GROVER F. POWERS LECTURE

October 17, 1957

PUBLIC RESPONSIBILITY FOR THE HEALTH AND WELFARE OF CHILDREN.
By Martha Eliot, Professor of Maternal and Child Health, Harvard University School of Public Health, Boston, Massachusetts.

Public responsibility for the health and welfare of children is the responsibility that must be assumed by all the people as a whole. Only as citizens develop this sense of responsibility can we as a nation make sure that all children have a good chance to grow and develop normally, to have a happy family life with adequate food, shelter, clothing and medical care, to be protected by law from exploitation, neglect, and economic want, and to be provided with a substitute family when their own family breaks down.

We have made great progress in our quest for the healthy development of the child since the middle thirties. But we have made less progress in our understanding of the emotional development of children and of child behavior and in applying what knowledge we have to the health and social care of children.

Great discrepancies still exist in the medical care and preventive health services for children in this country depending on where they live—in an isolated or semi-isolated rural area vs. a large metropolitan city—or on the income and size of their family.

Three areas of action in the pediatric and child health program are urgent:

First. The times call for a new look at our health and medical care programs for children. Our child health forces must be concentrated in extending child health supervision to all children—services that are comprehensive in scope and adequate in their physical, social, and mental health aspects, and that are made available wherever children receive care, singly or in groups in the offices of physician, in prenatal clinics, child health conferences, school health programs, community health centers, in hospitals, children's institutions, in child welfare programs.

One of our greatest assets in accomplishing this lies in new tools and new knowledge now available through research in the natural, behavioral, and social sciences.

Second. We are confronted with a great shortage of professional workers—physicians, nurses, teachers, social workers, and other workers in contact with parents and children—who are well versed in the total care of children, who understand the stages and nature of growth, the factors that influence it and how deviations from the usual may be met. How can we educate professional persons to qualify them to work more effectively with children? Is it possible to increase the number of workers while at the same time standards are raised and content broadened? These are typical of the questions we must answer for all professions in contact with children and their parents.
Only within recent decades has this scientific knowledge of human development been included as a part of general medical education. Present-day medical students can have many opportunities for child health supervision in child health conferences, school health programs, programs for the care of handicapped children, and in many children's institutions. But for the greater part of their supervised experience, these students should be assigned to ongoing health programs of well-staffed local public health departments. If students from schools of social work and schools of nursing could be assigned to the same centers, the learning experience for all would be richer.

Third. Research must be extended into many areas of child life if more knowledge is to be available with which pediatric care of sick and well children can be improved, our understanding of child behavior enriched, and more effective prevention and treatment of emotional disturbances be provided in childhood and adolescence.

The pediatrician, general practitioner, obstetrician, and other child health workers must epitomize the best philosophy of public responsibility for the health and welfare of children which on the one hand calls for service focused on the peculiar needs of each child and on the other demands of forward looking planning for all children on a community-wide basis, whether that community is a village, a neighborhood, a city, a state, the nation, or the world community of nations. The most important business in the world even for governments as well as for parents is the rearing of children.

CARDOVASCULAR AND GASTROINTESTINAL STUDY UNITS

December 16, 1957

PORTAL HYPERTENSION. By Charles G. Child, III, Tufts College of Medicine, Boston, Massachusetts.

Portal hypertension is, for the most part, an innocuous condition provided that its one major complication, hemorrhage, is prevented. There are two groups of people with portal hypertension to be considered—those with esophageal varices who have never bled, and those who have had one or more episodes of bleeding. Survival figures show that after the first episode of hematemesis 40 per cent of patients will be dead within one month and 70 per cent will die in one year. Yet, after a successful portal decompression operation, the vast majority of patients are protected from future hemorrhage. The mortality from such surgery varies with the condition of the patient and his hepatic function at the time of operation and ranges from 3 per cent to 30 per cent. In addition there is an average 15 per cent morbidity largely from recurrent amine intoxication.

