physiology
Associate Editor (Sonnenschein)
Editor (Hall)

Archives of Biochemistry and Biophysics
Referee (Roberts)

Archives of Pathology
Editorial Board (Madden)

Bulletin of the International Brain Research Organization
Editorial Board (Brazier)

Circulation
Editorial Board (Mommaerts)

Comparative Biochemistry and Physiology
Editorial Board (Bullock)

Electroencephalography and Clinical Neurophysiology Journal
Editorial Board (Brazier)

Elsevier Press, Progress in Brain Research
Advisory Panel (French)

Endocrinology
Referee Editor (Sawyer)

Experimental Neurology
Associate Editor (Clemente)
Referee Editor (Sawyer)

Journal of Applied Physiology
Editorial Board (Hemingway)

Journal of Bacteriology
Editorial Board (Rasmussen)

Journal of Comparative and Physiological Psychology
Consulting Editor (Lindsley)

Consultants or Advisors to Scientific Publications

Journal of Nervous and Mental Diseases
Editorial Board (Brazier)

Journal of Neurochemistry
Referee (Roberts)

Journal of Neurophsyiology
Editor (Green)
Editorial Board (Bullock)

Journal of Pharmacology
Editorial Board (Jenden)

Journal of the History of Behavioral Sciences
Editorial Board (Brazier)

Journal of Ultrastructure Research
Associate Editor (Pease)

Mind
Board of Consulting Editors (Ditman)

Physiological Reviews
Editorial Board (Bullock)

Proceedings of the Society for Experimental Biology and Medicine
Editorial Board (Hemingway)

Rheumatism Reviews
Associate Editor (Pearson)

Science
Editorial Consultant (Lindsley)
Referee (Brazier)
Referee Editor (Sawyer)

Stain Technology
Abstracting Editor (Clemente)

Toxicon
Editorial Advisory Board (Taylor)

UCLA Forum in Medical Sciences
Editor (Hall)

University of California Publications, Medical and Health Sciences
Advisory Panel (French)

F A C I L I T I E S

Few research projects or programs can operate effectively as independent units. Certain basic facilities, such as housing, the availability of simple maintenance service, and minimal logistic support, are essential to the initiation of even simple experimental environments. In large organizations such as the Brain Research Institute, research support facilities necessarily are varied and extensive if the full productivity of a highly-competent professional staff is to be realized. It is a prime advantage of large organizations over small ones that important technical assistance can be provided economically to able investigators in expanding the scope of their explorations and in freeing them from undertaking personally routine, nonproductive detail.

Problems in developing research support facilities are complex and continuing, yet much progress toward their solution was made during the past year. The committee appointed to examine the magnitude of need for each resource made definitive appraisals in the eight facility requirements reviewed below. The substance of these reviews formed a report submitted to the National Institutes of Health, and extensive negotiations with representatives of the National Institutes of Health were established in order to explore solutions to these general research support needs. As a result, a proposal requesting approximately two and a half million dollars for a period of three years was submitted and is currently under consideration by the National Institutes of Health.

Research Resources Committee

ADEY, W. Ross
BRAZIER, Mary A. B.
BROWN, W. Jann
BUCHWALD, Nathaniel A.
CLEMENTE, Carmine D.
FRENCH, John D., Chairman
GREEN, John D.
KADO, Raymond T.
LINDSTROM, Allan J.
MAGOUN, H. W., Advisor
RICH, Sigmund T.
ROBERTS, Sidney
SLUSHER, Margaret A.

ADMINISTRATION

In addition to the director, during the past fiscal year, the administrative staff consisted of eight full time positions. Of these, two, an administrative assistant and a principal clerk, are supported by salaries from the University of California, Los Angeles. The remaining six are supported by block grants (NINDB, NIMH, NASA, AFOSR, ONR), to which they recognize a prime responsibility. Insofar as possible, an attempt is made to coordinate these programs with related Brain Research Institute activities.

Administrative Staff

BELTMAN, Myrna M.	Principal Clerk
COURET, Jocelyn M.	Principal Clerk
FITZGERALD, Naureen J.	Senior Typist Clerk
FRENCH, John D.	Director
FRUMKES, Carol A.	Senior Typist Clerk
HRABOSKY, Elizabeth A.	Secretary-Stenographer
KELLY, Arline C.	Senior Typist Clerk
KRECKLAU, Joan S.	Senior Typist Clerk
SHAFER, Shirley A.	Secretary
SPENCER, Judith G.	Senior Typist Clerk
VAN BOMMEL, Ruth D.	Administrative Assistant

One important responsibility recognized by the administrative staff is to coordinate visits to the Institute made every year by hundreds of interested persons, such as political and governmental officials, educators, professional representatives, distinguished scientists, and private citizens. Visitors during the period July 1, 1963 - June 30, 1964, included:

Visitor*	Institution	Location
ADAMS, Scott	National Library of Medicine	Bethesda, Maryland
ALBUQUERQUE, Edson X.	University of Illinois	Chicago
ASANUMA, Hiroshi	Osaka City University	Japan
BACIA, Tadeusz	Warsaw Medical Academy	Poland
BAILEY, Percival	Illinois State Psychiatric Institute	Chicago
BALDWIN, B. E.	Loma Linda University	California
BALDWIN, Marjorie	Loma Linda University	California

*Names of visitors mentioned in connection with attendance at Conferences or other Brain Research Institute programs are not repeated here.

Visitor	Institution	Location
BAUMGARTNER, Gunther	University of Pennsylvania	Philadelphia
BELL, Fred	University of London	England
BICKFORD, Reginald	Mayo Clinic	Rochester, Minnesota
BLOOM, Hugh	Business Week	New York
BOOTHE, B. E.	National Institute of Mental Mental Health	Bethesda, Maryland
BOSHES, Benjamin	Northwestern University	Chicago, Illinois
BRONFENBRENNER, Urie	Cornell University	Ithaca, New York
BROOKS, Vernon	Rockefeller Institute	New York
BROWN, R. B.	Air Force Office of Scientific Research	Washington, D.C.
BRYGOO, P. R.	Institut Pasteur	Paris, France
BURCHETT, Eleanore A.	Stanford Research Institute	Palo Alto, California
BUSER, Arlette R.	University of Paris	France
BUSER, Pierre	University of Paris	France
CAMARGO, R.	Instituto Politecnico National	Mexico
CARLSON, Laurent	University of Kentucky	Lexington
CARPENTER, M. B.	Columbia University	New York,
CASE, Everett	Alfred P. Sloan Foundation	New York
CHAMBERS, William R.	Rollman Psychiatric Institute	Cincinnati, Ohio
CHITMER, J.	Rome Air Det. Ctr., G. A. F. B.	New York
CLARK, Kemp	University of Texas Southwestern	Dallas

Visitor	Institution	Location
CLULVER, B. W.	Aerojet-General Corporation	Glendora, California
COLE, Kenneth S.	National Institutes of Health	Bethesda, Maryland
CONRAD, J. Miles	Biological Abstracts	Philadelphia, Pennsylvania
CRAIG, John	National Aeronautics and Space Administration	Washington, D.C.
CRAWFORD, W. Allen	Royal Air Force	Washington, D.C.
DALLOW, Thomas P.	National Aeronautics and Space Administration	Washington, D.C.
DAVIS, Ross	Callan Park Hospital	Sydney, Australia
DAVSON, Hugh	University College	London, England
DiMASCO, Albert	Boston Psychiatric Hospital	Massachusetts
DORDONI, Franco	University of Rome	Italy
DOREMUS, Andre	Rockefeller Foundation	New York
DORNHOFFER, Szilard	University of Pecs	Hungary
EAGLE, Edward	Research Labs, Surft & Co.	Evanston, Illinois
ECCLES, John C., Sir	National University of Australia	Canberra
EDWARDS, Charles	University of Minnesota	Minneapolis
EHRLICH, Walter	Institute of Hygiene	Prague, Czechoslovakia
ELKES, Joel	Johns Hopkins University	Baltimore, Maryland
ELLINGSON, H. V., Col.	School of Aerospace Medicine Brooks A.F.B.	San Antonio, Texas
ELMADJIAN, Fred	National Institute of Mental Health	Bethesda, Maryland

