produced on the lower end of the esophagus, the cardia and the fundus et corpus ventriculi. Relatively low frequencies and intensities of stimulation cause pronounced contraction. Increase in frequency or strength beyond that of the excitatory stimulation, on the contrary, after producing first an initial contraction, leads to relaxation during stimulation and strong after-contraction on cessation of stimulation. Repetition of the inhibitory stimulation during the after-contraction causes relaxation, and is followed again by contraction. These effects are produced most readily in the lower end of the esophagus. When this part of the gullet has been thrown into contraction by excitatory stimulation of the vagus, an increase either in frequency or strength of stimulation evokes relaxation. Conversely, relaxation gives place to contraction, when in a period of inhibitory stimulation either frequency or intensity is diminished.

The fundamental difference in effect produced by the two types of stimulation is illustrated further by simultaneous stimulation of both vagi. In the case of the lower end of the esophagus, excitatory stimulation of one vagus may have little or no effect if repeated during the relaxation caused by simultaneous inhibitory stimulation of the other vagus. Moreover, the strong contraction produced by excitatory stimulation of one vagus may be reduced practically to nothing by simultaneous inhibitory stimulation of the opposite vagus.

The above reactions are independent of the cardio-inhibitory action of the vagus.

The change from contraction to relaxation on increase in frequency or strength of vagal stimulation is analogous to the Wedensky effect,[1] and it may be explained on similar grounds. It may have important bearing on processes of inhibition in general. The reaction which occurs when stimulation of relatively high intensity or frequency is applied to the vagus stands in close relationship to such phenomena as reversal of the action of the vagus on the heart,[2] and reflex rebound.[3] It is quite typical also of reactions characterized by initial increase of activity of the effector on stimulation of its nerve, followed by decrease of activity during stimulation, and a second increase on cessation of stimulation. Such reactions are seen under certain conditions in the action of the chorda tympani on the submaxillary gland,[4] the nervus erigens on the bladder,[4] and the cervical sympathetic on the m. dilatator pupillae.[5] It is probable that the change from an excitatory to an inhibitory effect on increase in frequency or strength of stimulation of the vagus will throw light on these imperfectly understood phenomena.

A full account of this investigation will be published in the *American Journal of Physiology*.

H. O. VEACH

HARVARD MEDICAL SCHOOL

[1] Wedensky, N., *Archiv. f. d. ges. Physiol.*, 1885, XXXVII, p. 69; *Archives de Physiol.*, 1891, XXIII, p. 687.

[2] Dale, Laidlaw and Symons, *Journ. Physiol.*, 1910, XLI, p. 1.

[3] Sherrington, C. S., *Proc. Roy. Soc.*, 1908, B, LXXX, p. 53.

[4] Langley, J. N., *Journ. Physiol.*, 1911, XLIII, p. 125.

[5] Dale, Laidlaw and Symons, *Journ. Physiol.*, 1910, XLI, p. 16.

THE INDIANA ACADEMY OF SCIENCE

THE Indiana Academy of Science held its thirty-ninth annual meeting at DePauw University, Greencastle, Indiana, on December 6 to 8. The following program was presented:

GENERAL SESSION

Brief Business Session.

Presentation of Papers of General Interest.

Causes of and remedies for the inefficiency of locomotive whistles: ARTHUR L. FOLEY.

The southern Ute Indians of Pine River Valley, Colorado: ALBERT B. REAGAN.

Variations among Indiana counties in the death rate: S. S. VISHER.

A plea against over-standardization in scientific education: E. G. MAHIN.

Presidential Address: *Bacteriology and its practical significance:* CHARLES A. BEHRENS.

SECTIONAL MEETINGS

BOTANY–ZOOLOGY

Does Allium vineale L. produce seeds in Indiana? Recent Indiana weeds; A weed survey of Indiana: A. A. HANSEN.

Indiana fungi: J. M. VAN HOOK.

Plants new or rare to Indiana—XII: CHAS. C. DEAM.

Culture methods in the production of polyembryony in certain ferns (Polypodiaceae); Behavior of fern pro thallia under prolonged cultivation: D. M. MOTTIER.

Plant relations in Brazos County, Texas: ELMER GRANT CAMPBELL.

The trees of Vanderburg County: A. J. BIGNEY.

Some soil and water reactions in the dunes region of Porter County: M. W. LYON, JR.

Notes on grasses: PAUL WEATHERWAX.

Indiana plant diseases, 1923: MAX W. GARDNER.

Nitrate studies on Purdue rotation field number 6: I. L. BALDWIN, W. J. NICHTER, R. O. LINDSEY.

Cultural methods with rusts: E. B. MAINS.

Plants of White County—VI: LOUIS F. HEIMLICH.

Notes on the life history of the snapdragon rust, Puccinia antirrhini: E. B. MAINS.

An ecological view of wet waste land: BLANCHE MCAVOY.