The management of the patient with varices who has never bled is difficult to plan as there are no figures on which to base the incidence of first bleeding. This is primarily due to the fact that people with portal hypertension and good hepatic function without bleeding varices do not present themselves to a physician. To subject this patient to the mortality and
morbidity of a portal decompression procedure as a prophylactic measure cannot be fully justified although in those patients with ascites the reduction in portal venous pressure may contribute to improvement.

In either group of patients it is advisable to institute a medical rehabilitation program if the condition of the patient is poor. This may extend over six months to a year at which time liver function, serum, albumin, the response to a salt and a protein load, and the general physical condition can be evaluated optimally. Reduction in portal pressure can be marked with disappearance radiographically of varices or reduction in ascites. An end-to-side portacaval anastomosis has been found most satisfactory.

R. N.

YALE MEDICAL SOCIETY
January 13, 1958

ADRENALECTOMY AND CARBOHYDRATE METABOLISM. By William Winternitz, Departments of Physiology and Internal Medicine.

Following epinephrine administration adrenalectomized rats show a large net deficit of the body stores of carbohydrate due to the greater loss of muscle glycogen and the failure of accumulation of liver glycogen as compared to normal controls. The abnormal response is corrected by replacement with adrenal cortical extract. The co-existence of alloxan diabetes and adrenalectomy does not prevent the excessive carbohydrate disappearance characteristic of the adrenalectomized state. Evisceration, however, does abolish the differences in the response to epinephrine of normal and adrenalectomized animals. Adrenalectomized rats perfused with various carbohydrate precursors also show a larger utilization of carbohydrate than do normal controls.

The respiratory quotient of adrenalectomized animals given epinephrine is maintained at a high level for about three to four hours after epinephrine, while in the normal animal there is little change than that caused by the displacement of CO$_2$ by lactic acid. When $^{14}$C$_2$ pyruvate is administered as a tracer following epinephrine, the adrenalectomized rat exhales more C$_{14}$O$_2$ in the ensuing four hours.

It is concluded that the adrenalectomized animal not only forms less but also utilizes more carbohydrate than does the normal control. The chief site of action is believed to be hepatic, and it is felt that the oxidative route of carbohydrate utilization is the one affected most by the presence or absence of the adrenal cortical hormone.

W. W.

January 13, 1958

AMNIOTIC FLUID EMBOLISM AND MATERNAL DEATH. By Harold D. Attwood, Research Fellow, Department of Pathology.

Amniotic fluid embolism is a histologically defined entity but a clinically obscure one. It was first described in 1926 by Ricardo Juvenal Meyer (Brasil Med., 1926, 2, 301), and since then numerous case reports have
appeared in the literature. Microscopically, it is characterized by the presence in the maternal pulmonary vessels of epithelial squames and lanugo hair from the amniotic fluid, fat from the vernix caseosa, and mucin from meconium contamination of the amniotic fluid. This foetal material can also be isolated from blood taken from the inferior vena cava or right heart and, in a number of cases, has been demonstrated, histologically, in the myocardial, cerebral, renal, and uterine vessels. At autopsy, the only gross changes are cyanosis and a dilated right heart. The lungs show no abnormality visible to the naked eye.

In a histological study of the lungs from 119 pregnant, parturient, and puerperal women dying in two Scottish hospitals, trophoblastic giant cells were found in the maternal vessels in 44 per cent of the cases. Such trophoblastic emboli are not regarded as pathologically significant, but are probably normal concomitants of pregnancy and labour. In only two cases, however, could the presence of amniotic fluid debris within the maternal pulmonary vessels be demonstrated. In one of these cases, only a few squames and one strand of mucin could be seen; death had been the result of chloroform toxicity. In the other, the foetal debris was widespread in the maternal pulmonary vessels and could be demonstrated in sections taken from 15 blocks of lung tissue. In this case, the woman had died suddenly during an apparently normal labour following an apparently normal pregnancy. Amniotic fluid embolism was the only pathological finding.