Visitor	Institution	Location
ETOH, Seiichi	Towada Mental Hospital	Aomori-Ken, Japan
EVANS, Bryant	San Diego Union	California
EVANS, Joseph	University of Chicago	Illinois
EYZAGUIRRE, Carlos	University of Utah	Salt Lake City
FARLEY, B. G.	Massachusetts Institute of Technology	Cambridge
FARRIER, R. M.	Clinical Center, NIH	Bethesda, Maryland
FELDMAN, Sanford E.	University of California	Berkeley
FERMI, Giulio	Max Planck Institute	Tubingen, Germany
FIELDS, W. L.	Baylor University College of Medicine	Houston, Texas
FISCHER, Roland	Ohio State University	Columbus
FISHER, Ronald R.	University of Toronto	Canada
FISHMAN, Ronald	National Institutes of Health	Bethesda, Maryland
FRAISSE, Paul	University of Paris	France
GASTAUT, Henri	Universite d'Aix	Marseille, France
GAULDEN, E. C.	California Rehabilitation Center	Corona
GERARD, R. W.	University of Michigan	Ann Arbor
GERSHON, Samuel	Psychiatric Institute	St. Louis, Missouri
GERSTEIN, George L.	Massachsetts Institute of Technology	Cambridge
GOLDBERG, Frank	St. Mary's Hospital Medical School, London University	England
GOLDBY, Frank	St. Mary's Hospital Medical School, London University	England

Visitor	Institution	Location
GOTTSCHE, H.	Deutsches Rechenzentrum	Darnstadt, Germany
GOTZ, W.	Max Planck Institute	Tubingen, Germany
GREEN, P.	University of Chicago	Illinois
GRIFFITH, Wendell H.	Federation of American Societies for Experimental Biology	Washington, D.C.
GUERRI, L.	Ispra, Euratom	Varese, Italy
HALL, Robert	Santa Clara County Hospital	Santa Clara, California
HAMPSON, John L.	University of Washington	Seattle
HARTMANN, J. F.	University of Minnesota	St. Paul
HENRY, James	University of Southern California	Los Angeles
HERMANS, Robert	Nuremberg University	Germany
HERRLINGER, Dr. & Mrs.	University of Kiel	Germany
HICKAM, John B.	Indiana University	Indianapolis
HODGE, Harold C.	University of Rochester	New York
HUNT, Edward L.	Naval Radiological Defense Laboratory	San Francisco, California
IKEDA, Kazuo	Juntendo University	Tokyo, Japan
ISHIKAWA, K.	Loma Linda University	Pasadena, California
IWAYAE, Nobuhiko	Mukogawa Hospital	Nishinomiya, Hyogo-Ken, Japan
JAIN, K. K.	University of Ottawa	Canada
JOHANSSON, Karl	National Institutes of Health	Bethesda, Maryland
JOHNSON, Louis F., Jr.	EOAR, U.S.A.F.	Brussels, Belgium

Visitor	Institution	Location
JOHNSON, Walter L.	Washington University School of Medicine	University City, Missouri
JOUVET, Michel	School of Medicine	Lyons, France
KATO, M.	Hokkaido University	Japan
KATONA, F.	Mt. Sinai Hospital	New York
KAWAKAMI, M.	University of Yokohama	Japan
KAWAMURA, Yojiro	Dental School	Osaka, Japan
KAWASHIMA, Fukuko	Moriyamaso Mental Hospital	Nagoya City, Japan
KERLES, E. O.	National Institute of Neurological Diseases and Blindness	Bethesda, Maryland
KERR, Frederick	Mayo Clinic	Rochester, Minnesota
KESIC, Brinco	University of Zagreb	Yugoslavia
KETCHUM, James S.	Edgewood Arsenal	Maryland
KINILDORF, Donald J.	Naval Radiological Defense Laboratory	San Francisco, California
KLERMAN, Gerald L.	Boston Psychiatric Hospital	Massachusetts
KOBAYASHI, Sadao	Kobayashi Mental Hospital	Tokyo, Japan
KOELLA, Werner P.	Worcester Foundation	Shrewsbury, Massachusetts
KOGA, Einosuke	Toho University	Tokyo, Japan
KURITA, Masafumi	Kurita Mental Hospital	Kanagawa, Japan
KURTIZ, Andrew	University of Toronto	Canada
KUWABARA, M.	Kyushu University	Fukuoka, Japan
LAJTHA, Abel	New York State Psychiatric Institute	New York

Visitor	Institution	Location
LAMBERT, E. H.	Mayo Foundation	Rochester, Minnesota
LANG, D.	Rockefeller Institute	New York
LASKE, E.	School of Aerospace Medicine	San Antonio, Texas
LAUFER, Miguel	Instituto Venezolano de Investigaciones Cientificas	Caracas, Venezuela
LENIHAM, J. M.	Regional Physicist of all hospitals	Scotland
LENNOX, Margaret	University of Copenhagen	Denmark
LETTVIN, J. Y.	Massachusetts Institute of Technology	Cambridge
LOTT, James R.	North Texas State University	Denton
LOURIE, Herbert	State University of New York	Syracuse
LOWRY, Oliver H.	Washington University School of Medicine	St. Louis, Missouri
LYNCH, Larry	Wall Street Journal	Los Angeles, California
MACKAY, D.	University of Keele	England
MALIS, Leonard I.	Mt. Sinai Hospital	New York
MASSELMEIER, H.	International Business Machines Corporation	Stuttgart, Germany
MASUIZUMI, Tatsuji	Japan Mental Hospital Association	Tokyo, Japan
MATSUBARA, Taroh	Matsubara Mental & Nervous Hospital	Kanazawa, Japan
McCRUM, W. R.	Henry Ford Hospital	Detroit, Michigan
MEADER, Olive Root	National Institutes of Health	Bethesda, Maryland

Visitor	Institution	Location
MEEHAN, John P.	University of Southern California	Los Angeles
MELUP, Zula	Excerpta Medica Foundation	Amsterdam, Netherlands
MERILAN, C. P.	University of Missouri	Columbia
MICHALSKI, Joseph	National Institutes of Health	Bethesda, Maryland
MIEDEL, G.	Deutsches Rechenzentrum	Germany
MIMOTO, Yoshiomi	Dohjinkai Mental Hospital	Fukuoka, Japan
MONNIER, A. M.	University of Paris	France
MONNIER, Andree	University of Paris	France
MONNIER, Marcel	Physiological Institute of Basel	Switzerland
MULLEN, J.	University of Chicago	Illinois
NARA, Toshio	Keio University	Tokyo, Japan
NARKIEWICZ, Olgierd	School of Medicine	Gdansk, Poland
NAUTA, Walle J. H.	Walter Reed Hospital	Washington, D.C.
NAYLOR, Winifred G.	Baker Medical Research Institute	Victoria Australia
NEFF, W. D.	Indiana University	Bloomington
NEES, Paul O.	Wisconsin Alumni Research Foundation	Madison
NULSEN, Frank	University Hospitals, Western Reserve University	Cleveland, Ohio
OBRADOR, Sixto	University of Madrid	Spain
OHASHI, Seiroh	Senbon Mental Hospital	Shizuoka-ken, Japan
OKAMOTO, M.	Kyoto University	Japan
ORNE, M.	Harvard Medical School	Boston, Massachusetts

Visitor	Institution	Location
PAES DE CAVALHO, Antonio	Chagas Institute	Rio de Janeiro, Brazil
PENDLETON, R. B.	San Jose State College	California
PETERSON, Leon	University of Ottawa	Canada
PICCINELLI, D.	University of Rome	Italy
PLUM, Fred	New York Hospital	New York
POLLOCK, Herbert	George Washington University	Washington, D.C.
POPE, Alfred	Harvard Medical School	Brookline, Massachusetts
PORIN, G.	Ispra, Euratom	Italy
POTTS, A. M.	University of Chicago	Illinois
PRINZMETAL, Dr. & Mrs.		Beverly Hills, California
PROCTOR, Lorne D.	Henry Ford Hospital	Detroit, Michigan
PRONOVE, Pacita	National Institutes of Health	Bethesda, Maryland
RADIN, Norman S.	Mental Health Research Institute, University of Michigan	Ann Arbor
RAHN, Herman	University of Buffalo	New York
RAYPORT, Mark	A. Einstein College Medical School	New York
REICHARDT, W.	Max Planck Institute	Tubingen, Germany
RICHTER, Anders	University of Chicago Press	Illinois
ROBB, Preston	Montreal Neurological Institute	Canada
RODNIGHT, Richard	The Maudsley Hospital	London, England
ROMAN, J. M.	National Aeronautics and Space Administration	Edwards A.F.B., California