Preliminary notes on comparative growth in grazed and ungrazed woodlots at Purdue: BURR N. PRENTICE.

A new station for Tipularia discolor (Pursh) Nutt: RAY C. FREISNER.

The relations of vegetation to bird life in Texas: HARRY C. OBERHOLSER.

A note on the functions of the forceps of earwigs: W. P. MORGAN.

A seven somite human embryo: F. PAYNE.

A study of the breeding habits of the Bluegill, Lepomis pallidus Mitchill: LOWELL THELWELL COGGESHALL.

The relation of size to age in some common freshwater fishes: HOMER R. BOLEN.

The diurnal oxygen pulse in Eagle (Winona) Lake; An analysis of the contribution of Hyalella to the economy of a lake; The morphometry of Eagle (Winona) Lake: WILL SCOTT.

New intra-state records of Indiana mammals: M. W. LYON, JR.

What is the Indiana state normal school doing to promote public health? R. A. GANTZ.

Re-vegetation; Midsummer growth; Studies on pollen —IV; Protoplasmic streaming: F. M. ANDREWS.

CHEMISTRY–PHYSICS–MATHEMATICS

A Rayleigh disk of new design and increased pitch range; A proposed phonometer based on a new principle; The inadequacy of resonance theories applied to horns; Further experiments on spoke and disk wheels: ARTHUR L. FOLEY.

Why the logarithm in logarithmic decrement: R. R. RAMSEY.

The silent electric discharge and its effects on gases: R. H. GEORGE and K. A. OPLINGER.

The electrometric titration of boric acid in the presence of polyphenols and of organic acids: M. G. MELLON and V. N. MORRIS.

Calculating the results of a volumetric analysis: M. G. MELLON.

The corrosion of lead cable sheath by Indiana soils; Some calculations of the composition of liquid water: F. O. ANDEREGG.

The influence of certain factors on the hydrogen ion concentration of milk: ELI DUNCOMBE.

Some farm chemistry I have met: R. H. CARR.

Electrometric titration of the vegetable alkaloids: E. G. MAHIN and G. B. WILSON.

Tests of new alloys for permanent magnets: C. M. SMITH.

On the verification of Lommel's theory of diffraction: MASON E. HUFFERD.

Familiarizing chemistry students with the gram-molecular volume of gases: W. M. BLANCHARD.

GEOLOGY–GEOGRAPHY

The Lost River region and a guide to its study; The deepening and widening of valleys: CLYDE A. MALOTT.

Notes on a few Cretaceous species of Western America, most of them new to science; Indian funerals; Whaling off the Olympic Peninsula of Washington; A West Coast Indian honeymoon: ALBERT B. REAGAN.

Data on the use of Indiana dune sand for track elevation in Chicago: S. S. VISHER.

Geology of the coal measures of Indiana: W. N. LOGAN.

A geologic and physiographic study of the region in the vicinity of Raccoon Creek and the Wabash River, located principally in Parke County, Indiana: GLENN G. BARTLE.

Soil survey in Indiana: T. M. BUSHNELL.

A groundwater experiment at South Bend, Indiana: W. M. TUCKER.

The Fall Creek-Bell Creek Valley, Indiana; The present status of geography: FRED J. BREEZE.

GENERAL MEETING

(Open to the public)

Concert by DePauw University School of Music; Orchestra and University Choir; Courtesy of Dean R. G. McCutchan, Conductor.

Illustrated Lecture on the General Subject of Colloids: MARTIN H. FISCHER.

Science in the government service: HARVEY W. WILEY.

At the general meeting to which the public was invited on the evening of December 7, Dr. W. M. Blanchard, the chairman of the program committee, introduced a rather unusual but very popular departure from the regular procedure at such meetings in having the DePauw orchestra and choir on the program.

Dr. Wiley's talk was a strong plea for the continuation of the Chemical Warfare Service, the abandonment of which is at this time threatened as an economic and humanitarian measure. The fallacy of this attitude, under present-day world conditions, was shown.

Dr. Fischer's talk was a clear, concise, non-technical presentation of the general principles of colloid chemistry and their application to applied chemistry and to plant and animal physiology. Such presentations of highly technical subjects is all too often overlooked by scientific men and can not be too strongly recommended.

The officers of this meeting were:

C. A. Behrens, Purdue University, *president*; F. Payne, Indiana University, *vice-president*; Flora Anderson, Indiana University, *secretary*; W. M. Blanchard, DePauw University, *treasurer*; J. J. Davis, Purdue University, *editor*.

The following officers for the year 1924 were elected:

C. C. Deam, Conservation Department, *president*; C. M. Smith, Purdue University, *vice-president*; Flora Anderson, Indiana University, *secretary*; W. M. Blanchard, DePauw University, *treasurer*; J. J. Davis, Purdue University, *editor*.

HARRY F. DIETZ,
Press Secretary