EVENTS

BEAUMONT CLUB
April 18, 1952

MALPIGHI AND HIS THEORY OF PRE-EXISTENCE. By Howard Adelmann, Professor of Histology and Embryology, Cornell University.

Marcello Malpighi (1628-1694) had at the age of twenty-five already received his doctorate of medicine and philosophy degrees. At twenty-eight he was the professor of medicine at the University of Bologna. Among his accomplishments we find that he discovered the alveoli in the lung and observed red blood corpuscles in the blood vessels of the omentum of the hedgehog (at the time he interpreted them as fat droplets). He described the stratum germinativum of the epidermis, and the fibers of the central nervous system which he thought were glandular ducts; he discerned the glandular nature of the liver, described the architecture of the kidney, pointed out the contractile, sponge-like nature of the spleen, and was actually the first to describe the epiophoron, Gartner's duct, and the anatomy of the metamorphosing silkworm. Malpighi was also the first to remove the entire chick blastoderm and study it on a glass slide and to describe the neural folds in the chick embryo. His observations and descriptions of the embryology of the chick remained unsurpassed for 150 years.

Because he observed an embryo in an egg which he believed to be unincubated, he felt that the embryo "pre-existed." His theory of pre-existence however, bore more similarity to the modern concept of epigenesis than to theories of pre-formation or enboitement. He conceived of the egg as supplying the amorphous material for the formation of the embryo and the sperm as providing the "plastic spirit." Even with our use of the terms organizer, inductor, and field, one wonders just how far we have progressed beyond Malpighi in our understanding of the forces fashioning and directing the development of the embryo.

Although some of his interpretations were incorrect, the extent and accuracy of his observations, made without the aid of fixation, staining, or injection techniques, must arouse our deepest esteem and admiration for this great scientist.

J. M. Q.

PLANT SCIENCE SEMINAR
April 21, 1952

DEVELOPMENTAL STUDIES OF BIOCHEMICAL CHARACTERS IN PLANT HAIR CELLS. By Milton L. Zucher, Washington University.

The hair cells of Coleus plants afford an opportunity to study cellular differentiation on a very simple level. Each of these hairs is derived from a single cell, and consists, when mature, of cells which are all of the same type, differing from one another only quantitatively.

An epidermal cell, by a series of divisions, produces a single file of cells, tapering from base to tip. Only the terminal cell of the growing hair divides. Cell elongation begins terminally and progresses basally. A study was made of the development of pigmentation in the growing hair. The anthocyanins and flavenoids were determined from cell extracts, and compared by means of a microspectrophotometer with the pigments of individual growing cells. It was found that anthocyanin formation follows the wave of cell elongation from tip to base, but is slower, reaching the middle of the hair by the time
elongation is completed. Flavenoid production, on the other hand, proceeds simultaneously in all cells. The pigment concentration in mature hairs is constant from cell to cell; the ratio of amount of pigment to cell volume is essentially the same as that of nuclear volume to cell volume.

Tissue culture experiments showed that it is not a simple gradient of nutrient concentration which is responsible for the decrease in size of each cell cut off in the growth of the hair.

It has been found that X-rays and ultraviolet light cause unusual patterns of pigment development. These are now being studied.

R. R. L. G.

PHARMACOLOGY SEMINAR
April 24, 1952

THE PHYSIOLOGICAL AND CLINICAL IMPORTANCE OF AMINE OXIDASE.
By J. H. Burn, Professor and Chairman of the Department of Pharmacology, Oxford University.

Monoamine oxidase has been demonstrated in such sympathetic-innervated structures as the nictitating membrane, pupil, and blood vessels of the cat by manometric measurement of O₂ uptake in homogenates. Tyramine was used as the substrate. It was shown that the enzyme has greater activity on nor-epinephrine than on epinephrine by incubating a fifty-fifty mixture of the two substances with the amine oxidase and biologically assaying for their ratio before complete breakdown had taken place. This fact may explain why nor-epinephrine gives a shorter and lesser response on the nictitating membrane than that obtained with epinephrine, since the latter would be destroyed at a slower rate. It was also shown that after denervation this difference in activity is almost completely abolished, in spite of the fact that the enzyme drops by only 40 per cent by the tenth day, and then slowly rises to normal levels. The possibility of reinnervation has to be considered here.

Thyroid extract was shown to depress liver amine oxidase, permitting more epinephrine to exert its glycogenolytic effect and resulting in a greater hyperglycemic response. Thyroidectomy, on the other hand, produced the opposite results.