Visitor	Institution	Location
ROSENBERG, Arthur	Theatre Arts Department, University of California	Berkeley
ROSNER, B. S.	Yale University	New Haven, Connecticut
ROUNTHWAITE, C. S.	Addiction Research Foundation	Toronto, Canada
SAHS, A. L.	University Hospital	Iowa City, Iowa
SAKAMOTO, Toshifusa	University of Tokyo	Japan
SANCHEZ, V.	Catholic University	Santiago, Chile
SANTIBANEZ-H, Guy	Institute of Physiology, University of Chile	Santiago
SALTZBURG, Bernard	Bissett, Berman Corporation	Santa Monica, California
SAPIER, Philip	National Institute of Mental Health	Bethesda, Maryland
SAUNDERS, Joseph F.	National Aeronautics and Space Administration	Washington, D.C.
SCHANKULA, S. J.	Addiction Research Foundation	Toronto, Canada
SCHNEIDER, D.	Max Planck Institute	Tubingen, Germany
SCHUMACHER, George A.	University of Vermont College of Medicine	Burlington
SHAGASS, Charles	State University of Iowa	Iowa City
SHIMAZOMO, Yasuo	Kanazawa University	Japan
SILVERSIDES, J. L.	Addiction Research Foundation	Toronto, Canada
SMITH, Frank P.	University of Rochester	New York
SNIDER, Ray S.	University of Rochester	New York
STARK, Lawrence	Massachusetts Institute of Technology	Cambridge

Visitor	Institution	Location
STOLLAR, B. D.	Air Force Office of Scientific Research	Washington, D.C.
STUMPF, Walter E.	University of Chicago	Illinois
STUNKARD, Albert	University of Pennsylvania	Philadelphia
SUHARA, Kenkichi	University of Education	Tokyo, Japan
SVAETICHIN, Gunnar	Instituto Venezolano de Investigaciones Cientificas	Caracas, Venezuela
SWANK, Roy L.	University of Oregon Medical School	Portland
TAKAHASHI, I.	Institute of Psychiatric Research	St. Louis, Missouri
TANABE, Saburoh	Koganei Mental Hospital	Tokyo, Japan
TASKER, Ronald	University of Toronto	Canada
TERRY, R. D.	Einstein College of Medicine	White Plains, New York
TEUBER, H. L.	Massachusetts Institute of Technology	Cambridge
TOBIAS, Paul	Aerospace Corporation	El Segundo, California
TROTTER, William D.	University of Otago	Dunedin, New Zealand
TRUEX, Ray C.	Temple University	Philadelphia, Pennsylvania
TYM, Robert	Manchester Royal Infirmary	England
VERNON, Leo P.	Kettering Research Laboratory	Yellow Springs, Ohio
VOORHOEVE, Paul	University of Leiden	England
VOWLES, D.	Oxford University	England
WADA, Toyoio	Hirosaki University	Japan

Visitor	Institution	Location
WALL, P.D.	Massachusetts Institute of Technology	Cambridge
WARD, Arthur	University of Washington	Seattle
WARD, James W.	Vanderbilt Medical School	Nashville, Tennessee
WARNER, F.J.	Eastern Pennsylvania Psychiatric Institute	Philadelphia, Pennsylvania
WAGGONER, J.W.	Garrett AiResearch Corp.	Los Angeles, California
WEBB, I. Ryan	University of Missouri School of Medicine	Columbia
WEIL, Joseph	University of Florida	Gainesville
WEITZMAN, Elliot D.	Albert Einstein College of Medicine	New York
WHITLOCK, David G.	State University - Upstate Medical Center	Syracuse, New York
WOLLEMANN, Maria	Hungarian Academy of Sciences	Budapest
WOOLSEY, Clinton N.	University of Wisconsin	Madison
YASUNOSUKE, Kawashima	Moriyamaso Mental Hospital	Nagoya City, Japan
ZIMMER, Herbert	Bioelectric Comp. Lab., University of Georgia	Athens

EDITORIAL PROGRAM

For several years the Institute has supported an editorial staff of editors and secretaries to assist members in the preparation of manuscripts and to prepare the proceedings of conference programs for publication. This staff was supported by grants-in-aid and proved to be most effective in providing assistance to investigators. While this responsibility continues to be a prime occupation of the unit, a change in the orientation of the unit was accomplished in 1963 in order to make it useful to a wider segment of the scientific environment of the Center for the Health Sciences.

Dean of the Medical School, Dr. Sherman Mellinkoff, provided a fund for publication costs for completed manuscripts, and the Institute agreed to transfer supervision to a committee entitled "UCLA Forum in the Medical Sciences," appointed by Dean Mellinkoff, under the chairmanship of Institute member and Professor of Physiology, Victor E. Hall.

The publication prepared by the unit which appeared during the year under review was entitled: Brain Function. Cortical Excitability and Steady Potentials; Relations of Basic Research to Space Biology. Ed. M. A. B. Brazier, 1963, University of California Press.

Editorial Staff

BASCOPE, Martha	Editor III
DYER, Joan	Secretary
GODWIN, Beverly	Editor II
HALLENBECK, Hope	Editor I

DATA PROCESSING FACILITY

The Data Processing Laboratory represents a major undertaking which has continued to mature during the past year. A generous proportion of need recognized by the Research Support Proposal prepared during the past year has been directed toward expansion of this facility.

VISUAL AIDS - DRAFTING AND PHOTOGRAPHY

Members of the Institute published nearly 400 scientific articles and presented many lectures last year. All of the lectures and publications required illustrations.

Commitments of the Center for Health Sciences visual aids division have been so extensive that supplementary assistance has been necessary in meeting the need of Brain Research Institute investigators. For this reason, a small division of visual aids composed of a photographer and a medical illustrator was established with funds available on base grant B-611. Considerable expansion of this unit will be required in the near future.

Personnel

ARLEN, Suzanne A.	Medical Illustrator
SABBOTT Rudolph W.	Senior Photographer

ELECTRONIC MAINTENANCE, DEVELOPMENT AND STANDARDS LABORATORY

The equipment of fully half of the research laboratories within the Brain Research Insitute is predominantly or exclusively electronic in nature, and electronic requirements of the remaining laboratories are considerable. For this reason, the Institute recognizes a major effort

in the maintenance of costly equipment. A few of the laboratories have been able to make provision for maintenance of electronic equipment in their own programs. Needs of others have, in general, received sympathetic consideration and, where possible, help from existing University or medical center facilities. Additional assistance to members for whom such service is inadequate has been provided on an informal basis from other units. Two departments (Anatomy and Physiology) have established electronic units in the Brain Research Institute for the convenience of the members of those departments who are also members of the Brain Research Institute. Additionally, large independent units of the Brain Research Institute, such as the Space Biology Laboratory, whenever feasible, have made their own maintenance facilities available to members. A considerable expansion of the electronic capabilities of the Institute will be required, however, in order to serve all members adequately.

Personnel

FISHER, Byron E.	Principal Electronics Technician
VALDEZ, Anthony F.	Senior Electronics Technician

MECHANICAL LABORATORY

A laboratory equipped to develop or repair mechanical objects or equipment exists only in the Space Biology Laboratory, and this unit has heavy Space Biology Laboratory commitments. Expansion of this facility is necessary in solving mechanical development or repair needs of the more than 100 laboratories in the Institute.

Personnel

BELLOWS, Ernest	Consultant
LUTHER, William N.	Senior Laboratory Mechanician
TILLSON, Harry A.	Senior Laboratory Mechanician

HISTOLOGY LABORATORY

At present, two departments (Anatomy and Pathology) have established laboratories within the Brain Research Institute in order to provide tissue processing facilities for members of their departments who are also members of the Institute. These two laboratories have undertaken to attempt the processing of requests from members of the Institute, but additional facilities are required to meet rapidly-expanding demands.

Personnel

KOITHAN, Arlene L.	Laboratory Technician II
RUCKER, Cora L.	Laboratory Technician II
BEDARD, Beverly	Laboratory Technician I

CHEMISTRY LABORATORY

Over the past several years, many investigators of the Brain Research Institute have requested that various chemical analyses be made of tissues and biological fluids obtained from their experimental animals. These have included analyses of a more specialized type, i.e., steroids and catechol amines, as well as those more routine in nature, such as blood sugar, sodium, potassium, etc. Of necessity, these analyses have been made by commercial laboratories or by the principal investigator, Dr. Margaret A. Slusher, of the only laboratory in the Brain Research Institute equipped to handle such requests. The Institute recognizes the need to develop a laboratory designed and equipped for the sole purpose of analyzing various chemical constituents in physiological sample media as requested by member scientists.

VIVARIUM

Most laboratories within the Institute employ animal subjects of one form or another in their investigation. For this reason, an adequate supply of healthy animals and adequate maintenance of test animals is of the utmost importance to all investigators.

Existing capacities for supplying and maintaining animals are adequate for small animals, such as mice, rats and rabbits, and for a limited number of large animals, but considerable expansion is necessary in order to care for a sufficient supply of cats and monkeys, the two principal subjects employed in the Institute research. Also, facilities are not large enough to provide for the maintenance of enough aquatic invertebrates and coldblooded vertebrate animals to meet existing requirements. Moreover, since programs within the Institute are now utilizing chimpanzees, the inadequate size of the present vivarium is all the more emphasized.