The presence of the foetal debris in the maternal pulmonary vessels can be overlooked in routinely stained (haematoxylin and eosin) sections. The application of special staining techniques can make the diagnosis easier and, hence, more certain. The fuchsinophilia of the epithelial squames can be best demonstrated in the picro-Mallory preparations. The large amount of foetal debris that may be present in the maternal pulmonary vessels is best demonstrated by a combined stain for the mucin and epithelial squames. A combination of Alcian green for the mucin with the phloxin tartrazine method to demonstrate the squames has been found to be most useful.

The cause of death in cases of amniotic fluid embolism is a matter of some controversy. On the one hand it is believed that the foreign material may be toxic to the mother and death may result from an "anaphylactoid reaction." Others believe that obstruction of the maternal pulmonary vessels by foetal debris may be the important lethal factor. In experiments to study the cause of death, mice were injected intravenously with amniotic fluid or meconium suspensions. A constant injection technique of 1 ml. in one minute was used. It was found that the number of animals dying as a result of the injection was directly related to the amount of suspended material in the fluid. When filtered fluid was injected, no animals died. Experiments are currently being carried out on dogs to measure the changes in pulmonary artery pressure following the intravenous injection of amniotic fluid and meconium suspensions.

D. W. E. S.
BOTANY SEMINAR

January 14, 1958

THE MECHANISM OF GENETIC RECOMBINATION THROUGH TRANSDUCTION in Salmonella. By M. Demerec, Carnegie Institute of Washington, Cold Spring Harbor, Long Island, New York.

One cystine and four tryptophane markers were used in preliminary experiments in Salmonella in order to shed some light on the mechanism of induction. The five loci are linked (probably since the tryptophane loci are functionally related) in a previously determined order and are always carried on a single transducing segment. By plating on indole and cystine and by further transduction experiments, 26 of the 31 possible recombinants from reciprocal transductions have been recovered and identified. The results were found not to be influenced by type of marker nor by whether a given allele was carried on a bacterial chromosome or on a transduced fragment, but were similar to crossover results. Crossover frequency data permit calculation of the distances between loci relative to over-all length of fragment. Since single crossovers would produce long inviable deficiencies, they cannot be observed directly, but calculations from data indicate that they may take place. Double crossover frequencies are within the expected values. The existence of negative interference may be inferred from the occurrence of quadruples and of a single sextuple crossover in excess of expectation. The latter is at present unique in genetic literature. An estimate of the base line is impossible since all the phages do not transduce; the data presented are taken to indicate, however, that 50 per cent of the fragments enter into transduction.

These data suggest a possible mechanism for transduction: during formation of new chromosomal material, the reproducing element may choose either the region of the bacterial chromosome or the phage-transduced fragment as a template for the chromosomal segment involved. Each copy choice influences the succeeding one nonrandomly.

G. E. W. 3RD

ZOOLOGICAL JOURNAL CLUB

January 15, 1958

ONOTOGENY OF ENZYMATIC ACTIVITY. By Clement L. Markert, Professor of Biology, Johns Hopkins University, Baltimore, Maryland.

Electrophoresis combined with histochemical determination on cell extracts provides a technique for measuring esterase activity at various stages of growth. Cell extracts are placed on a starch gell strip and electrophoresed at 6 volts/cm. and a pH of 8.6. Enzyme localization on the anodal strip is then analyzed by providing a reaction substrate and a diazonium salt dye. Various bands of reaction with the dye indicate specific enzyme activity; intensity gives a ratio of relative concentration. Substitution of substrate and use of different inhibitors permits specific enzyme analysis.
This method will work on any electrophoretically labile enzyme which may be histochemically analyzed.

Twenty esterases have been thus demonstrated in mouse liver. Various esterases in the liver, eye, and duodenum are added, and relative amounts of enzyme change during pre- and postpartum growth. Four patterns of change in enzyme activity with increase in age are found in various mouse tissues: gradual rise, logarithmic growth, high initial concentration with postpartum decline and adult increase, and a sudden appearance or increase at adulthood.