On the separated and perfused rabbit-ear a difference in effect has also been demonstrated, 5.9 times as much nor-epinephrine being necessary to give the vasoconstrictor effect produced by epinephrine. After ephedrine this ratio drops to 1.7, presumably because of inhibition of amine oxidase activity besides a direct stimulatory effect. Cocaine, amphetamine, and desoxy-amphetamine are considered purely inhibitory on the enzyme, their facilitatory and stimulating actions being thus due to interference with the breakdown of the nor-epinephrine released at the neuro-effector junction.

N. A. H.

THE FIFTEENTH HARRY BURR FERRIS MEMORIAL LECTURE
April 30, 1952

THE RÔLE OF THYROID STRUCTURES IN THE ELABORATION OF THYROXINE. By Charles P. Leblond.

The hypothetical sequence of events in the elaboration of circulating thyroxine can be conveniently divided into five steps as follows: concentration of iodide in the following cells; transformation of iodide into thyroglobulin; temporary storage of thyroglobulin in the colloid; enzymatic
hydrolysis of thyroglobulin to thyroxine; secretion of thyroxine into the circulation.

No evidence was presented to relate the first step to any morphological structure. Regarding the second step, a new technique of applying photographic emulsion directly to histological sections showed that at one hour after the injection of radioactive iodine into normal rats there was photographic evidence of a concentration of thyroglobulin in the apices of the follicular cells. That these particles were not merely iodide was presumed from the fact that iodide would have been dissolved and lost during the histological staining process. Likewise for the third step, twenty-four-hour-post-injection specimens revealed a similar concentration of thyroglobulin in the colloid of the follicle instead of in the cells. It was further shown that rats on a low-iodide intake or on pituitary extract intake concentrated thyroglobulin in the colloid within an hour, whereas hypophysectomized rats showed thyroglobulin in the follicular cells as late as twenty-four hours.

The validity of the hypothesis that hydrolysis results in the elaboration of many iodinated amino acids in addition to thyroxine was indicated by studying radio-autographic records of two-way filter paper chromatograms of thyroid extracts and plasma. Mono- and di-iodothyroxine, triiodothyronine, and thyroxine as well as several other unidentified iodine-containing compounds were found in the colloid or thyroid tissue; thyroxine alone was found in the plasma.

No evidence was proffered to indicate the exact anatomical site of the fifth step.

J. F. S.

NU SIGMA NU LECTURE
May 1, 1952

The Pathologic Physiology of Cor Pulmonale as Related to Diagnosis and Treatment. By C. K. Friedberg, Chief of Cardiology, Mount Sinai Hospital, New York, New York.

With the development of quantitative methods, cardiorespiratory physiology has become susceptible to more precise study in recent years. In cor pulmonale, the lungs as well as the heart become decompensated. Pulmonary insufficiency may be defined as a condition in which the oxygen saturation of the blood decreases below normal levels. The etiological conditions leading to this insufficiency fall into several groups: (i) emphysema (obstructive), (ii) fibrosis with or without emphysema (restrictive, obstructive), (iii) fibrosis (alveolar, capillary), and (iv) vascular obstruction. Each group may involve a different physiological mechanism but all may cause pulmonary decompensation resulting in low oxygen tension in the arterial blood and cyanosis. Furthermore, in some instances, a concomitant insufficiency of the right heart, attended by its well-known clinical syndrome, may develop. In chronic cor pulmonale, the two common factors affecting the heart are elevated pressure in the pulmonary vascular bed and reduced oxygen saturation of the arterial blood. The observation that the pulmonary vascular resistance rises during exercise suggests that right-sided heart failure may be somewhat analogous to left-sided failure in systemic hypertension. Digitoxin tends to improve quantitatively the output of the right ventricle and to relieve the clinical symptoms referable to heart failure, but it does affect the cyanosis. An explanation, therefore, of the development of cor pulmonale must begin with the poor aeration of the blood. The anoxia of the blood going to the tissue sets up reflexes which
increase cardiac output. The heart is burdened further by pulmonary hypertension in the diseased lungs, and "high-output failure" follows.

Diagnosis rests on the demonstration of primary pathology of the lung. Decompensation occurs under some strain, commonly an infection. Therapy is directed toward both the precipitating factor and the myocardial insufficiency. Cardiac treatment, including digitoxin, helps the heart meet its obligation to supply more blood to the tissues, but recovery of the heart and of the patient is dependent on the reestablishment of pulmonary compensation. Oxygen therapy is used with care not to produce respiratory depression. Phlebotomy, after the acute phase, may ease the load imposed by polycythemia, but is not in itself a curative measure.

O. L. K.

PHARMACOLOGY SEMINAR
May 8, 1952

POTASSIUM AND SODIUM IONS IN NERVE PHYSIOLOGY. By R. Lorente de Nó, Rockefeller Institute for Medical Research, New York, New York.