The director of the vivarium, Dr. Sigmund T. Rich, has maintained high standards of care but is aware of the limitations in size of this facility. He has, therefore, agreed to serve on the Vivarium Committee for the Brain Research Institute which has developed realistic plans for meeting the severe animal shortage and has incorporated such plans in the General Research Support Facility proposal.

Brain Research Institute Vivarium Committee

BUCHWALD, Nathaniel A.
GREEN, John D., Chairman
RICH, Sigmund T.

OPERATIONAL SUPPORT

In the past, of necessity, support has been derived largely from government sources. Reliance will continue to rest predominantly upon governmental funding in the future, although necessary restrictions on expenditures of such funds limit vital Institute activities in critical areas. For this reason, members are keenly aware of the need for attracting considerably greater support from private individuals, institutions, foundations, and associations. One such fund, the Leslie Fund, has continued to provide vital assistance during the past year.

The magnitude of support required to finance the projects and programs active in the Brain Research Institute is illustrated in Table I. Here it can be seen that for fiscal year 1963-1964, 126 grants provided the yearly operating sum of about $4,800,000 to BRI members and programs. 106 of these grants, project grants in general, were in amounts under fifty thousand dollars a year, while 11 were over fifty thousand a year, and 9 were in excess of one hundred thousand annually. (Table III, Fig. 1)

With respect to sources, 2.73 million (57%) of the total budget came from the National Institutes of Health, while 2.09 million (43%) came from other agencies (Table II). Of the total awards, 36% came from the federal government (Armed Forces, Atomic Energy Commission, National Science Foundation , National Aeronautics and Space Administration, North Atlantic Treaty Organization, Veterans Administration). The State (California Department of Public Health and California Department of Mental Hygiene) gave 3.0% of the operating support and 4.0% came from private donors, foundations, or agencies (Table III, Fig. 2). It must be noted, however, that academic and departmental salaries as well as utility maintenance provided by the University of California are not included in these figures. Graphically displayed (Fig. 3), it is evident that of the total 4.8 million dollars, 2.8 million dollars could be considered as supporting individual projects of members of the Institute, whereas 2.0 million dollars were supplied in the form of block grants, mostly in amounts in excess of fifty thousand dollars each.

Of the total operating support, 84% was awarded for research, 9% for training and 7% for fellowships and facilities.(Table II)

TABLE I

BRAIN RESEARCH INSTITUTE FUNDING

Grants to BRI Members		$4,821,716
National Institutes of Health		
A - Arthritis & Met. Dis.	- 4 Grants	110,677
B - NINDB	36	1,450,270
C - Cancer	2	60,121
H - Heart	7	160,637
M - NIMH	14	790,183
Other NIH	8	156,877
	71	2,728,765
Other Grants or Gifts	55	$2,092,951
TOTAL	126	$4,821,716

TABLE II

RESEARCH AND TRAINING BUDGET
of
BRAIN RESEARCH INSTITUTE ACTIVITIES

Total Budget			4.82 million
NIH		2.73 = 57%	
NINDB	1.45 = 53%		
NIMH	.80 = 30%		
Other NIH	.48 = 17%		
Others		2.09 = 43%	
Federal (7 sources)	1.73 = 83%		
State (3 sources)	.13 = 6%		
Private (13 sources)	.23 = 11%		
Budgetary Allocation			
Research		4.05 = 84%	
Training		.46 = 9%	
Fellowships & Facilities		.31 = 7%	

TABLE III

BRAIN RESEARCH INSTITUTE

NUMBER OF YEARLY AWARDS

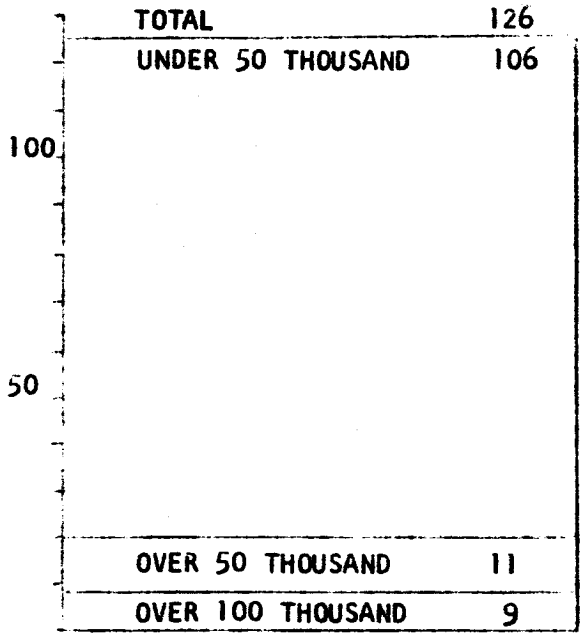


Fig. 1

SOURCE OF YEARLY OPERATING BUDGET
4.82 MILLION

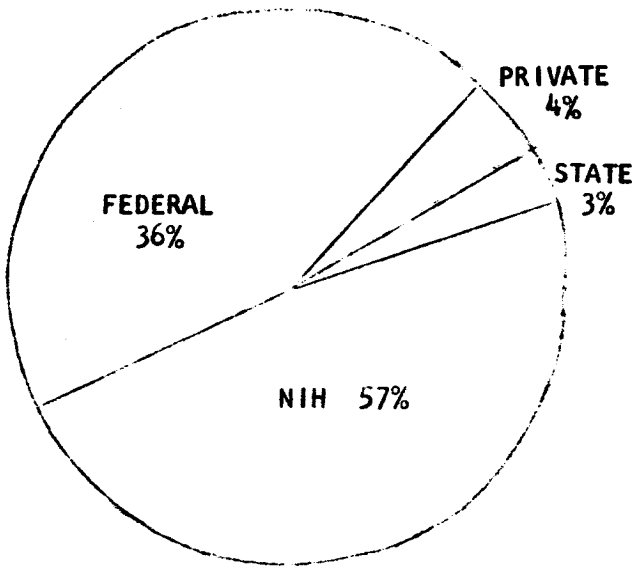


Fig. 2

YEARLY EXPENDITURES
(MILLIONS)

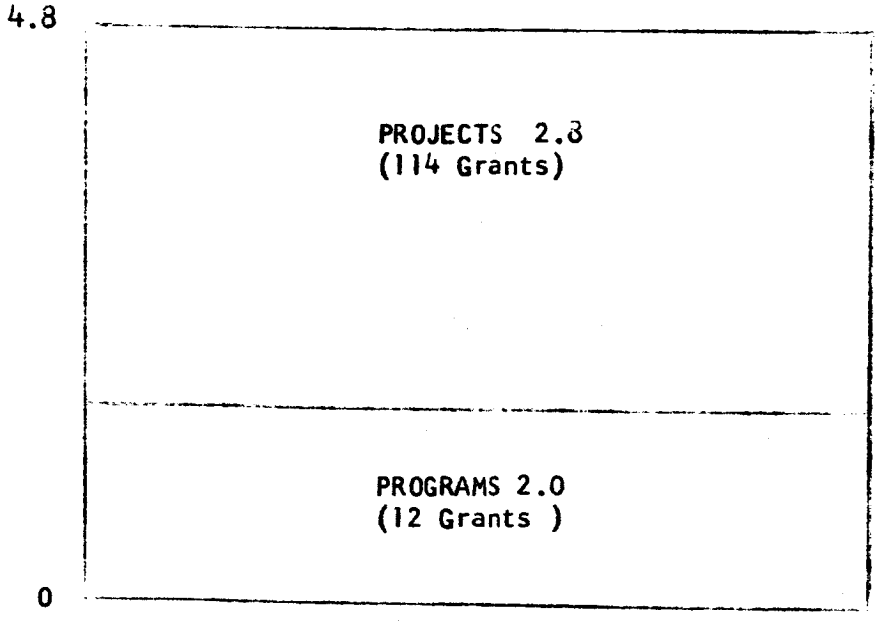


Fig. 3

APPENDIX I

SOURCES OF FINANCIAL SUPPORT

American Heart Association

60-F-007-EG The link between excitation and contraction. 6,160.
BRADY: Mommaerts

California Department of Mental Hygiene

62-2-23.1 Biochemistry of the developing brain. 22,681.
62-2-23.2 Biochemistry of the developing brain. 8,653.
EIDUSON: -

62-2-7.2 Electrophysiology and behavior. 12,216.
LESSE: -

62-2-31 Exploratory research projects. 1,000.
LESSE: -

61-2-C-2.3 Computer services fund for research. 1,000.