These data imply two methods for cellular differentiation: genetic makeup and cellular interaction. Mouse tissue culture extracts show a different electrophoretic pattern by this method which suggests that although genes are instrumental in cell differentiation, their presence is not sufficient for enzyme differentiation, but the environment of the cell during development is of great importance.

G. E. W. 3rd

February 12, 1958

CHEMORECEPTION AND THE REGULATION OF FEEDING IN THE BLOWFLY.
By Vincent G. Dethier, Professor of Biology, John Hopkins University, Baltimore, Maryland.

Mechanisms regulating feeding behavior in the black blowfly (Phormia regina) indicate significant implications in relation to the concepts of vertebrate behavior.

Gustation occurs by means of chemoreceptive hairs localized primarily on the tarsi and labellum of the fly. Each hair is associated with three bipolar sensory neurones, one responding to "acceptable" stimuli (e.g. sucrose), another to "unacceptable" stimuli (e.g. NaCl), and the third to bending of the hair. Exposure of one hair to an acceptable solution will elicit a feeding response (proboscis extension) from a hungry animal. The threshold sugar concentration leading to a feeding response is an inverse function of the degree of starvation. A rise in response threshold is not a result of receptor cell adaptation; thus, threshold is centrally regulated.

In the alimentary tract, when the midgut becomes empty, stored food from the crop is transported to the oesophagus, thence to the midgut. The inhibition of feeding behavior is a result of the presence of fluid in the oesophagus. The central nervous system is informed of fluid presence via the recurrent nerve leading to the hyperpharyngeal ganglion, thereby causing adjustment of the response threshold. Flies with transected recurrent nerves were unable to stop feeding. Nothing is known of the oesophageal receptors involved.

These results are significant with respect to the concepts of vertebrate behavior. Thus, the consummatory act to cause cessation of feeding is neither a Lorenzian "drainage" of the nervous system, nor a fulfillment of a metabolic need, nor a function of a given amount of muscular activity; cessation of feeding is simply the result of inhibitory impulses from the fluid-filled foregut. Drive results in this case from the interaction of exter-
nal and internal sensory receptors and has nothing to do with endogenous central nervous activity. The feeding and satiation centers can perhaps be considered at the level of the synapse in the blowfly.

F. M. WILLIAMS

February 19, 1958

EVOLUTION IN TROPICAL FORESTS AND THE PROBLEM OF FAUNAL DOMINANCE. By Edward O. Wilson, Biological Laboratories, Harvard University, Cambridge, Massachusetts.

The ant subfamily Ponerinae in Melanesia shows a three-step pattern of distribution: (1) Ants have invaded the islands mainly from the Oriental region, a few have entered from Australia; (2) they have diversified in the islands; (3) the parental stock has vanished from the mainland leaving relict forms in the islands. There has been little backcurrent so that Melanesia has been an evolutionary cul de sac. The greatest number of ant species is found living in rotting wood in the thin leaf litter on the floor of the tropical rain forest; fewer species are found in marginal areas. Species in the littoral, savannah, and monsoon forest (marginal areas) are chiefly from the first category, those in the montane rain forests are almost entirely of the second and third categories. Rain forest species are found in a distributional mosaic as an almost closed ecological system which must render direct colonization from the mainland difficult, if not impossible.

A possible hypothesis to explain this pattern of distribution is proposed. During a fluctuation peak in an Oriental rain forest, part of a mainland ant population expands into a marginal area. This portion may undergo genetic adaptation to the new environment. Some cross the water gap and, if adapted, may colonize insular marginal areas and spread. Once established, they must quickly readjust in order to re-enter the optimal rain forest, since the peripheral area is truly marginal for Ponerines. When back in the rain forest, they diversify, and may even reinvade the marginal area. In some cases, the parental population becomes extinct on the mainland.

G. E. W. 3RD