The observed effects of potassium on depolarization of the nerve are of pharmacological rather than physiological significance. If potassium were of import in physiologic excitability, the ion should depolarize the nerve instantaneously, whereas it actually requires several hours. Furthermore, hypertonic solutions of either sodium chloride or glucose prevent the potassium depolarization. The nerve fibre, it appears, is maintained more by active metabolism than by substances in the surrounding nutrient medium.

After the nutrient medium is deprived of sodium for several hours the intact nerve loses its excitability; removal of the epineurium, a process which produces constriction and basophilia of the axoplasm, reduces the onset of inexcitability to five or six minutes. A number of quaternary ammonium compounds containing two or more ethyl groups (or larger radicals) are able to substitute for sodium. Also able to restore excitability of nerve in a sodium-free medium are quaternary ammonium compounds extracted from brain. It is hypothesized that sodium plays a rôle similar to a coenzyme and aids in synthesizing quaternary ammonium compounds necessary for normal nerve activity. These substances are lost in a sodium-free medium.

J. P. G.

NEUROLOGICAL STUDY UNIT
May 19, 1952

BODY IMAGE IN NEUROLOGY. By McDonald Critchley, Dean of the Institute of Neurology, National Hospital, London.

The conceptual scheme of one's body image is frequently a denial of objective fact. Body image development lags behind anatomical and physiological development. Thus elderly people, although intellectually aware of their age, picture themselves in their youth, as demonstrated in the extreme by the fervor with which faded beauties attempt to cling to their former glamor. Moreover, giants and midgets construe their heights as normal, bald men picture themselves well covered, and persons afflicted with scoliosis imagine themselves erect.

The most dramatic demonstration of distorted body image is seen in the "phantom limb" syndrome. The image of a missing part of the body persists not only for limbs, but also for the nose, rectum, penis, etc. However, there seems to be no persistent image of the breast after mastectomy.
Certain other pathological and psychological states also distort the body image. Hypochondria and localized pain increase the size of the image of the afflicted part; electric shock decreases the total body image; various ecstatic states, induced by Hashish intoxication or even music, distort the body image. The image of an orchestra conductor assumed enormous proportions during moving musical passages, until he envisioned himself conducting while astride the world. On the other hand, parietal hemiplegia may result in the loss of the image of the affected side of the body to an extent that may lead to its denial or neglect. Depersonalization may engender visions of imaginary people as well as denial of real images.

The body image may project beyond the body to include inanimate objects like clothes, or the iron lung in the case of a victim of bulbar poliomyelitis. An automobile driver extends his image to all four fenders, a surgeon to the tips of his instruments.

So profuse are the different forms of the body image, even in normal people, that one wonders which image is raised in resurrection.

G. McK.

SEVENTH ANNUAL ALPHA KAPPA KAPPA LECTURE
May 19, 1952

HEADACHE MECHANISMS. By Harold Wolf, Professor of Medicine and Associate Professor of Psychiatry, New York-Cornell Medical School.

The most common complaint presented to physicians, the headache, results from a variety of mechanisms such as displacement or distension of pain-sensitive intracranial structures, distension and edema of branches of the carotid artery, prolonged contraction of muscles of the scalp and neck, painful stimulation of the mucous membranes, and pressure from intracranial tumors.

Six basic mechanisms contribute to headaches that originate from intracranial sources: (i) traction on the sinuses and its tributary veins, (ii) traction on the middle meningeal artery, (iii) traction on the Circle of Willis, (iv) inflammation of pain-sensitive areas of the dura, (v) dilatation of pain-sensitive arteries, and (vi) direct pressure on the fifth, ninth, and tenth cranial nerves. Traction and displacement of these pain-sensitive structures may accompany increased intracranial pressure, or the decreased intracranial pressure often resulting from spinal taps. Moreover, the generalized throbbing headache seen in anoxia, "hangover," and fever, and experimentally produced by the intravenous injection of histamine, follows increased pulsation and distension of the intracranial arteries. Headaches that result from these mechanisms can be "spun out" by a "human centrifuge" that decreases cranial pressure and blood flow.

Migraine headaches, associated with distension of extracranial arteries, appear to have three phases: (i) vaso-constriction of the arteries producing blanching and occasionally visual defects—a pre-headache phenomenon, (ii) painful vasodilatation, and (iii) edema of the vessel walls. Small vascular accidents often accompany the second and third phases.

Psychological factors play a significant rôle in almost 80 per cent of all headaches. Many migraine attacks can be relieved by removing the psychological disturbances, headaches associated with hypertension are often alleviated without modifying the hypertension, and hay fever attacks can be induced and relieved by psychological suggestion.

G. McK.