LESSE: -

63-2-T Research team 64,808.
LESSE: -

California Department of Public Health - Alcohol Rehabilitation Commission

Research on alcoholism. 8,000.
DOCTER: -

California Elks Major Project, Inc.

Eye movements study in cerebral palsied. 10,000.
JONES: -

California Institute of Cancer Research

Tracer compounds and a scanning device for brain tumors. 11,147.
CRANDALL: Cassen

Commonwealth Fund

Study of vestibular and basal ganglia inter-relations. 10,832.
MARKHAM: -

Ford Foundation

Neuroendocrinology of reproduction. 40,000.
SAWYER: Gorski, Hilliard

Life Insurance Medical Research Fund

61-33 Molecular aspects of cardiac and muscular contraction. 9,900.
MOMMAERTS: -

Markle, John and Mary R.

Foundation scholarship. 6,000.
MAXWELL: -

Muscular Dystrophy Association of America

Studies on heat production as a measure of the energy release in muscle. 15,000.
MOMMAERTS: -

Clinical, biochemical, and pathological studies of muscular diseases. 48,000.
PEARSON: -

National Aeronautics and Space Administration

NsG 515 Monitoring brain functions and performance in the monkey under prolonged weightlessness. 92,394.
ADEY: -

NsG 505 Study of brain function through advanced computer techniques for analysis of electroencephalographic data. 69,190.
ADEY: French

NAS 9-1970 Computer analysis of EEG data for a normative library. 100,577.
FRENCH: Adey

NsG 502 Neurophysiological and behavioral studies of chimpanzees, including establishment of a group of implanted animals suitable for space flight. 150,000.
FRENCH: Adey

NsG 528 Effects of space environment on circadian rhythms of plants, for the purpose of defining and verifying an experiment suitable for use in a biosatellite. 23,277.
FRENCH: Hoshizaki

NsG 623 Neurophysiological studies of perception. 65,054.
LINDSLEY: -

National Association of Mental Health

The effect of early hemidecortication on spatial orientation. 16,000.
WENZEL: Tschirgi

National Multiple Sclerosis Society

302-2 Fractionation and analysis of myelin proteins of white matter and spinal roots. 26,035.
ROSE: Wolfgram

National Science Foundation

G 18973 Studies of the antagonism between potassium and adrenergic blocking agents in vascular smoothness. BEVAN: -	11,500.
GB-2515 Connection between excitation and response in contractile tissues. BRADY: -	17,820.
G-19394 Studies in comparative neurology. BULLOCK: -	80,000.
GB-373 Collaborative program in marine biology. FRENCH: -	240,000.
GB-1484 Brain mechanisms controlling pituitary-thyroid function. GEORGE: Lomax	15,200.
BF-289 Computer analysis of brain activity in perception and performance. LINDSLEY: -	40,800.
G-18487 Protein mobilization. ROBERTS	32,567.
G-923 Physiology of reptilian circulation. SONNENSCHEIN: -	4,200.
G-21521 Effect of altered blood chemistry on central nervous system function. WENZEL: Tschirgi	36,132.
GB-1115 Effects of brain lesions on discrimination learning in the pigeon. WENZEL: Tschirgi	9,000.

North Atlantic Treaty Organization

Science Fellowship. ENGER: -	8,000.
Fellowship. MC ILWAIN: -	6,000.

United Cerebral Palsy

Research and demonstration. JONES: -	8,000.

United States Air Force

AF-AFOSR 614 Nervous system and receptors in arachnids. BULLOCK: Rao	10,000.

AF-AFOSR 246-63 Continuing basic program in Space Biology Laboratory. 270,400.
FRENCH: Adey

AF-AFOSR 535 Microphysiological studies of nerve and muscle units. 32,000.
HAGIWARA: Bullock

AF-AFOSR 615 Electroreceptors. 28,000.
LISSMANN: Bullock

AF-AFOSR 146-63 Energetics of muscle activity in relation to the molecular physiology of the contraction process. 31,730.
MOMMAERTS: -

Chemical Hazards Division USAF 41 (609)-2329 Effects of unsymmetrical dimethylhydrazine on excitatory and inhibitory mechanisms in the CNS of the cat. 27,534.
FAIRCHILD: Sterman

United States Army Chemical Center

DA 49-193-MD-2495 Genetic relationships among human and animal strains of influenza virus. 19,022.
RASMUSSEN: -

DA-CML-18-064 Influence of stress on susceptibility to infectious aerosols. 27,780.
RASMUSSEN: -

DA 18-108-CNL-6613 (a) CPI-15190 The collection and study of plants containing disabling agents. 48,406.
TAYLOR: Mathias, Hultin, Dewhurst

United States Atomic Energy Commission

AT (11-1)-34 #60 Irradiation effects on brain wave correlates of conditioned behavior. 30,628.
ADEY: Schoenbrun

AT (11-1)-34 #68 Anatomical and electrophysiological studies of brain radiation in animals using high energy ionizing radiations. 23,045.
CLEMENTE: Kruger

United States Navy - Office of Naval Research

NONR 233-(69) Correlator studies in animal and man. 17,000.
BRAZIER: -

NONR 233-(51) Integration in groups of neurons. 16,000.
BULLOCK: -

NONR 4384-(00) Visual projection in the four-eyed fish Anabiens microlenis. 5,000.
KRUGER: Schwassman

NONR 233-(32) Brain organization and behavior. 25,217.
LINDSLEY: -

NONR 233-(33) Control of ACTH synthesis and secretion. 21,500.
ROBERTS: Magoun, Slusher

United States Public Health Service - National Institutes of Health

Division of Foreign Grants and Awards

FF-501 Fellowship on behalf of Cesar Romero-Sierra. 8,152.
BUCHWALD: -

Division of Radiological Health

RH-00068-03 Physiological basis of radiation conditioned behavior. 37,112.
GARCIA: Buchwald

Division of Research Facilities and Resources

General Research Support Grant--Maintenance of inter-departmental rat breeding colony. 6,000.
ROBERTS: -

National Cancer Institute

CA-2290 Purification of proteins and hormones. 27,000.
PIERCE: -

CA-04423-05 Yttrium hypophysectomy. 33,121.
RAND: Solomon, Brown, Westover

National Heart Institute

HE-06730-02 Action of drugs on intra-thoracic sensory endings. 8,740.
BEVAN: -

HE-08359-01 Morpho-pharmacology of vascular adrenergic transmission. 21,720.
BEVAN: Verity

H-6407 Central nervous system influences on the vasculature. 5,926.
MAXWELL: -

HE-03067-07 Chemical physiology and biophysics of cardiac and muscle contraction. 80,000.
MOMMAERTS: Brady

National Heart Institute, cont.

HE-07404-02 Functional role of the sulfhydryl groups of actin. 8,050.
MOMMAERTS: Katz

HE-05157-04 Nervous control of peripheral circulation. 20,565.
SONNENSCHEIN: -

National Institute of Arthritis and Metabolic Diseases

HD-00416-03 Nutrition in longevity after total body radiation. 38,508.
BROWN, W. J.: -

AM-06603 Developmental study of stress response. 25,000.
GELLER: Schapiro

AM-06106 Study of biosynthesis and physiology of ovarian steroids. 20,289.
HILLIARD: Sawyer

AM-06066 CNS control of pituitary-adrenal function. 26,880.
SLUSHER: Porter

National Institute of Child Health and Human Development

HD-01182-02 Studies on the ovarian-hypothalamic hypophyseal axis. 18,493.
GORSKI: -

HD-00902-04 Instrumental conditioning in the planarian. 10,435.
HALAS: -

HD-00972-01 Maturation of neurophil and behavior in the newborn. 20,000.
SCHEIBEL: -

National Institute of General Medical Sciences

5-K3-GM-3509-07 Neural correlates of behavior in unanesthetized animals. 15,325.
BUCHWALD, N.: -

GM-03869 Biosynthesis of anterior pituitary hormones. 41,360.
ROBERTS: -

National Institute of Mental Health

MH-03708-04 Brain impedance measurements with microvolt signals. 29,071.
ADEY: Kado

MH-07097-02 Behavioral and electrical studies of basal ganglia. 49,963.
BUCHWALD, N.: -

United States Public Health Service - National Institutes of Health, Cont.

National Institute of Mental Health, cont.

MH-07037-01 Thalamo-cortical correlates of learning. 16,066.
CLEMENTE: Lindsley

MH-08441-01 Psychophysiological studies of sustained alcohol intake. 15,000.
DOCTER: -

MH-05443 Biochemical correlates of imprinting. 25,020.
EIDUSON: Beckwith, Geller

MH-03968 Identification of phenothiazine metabolites. 18,337.
EIDUSON: Geller

5 TI MH-6415-07 Interdisciplinary program of research training in basic sciences related to mental health. 457,750.
FRENCH: -

MH-03756 Neuronal activity in the limbic system and emotion. 20,000.
FUSTER: -

MH-05163-03 The functional role of the rhinencephalon. 54,258.
GREEN: -

2 F3-MH-15, 191-02 The role of gamma efferent system in instrumental conditioning. 9,900.
HALAS: -

MH-05163-02 Auditory electrophysiology and behavior. 37,000.
MARSH: Worden

MH-08406-01 The effect of alcohol on the orienting reflex. 22,000.
MOSKOWITZ: Brill, Ditman

MH-05183 Learned mechanisms in arousal. 17,247.
SEGUNDO: -

MH-08839-01 Functional effects of nerve growth factor antiserum. 18,571.
WENZEL: -

National Institute of Neurological Diseases and Blindness

NB-01883-06 Temporal lobe functions in attention and learning. 64,323.
ADEY: -

United States Public Health Service - National Institutes of Health, Cont.

National Institute of Neurological Diseases and Blindness, cont.

NB-02866 The eye: growth and aging: changes in systemic disease. 40,486.
ALLEN: -

NB-04228-02 Ultrastructure of retinal bipolar cells. 23,253.
ALLEN: -

NB-04773 Computer aided research on the brain. 64,032.
BRAZIER: -

5-K6-NB Research Career Award
BRAZIER: -

NB-05520 Clinical application of EEG during anesthesia. 61,000.
BRECHNER: Riehl, Dillon

NB-00021 Studies in comparative neurology. 30,000.
BULLOCK: -

NB-03576 Early glaucoma--functional and structural. 27,500.
CHRISTENSEN: Allen

NB-01065 Effect of ionizing radiations on the nervous system. 23,161.
CLEMENTE: -

NB-04625 Developmental study of coordinated eye movements in the human infant. 30,457.
DAYTON: Jones

NB-01143-08 Integration of supraspinal and segmental activity. 40,172.
ELDRED: Buchwald, J.

NB-02501-03 Application of computing techniques to brain function. 127,613.
FRENCH: Adey

NB-02808-04 Special clinical research project (neurophysiology). 257,303.
FRENCH: Brill, Rose, Stern

NB-04183-02 Stimulus-evoked conflict and CNS resolution. 29,322.
FRENCH: Hyde

NB-00611-10 Neural correlates of mental activity and behavior. 83,471.
FRENCH: Magoun

United States Public Health Service - National Institutes of Health, Cont.

National Institute of Neurological Diseases and Blindness, cont.

NB-04499-02 The central nervous system in carbohydrate metabolism. 27,600.
GEORGE: Kokka

NB-02959-03 The activity of single neurons in rhinencephalic and related parts of the brain. 18,860.
GREEN: -

NB-04736 Intracellularly and extracellularly recorded neuronal activity. 21,134.
GREEN: -

NB-03604-03 Morphology of neurosecretory mechanisms and neuronal geometry. 12,498.
GREEN: Maxwell

NB-03536-03 Studies in microneurophysiology. 42,522.
HAGIWARA: Bullock

NB-03007-04 Mechanism of tremor induction and inhibition by drugs. 28,711.
JENDEN: Cho, George

NB-04967 Biochemistry and pharmacology of Ryania compounds. 29,973.
JENDEN: Fairhurst

NB-02684-05 Correlates of lamination in the cerebral cortex. 13,247.
KRUGER: -

NB-04578-02 Visual projection in submammalian vertebrates. 16,585.
KRUGER: -

NB-02743-03 Translations in Russian neurophysiology. 59,943.
LINDSLEY: -

NB-03604 Morphology of neurosecretory mechanisms and neuronal geometry. 11,612.
MAXWELL: Green

NB-00284-11 Neuroanatomical investigation by electron microscopy. 27,723.
PEASE: -

1 FIO NB-1138-01 Special Fellowship: Human stereotaxis as a research tool in the investigation of neurological disorders. 9,000.
PORTER: -

United States Public Health Service-- National Institutes of Health, Cont.

National Institute of Neurological Diseases and Blindness, cont.

NB-05248-01 Clinical application of EEG analog analysis. RIEHL: Walter	25,000.
NB-03837 Histochemistry and composition of myelin proteins. ROSE: Wolfgram	33,964.
NB-01162 Rhinencephalon neuroendocrine function and behavior. SAWYER: -	32,000.
NB-01063 A study of the electrical characteristics and anatomical configuration of selected neurophil areas in CNS. SCHEIBEL: -	25,600.
NB-04955-01 Conditioning of pyramidal activity by sensory inflow. SCHLAG: Sawyer	15,636.
NB-03556-03 Neuroendocrine mechanism in nutritional stress. SLATER: Brill	17,873.
NB-05199-01 Thermal and motor aspects of hypothalamic function. STUART: -	22,719.
NB-00738 The mode of action of neuromuscular blocking agents. TAYLOR: -	30,586.
NB-04133 Rhinencephalic cells in conditioned behavior. WORDEN: Fuster	20,000.

UCLA - Cancer Research Committee

Amino acid balance and protein synthesis. ROBERTS: -	9,124.

Various Donors

Prenursery project for cerebral palsied children. JONES: -	10,312.

Veterans Administration

Research in basic neuropsychiatry. PORTER: -	113,110.
	4,821,716.

APPENDIX II

PUBLICATIONS*

1. Abbott, B. C., and Brady, A. J. Amphibian muscle. In: Physiology of the Amphibia (J. A. Moore, Ed.), Academic Press, 1964: 329-370.

2. Adey, W. R. Modern concepts in neuroanatomy and neurophysiology. Fifth IBM Medical Symposium, 1963, 21 pp.

3. ---- Computers at the frontiers of biomedical research. Am. Fed. Information Processing Soc., 1963, 24: 603-607.

4. ---- Les transactions et stockage d'information dans les systèmes cérébraux; un modele derivé d'études des mécanismes hippocampiques dans l'enseignement. Actualités neurophysiol., 1963, 5: 263-295.

5. ---- Information processing and storage in the central nervous system, with emphasis on new techniques for measurement and analysis. Fifth IBM Medical Symposium, 1963, 19 pp.

6. Adey, W. R., Rhodes, J. M., and Kado, R. T. Cortical and subcortical recordings in the chimpanzee. Science, 1963, 141: 932-933.

Adey, W. R. See references 79, 90, 185, 216, 260, 261, 313, 315, 316, and 331.

7. Allen, R. A. Ciliated neurons of the retina. J. Ultrastruct. Res., 1964 (In press).

8. Allen, R. A., and Christensen, R. E. Interesting and unusual lesions of the macula in autopsy eyes. Trans. Amer. Acad. Ophth.-Oto., 1964 (In press).

9. Allen, R. A., and Straatsma, B. R. Pathology of lattice degeneration of the retina. Trans. int. Gonin Club, 1963 (In press).

Allen, R. A. See references 311, 312, and 318.

10. Arnstein, P., Cohen, D. H., and Meyer, K. F. Antibiotic medication of pigeons by inclusion of chlortetracycline in feed. J. Amer. vet. med. Assoc., 1964 (In press).

11. Baker, R. N., Schwartz, W., and Rose, A. S. The transient ischemic stroke: A report of the study and an analysis of the problem. Neurology, 1964, 14: 258.

12. Baldwin, B. A. Cerebral circulation in the sheep and goat. Symposium on Neurobiology, 1964 (In press).

13. Baldwin, B. A. The anatomy of the arterial supply to the cranial regions of the sheep and ox. Amer. J. Anat., 1964 (In press).

*Underscored names indicate members of Brain Research Institute.

Baldwin, B. A., See references 12, 13, 338, 339.

14. Baltscheffsky, M. Calcium uptake and relaxing activity in a fractionated rabbit muscle homogenate. Biochem. biophys. Res. Commun., 1964, 14: 296-301.

15. Barth, F. G. A phasic-tonic proprioceptor in the telson of the crayfish Procambarus clarki (Girard). Z. vergl. Physiol., 1964, 48: 181-189.

16. Baxter, C., and Pickens, P. E. Control of luminescence in hemichordates and some properties of a nerve net system. J. exp. Biol., 1964, 41: 1-14.

17. Bevan, J. A. The reflexogenic zone at the pulmonary artery bifurcation. Symposium on Drugs and Respiration. Second International Pharmacological Congress, 1963, 11: 179-190.

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A P P E N D I X I I I

MENTAL HEALTH TRAINING PROGRAM

SCHEDULE OF CLASSES - FALL SEMESTER 1963

Monday, Wednesday & Friday, 9:00-10:00 a.m. - Psychology 203A
(Dr. Morton P. Friedman) Advanced Psychological Statistics. A consideration of basic statistical concepts and methods. Particular stress in first semester on the analysis of quantitative data, non-parametric statistics and the simple forms of analysis of variance. Recurring information. 3 Units.
Room 4258 Franz Hall (beginning 9/16/63)

Monday, 9:00-11:00 a.m. - Psychology 298-Section 1 (Drs. Jacques W. Kaswan and Leonore R. Love) Special Problems in Psychology. New approaches to clinical problems. New Course. 3 Units.
Room 4268 Franz Hall (beginning 9/16/63)

Monday, 11:00 a.m.-12:00 p.m. - Anatomy 209 (Dr. Arnold B. Scheibel)
Fine Structure and Function in the Central Nervous System. Course will consist of part lecture and part discussion of the fine structure of selected areas of the central nervous system, together with related electrical and biochemical patterns of activity. New Course. Approval is being sought to offer this course for 1 Unit credit.
Room 23-278 Health Sciences Center (beginning 9/9/63)

Monday and Friday, 11:00 a.m.-12:00 p.m. - Pharmacology 236
(Dr. Dermot B. Taylor) Neuropharmacology. An advanced course on the actions and mode of action of drugs acting on the nervous system. Interactions between drugs and nervous tissue. The movement of drugs and chemicals through the blood brain barrier and their distribution in the C.S.F. and brain. Problems of central transmission. Recurring information. 2 Units.
Room 23-105 Health Sciences Center (beginning 9/16/63)

Monday, Wednesday & Friday, 3:00-4:00 p.m. - Psychology 200
(Dr. Thomas R. Trabasso) Learning. A review and analysis of basic learning concepts such as reinforcement, extinction, generalization, and discrimination. New Material. 3 Units.
Room 4258 Franz Hall (beginning 9/16/63)

Monday, Wednesday & Friday, 3:00-4:00 p.m. - Psychology 216
(Dr. Norman H. Anderson) Advanced Learning. Purpose of course is to develop facility at theoretical conceptualization and to develop competence at experimental-methodological analysis. Course will stress avoidance conditioning, short-term memory and conflict. New Material. 3 Units.
Room 4260 Franz Hall (beginning 9/16/63)

Tuesday and Thursday, 11:00 a.m.-12:00 p.m. - Pharmacology 232 (Dr. Dermot B. Taylor) Fundamental Principles of Drug Action. Advanced lectures on the scientific basis of pharmacological action. Interactions between drugs and cell components. Principles governing absorption, distribution, metabolism, and excretion. Relationships between structure and action in relevant series of drugs. Recurring information. 2 Units.
Room 23-105 Health Sciences Center (beginning 9/12/63)

Tuesday, 1:30-4:00 p.m. - Physiology 301 (Dr. Sigmund T. Rich) Methods and Techniques in the Use of Laboratory Animals. Concepts and methods in the use and care of experimental animals. Emphasis is placed on a broad understanding of the problems of using animals in research and developing skill in a variety of techniques. This course consists of lectures, assigned readings, discussions, demonstrations and supervised practice. New material. 1 Unit.
Room 23-154 Health Sciences Center (beginning 9/17/63)

Tuesday, 1:30-5:00 p.m. - Pathology 432 (Dr. W. Jann Brown) Neuropathology Conference. All central nervous system specimens from the autopsies of the week are examined and sectioned in this conference. New material.
Room 13-167 (1:30-3:30 p.m.) Room 18-126 (4:00-5:00 p.m.) (beginning 9/10/63)

Tuesday, 3:00-5:00 p.m. - Psychology 298-Section 2 (Dr. Ivar Lovaas) Special Problems in Psychology. Experimental Analysis of Deviant Behavior. Emphasis will be placed on psychotic behavior (autism, chronic schizophrenia, etc.), developmental retardation and delinquency. New Course. 3 Units.
Room 184 Kinsey Hall (beginning 9/17/63)

Wednesday, 10:30 a.m.-12:00 p.m. - Neurology, Neurosurgery, Neuropathology Conference 418 (Drs. Augustus S. Rose, W. Eugene Stern and W. Jann Brown) Presentation of instructive case material and discussion of common and difficult problems from the wards of each participating service, supplemented by brief talks on topics of neurological interest, both medical and surgical. New material.
Room C8-183 Neuropsychiatric Institute (beginning 9/11/63)

Wednesday and Friday, 11:00 a.m.-12:00 p.m. - Anatomy 208 (Raymond Kado) Electronics for Research in Experimental Anatomy and Basic Neurology. Lectures and discussions on the applications of electronic instrumentation to the problems of data acquisition recording and analysis. Emphasis will be placed on practical solutions to problems. Attendance will be limited to a maximum of twenty persons. New Course. 2 Units.
Room 23-278 Health Sciences Center (beginning 9/11/63)

Wednesday, 12:00-1:00 p.m. - Pharmacology 251A (Dr. Robert George) Seminar in Pharmacology. New material. 1 Unit.
Room to be announced.

Wednesday, 2:00-3:00 p.m. - Anatomy 252 (Dr. Charles D. O'Malley) Seminar in Medical History. Bibliography and readings, class discussion and papers on selected topics in the history of medicine. Recurring information. 2 Units.
Room 22-001K Early Imprint Room, Biomedical Library (beginning 10/9/63)

Wednesday, 7:30-8:30 p.m. - Anatomy 254 (Dr. Lawrence Kruger) Research Seminar in Mental Health. Interdisciplinary seminars by senior research workers and staff dealing with problems related to mental health. New material. 1 Unit.
Room 23-105 Health Sciences Center (beginning 9/18/63)

Friday, 10:00-12:00 p.m. - Anatomy 256 (Dr. Richard D. Walter) Survey of the Basic Neurological Sciences. Lectures dealing with the most recent advances in the study of the central and peripheral nervous system. This course has been extensively revised and is intended expressly for persons participating in the Mental Health Research Training Program. Your special attention to this offering is therefore invited. New material. 2 Units.
Room 23-105 (10:00-11:00 a.m.), Room 13-105 (11:00 a.m.-12:00 p.m.) Health Sciences Center (beginning 9/13/63)

Saturday, 11:00 a.m.-12:00 p.m. - Neurology, Neurosurgery, Neuropathology Conference 434 (Drs. Brown, Porter, et al) Selected cases from neurological, neurosurgical and neuropathological services are presented and discussed. New material.
Room 17-364 Neuropsychiatric Institute (beginning 9/21/63)

The following courses are to be arranged. Please contact the course chairman for further information:

Pharmacology 234 - (Dr. Dermot B. Taylor) Experiments in Bioassay and Modes of Drug Action. A detailed laboratory course on the bioassay of pharmacological agents and the experimental techniques involved in the elucidation of their modes of action. 1 Unit.

Physiology 207 (Dr. Bernice M. Wenzel) Behavioral Neurophysiology. Presentation of behavioral concepts and techniques relevant to research problems encountered in modern neurophysiology and their integration with neurophysiological methods. New material. 2 Units.

Psychology 285 - (Dr. Morton P. Friedman) Seminar in Conditioning. Analysis of the basic literature of classical conditioning. (Pavlovian conditioning), including discussions of generalization, discrimination, semantic conditioning and physiological changes in conditioning. 3 Units.

Seminar in Neurobiochemistry - (Dr. Samuel Eiduson) The format of this seminar will require active participation from the members. The selection of topics and organization will be arranged according to the interests of the group. New Course.

SUPPLEMENTAL COURSES

Monday, Wednesday & Friday, 1:00-2:00 p.m., Friday, 2:00-5:00 p.m. - Zoology 122 (Dr. Theodore H. Bullock) Introduction to the Nervous System. Three lectures and one laboratory weekly. Structural and functional principles of the nervous system as a general biological phenomenon in vertebrates and invertebrates. For advanced undergraduates and graduates in biology or related disciplines. 4 Units. Room 4226 Life Sciences (beginning 9/16/63)

Tuesday, Thursday, 11:00-12:00 p.m. - Biological Chemistry 212 (Dr. John G. Pierce) Protein Structure. The chemical and genetic basis of the primary, secondary and tertiary structure of proteins with emphasis on the protein hormones and stable enzymes. Relationships between structure and biological activity. 2 Units. Room 23-154 Health Sciences Center (beginning 9/17/63)

Thursday, 7:30-10:00 p.m. - Zoology 242 (Dr. Theodore H. Bullock) Comparative Neurology. Seminar in recent developments in central and peripheral neurology with emphasis on lower animals. 2 Units. Room 4221 Life Sciences Building (beginning 9/19/63)

MENTAL HEALTH TRAINING PROGRAM

SCHEDULE OF CLASSES - SPRING SEMESTER 1964

Monday, 1:00-3:00 p.m. - Clinical Neurology Teaching Seminar
(Dr. Augustus S. Rose) Room 17-364 (No credits)

Monday, 4:00-5:00 p.m. - Neurochemistry Seminar for Neurologists
(Dr. Augustus S. Rose) Room 17-364 (No credits)

Monday and Thursday, 9:00-10:00 a.m. - Anatomy 208b (Raymond T. Kado)
"Electronics for Research in Experimental Anatomy and Basic Neurology"
Lectures and demonstrations on the integrated biological data acquisition system. Beginning with the amplifier, this subject will be expanded through the semester to include recording and data processing techniques. Required text: Electronics for Scientists, H. V. Malmstadt, C. G. Enke and E. C. Toren. 2 Units.
Lecture Hall 13-105

Tuesday, 2:00-5:00 p.m. - Pathology 432 (Dr. W. Jann Brown) Neuropathology Conference. All central nervous system specimens from the autopsies of the week are examined and sectioned in this conference.
$\frac{1}{4}$ Unit.
2-4 Morgue; 4-5 Room 18-126

Tuesday and Friday, 3:00-4:15 p.m. - Psychology 203B
(Dr. Norman H. Anderson) Advanced Psychological Statistics II.
Takes up analysis of variance techniques, especially for situations in which each subject is run under several conditions. Emphasis is placed on planning of experiments, not simply on statistical analysis of the results. 3 Units. Prerequisite: 203A or equivalent.
Room FH42-58

Wednesday, 10:30-12:00 p.m. - Neurology-Neurosurgery Conference
(Dr. Augustus S. Rose) NPI Auditorium (No credits)

Wednesday, 2:00-4:00 p.m. - Psychology 298 - Section 2
(Dr. Norman H. Anderson) Impression and Judgment Formation.
Seminar on experimental and theoretical problems in the study of impressions and judgments. Primary emphasis on the experimental analysis of personality impression formation; other problems in information integration will also be considered. 3 Units.
Room FH42-63

Wednesday, 2:00 p.m. February 5, 1964 - organizational meeting.
Anatomy 252 (Dr. C. D. O'Malley) Seminar in Medical History.
2 Units
Early Imprint Room of Biomedical Library.

Wednesday, 7:30 p.m. - Anatomy 254 - (Dr. Lawrence Kruger) Research Seminar in Mental Health. Interdisciplinary seminars by senior research workers and staff dealing with problems related to mental health. 1 Unit
Room 23-105 Health Sciences Center

Thursday, 10:00-12:00 p.m. - Psychiatry 200 - (Drs. Richard F. Doctor, and Richard D. Walter) Basic Concepts in Psychiatry with Clinical Neurology. Course aims to stimulate interest in research problems associated with human behavior, mental illness and neurological diseases. Presents clinical material in Psychiatry and Neurology intended for research workers; emphasis will be on case presentation and discussion of research problems relating to clinical phenomena. 2 Units.
Neuropsychiatric Institute 17-364

Thursday, 11:00-12:00 p.m. - Anatomy 240 - (Dr. C. D. O'Malley) History of the Basic Medical Sciences. A series of lectures on the history of the basic medical sciences from antiquity to the nineteenth century Course is co-operative one with illustrated lectures given by members of the medical faculty. 1 Unit.
Lecture Hall 13-105

Friday, 10:00-12:00 p.m. - Anatomy 256 - (Dr. Richard D. Walter) Survey of the basic Neurological Sciences. Lectures dealing with the most recent advances in the study of the central and peripheral nervous system. This course has been extensively revised and is intended expressly for persons participating in the Mental Health Research Training Program. Your special attention to this offering is therefore invited. 2 Units.
Room 23-105 Health Sciences Center

Friday, 3:00 p.m. February 14, 1964 - organizational meeting.
Biophysics 252 (Experimental Neurobiophysics) (Dr. Marcel Verzeano) An advanced graduate laboratory course. The course will deal with the advanced techniques of neurobiophysics, such as: microelectrode techniques, advanced electronic techniques for the analysis of the electrical activity of the nervous system, and the experimental study of neuronal networks. Students should have a sufficient knowledge of basic mathematics, electronics, neuranatomy, and neurophysiology in order to be able to participate usefully in the laboratory sessions. Two hours laboratory per week, plus two additional hours per week required for preparation and reports. 1 Unit.
Room B1-109 Health Sciences Center

Friday, 4:00 p.m. February 14, 1964 - organizational meeting.
Biophysics 262 (Seminar in Neurobiophysics) (Dr. Marcel Verzeano) This course involves a great variety of advanced topics on the application of biophysical methods to the study of the nervous system. 2 Units
Room B1-109 Health Sciences Center

Day and time TO BE ANNOUNCED - Pharmacology 233 - (Eskil A. Hultin) Bioassay Theory 1. The theory and practice of the application of statistical methods to the design of experiments and the analysis of data in pharmacology, toxicology and therapeutics. 1 Unit.

BRAIN RESEARCH INSTITUTE WEEKLY SEMINAR

(Anatomy 254)

Fall 1963 - Spring 1964

List of Speakers	Title	Institution
ADEY, W. Ross, M.D.	Professor of Anatomy and Physiology	University of California, Los Angeles
APRISON, M. H., Ph.D.	Associate Professor of Biochemistry	Institute of Psychiatric Research, Indiana University Medical Center, Indianapolis
BAUMGARTNER, G., M.D.	Neurophysiologie	Universitaet Freiburg, Germany
BODIAN, D., M.D., Ph.D.	Director, Department of Anatomy	Johns Hopkins University School of Medicine Baltimore, Maryland
BROOKS, Vernon, Ph.D.		Rockefeller Institute, New York
BROWN, Kenneth, Ph.D.	Associate Professor of Physiology	University of California, San Francisco
BUCHWALD, N. A., Ph.D.	Associate Professor of Anatomy, in Residence	University of California, Los Angeles
BUSER, Pierre, D.S.	Professor of Comparative Physiology	University of Paris, France
COHEN, Melvin J., Ph.D.	Associate Professor Department of Biology	University of Oregon, Eugene
COLE, K.C., Ph.D.	Regent Professor of Biophysics	University of California, Berkeley

ECCLES, J. C., Sir, Ph.D.	Professor, Department of Physiology	Australian National University Canberra
ENGER, Per, Ph.D.	Assistant Research Zoologist, Department of Zoology	University of California, Los Angeles
EYZAGUIRRE, Carlos, M.D.	Department of Physiology	University of Utah, Salt Lake City
HAMPSON, John, M.D.	Associate Professor Department of Psychology	University of Washington Seattle
HANCE, A. J., Ph.D.	Research Associate Department of Pharmacology	Stanford University Palo Alto, Calif.
KEYNES, Richard, Ph.D.	Director, Agricultural Research Council	Institute of Animal Research, Cambridge, England
KILLAM, Keith, Ph.D.	Department of Pharmacology	Stanford University Palo Alto
LAJTHA, Abel, Ph.D.	Principal Research Scientist	New York State Research Institute for Neuro-chemistry and Drug Addiction.
MAYER, Steven, Ph.D.	Department of Pharmacology	Emory University, Atlanta, Georgia
McGAUGH, James L., Ph.D.	Associate Professor of Psychology	University of Oregon Eugene
PETERS, Alan, Ph.D.	Department of Anatomy	Harvard Medical School Boston, Massachusetts
POMERAT, C. M., M.D.	Director of Research	Pasadena Foundation for Medical Research, California
PORTER, Robert, M.D.	Assistant Research Anatomist, Department of Anatomy	University of California, Los Angeles
SELLERS, M. I., Ph.D.	Associate Professor of Medical Micro-biology and Immunology (Virology)	University of California Los Angeles

SZEKELY, George, M.D.	Assistant Professor of Anatomy	University of Pecs, Hungary
TERRY, Robert, M.D.	Associate Professor of Pathology	Albert Einstein College of Medicine New York
UDENFRIEND, Sidney, Ph.D.	Chief, Laboratory of Clinical Biochemistry.	National Heart Institute Bethesda, Maryland
VAN HAAREVELD, A.,M.D., Ph.D.	Professor of Biology	California Institute of Technology, Pasadena
VOORHOEVE, Paul E.		Australian National University Canberra
WOODBURY, D. M., Ph.D.	Professor of Pharmacology	University of Utah Salt Lake City
WOOLSEY, Clinton N., M.D.	Director, Laboratory of Neurophysiology	University of Wisconsin Medical School Madison