previous occasions, and from time to time aid has been extended to some of those in need. The report of these experiments published for the use of the Senate in 1911 is one of the most interesting volumes in American medicine. However, these men have not been honored by congress alone. The American Medical Association at the Saratoga session in 1902 sent the members of the Yellow Fever Commission a vote of thanks and resolved that the far-reaching beneficence of their discovery was second in magnitude only to that of Jenner's discovery of vaccination. Scientific societies throughout the country paid similar respects; the Virginia state medical society has made the birthplace of Reed a national shrine, and monumental structures have been named in honor of other members.

These are the Americans who risked their lives to help discover the method of transmission of a fatal epidemic disease. They volunteered to be injected with blood from patients dying of yellow fever or to be bitten by infected mosquitoes, to sleep in beds in which patients died and to wear the clothes of patients who died. Thus they helped to drive yellow fever almost from the face of the earth. Our own land had previously been invaded at least ninety-five times with a loss of not less than a hundred thousand lives. It seems incredible in the light of present knowledge that epidemics of yellow fever have taken 3,454 lives in New York, 10,038 in Philadelphia, 4,565 in Charleston, 7,759 in Memphis, 2,000 in Norfolk and 41,348 in New Orleans, besides sweeping through Baltimore and many smaller cities. In those days people fled from their homes, for nobody knew whence or how the scourge came.

When the U. S. Army Commission was sent to Cuba in 1900 to investigate the cause, yellow fever was still taking the lives of American soldiers, although three years before Sanarelli believed that he had discovered the cause. Major Reed, the chairman, knew that Sanarelli's work had been accepted by some American investigators. The commission therefore gave its entire time at first to a search for *Bacillus icteroides* and after a study of twenty-one cases during life and eleven necropsies concluded that it bore no causative relation to the disease. Attention was then given to Finlay's theory that yellow fever was transmitted by mosquitoes. A camp was built near Havana, the buildings being screened so that mosquitoes could be kept in or out, as desired. The work was organized so that every step was controlled. Here the volunteers whom congress has honored offered their lives and lived for weeks in the face of death. Some of these men did not contract yellow fever but twenty-two cases were produced in the course of the experiments. All except Dr. Jesse W. Lazear recovered. It was proved that yellow fever is transmitted by *Stegomyia fasciata,* that it can be transmitted by the injection of blood from yellow-fever patients and that it is not transmitted by exposure to fomites.

In the further recognition of this achievement and in honoring and assisting these men, congress has reflected great credit on the whole country. The world has received the benefaction they bestowed.—*The Journal of the American Medical Association.*

SCIENTIFIC APPARATUS AND LABORATORY METHODS

SOME USEFUL PETROGRAPHIC METHODS

"A Location Finder for Microscopes" described in the February 15 issue seems to me a rather cumbersome and complicated method of doing what we have been doing for years with an ordinary mechanical stage on a (Leitz) petrographic microscope. The slide always fits into the stage in a fixed position relative to the optic axis of the microscope, and the coordinates of the object in view are simply read off and recorded, as 15/7, for example.

While on the subject, it may interest users of petrographic microscopes to learn of a method of determining refractive indices in thin sections, powders, etc., which has entirely superseded in this laboratory the Becke Line method, shading the mirror with a card, etc. The object is viewed with a No. 3 objective (Leitz microscope) with the polarizer in and the condenser out. The analyzer is slowly moved in, and the boundary between the adjacent mineral grains, or the mineral and immersion liquid, becomes sharply illuminated or shaded, as the relative index is less or greater. The method is exceedingly delicate; and the optical theory will be evident on brief consideration of the passage of light in the optical system.

Another small item which has been found useful is in the use of the pinhole and the oil-immersion ($^1/_{12}$) lens in securing interference figures of very small grains. It has been found that with the ocular removed, as is necessary for securing sharp definition, the Bertand lens makes a quite satisfactory provisional ocular, and may be used for orthoscopic vision while centering, etc., for conoscopic.

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RECORDING BY PERFORATING

Physiologists and psychologists may be interested in a new principle of accurate recording which has proved to be practical, convenient and inexpensive.

A pin was attached at right angles to the prong of a 100 dv. tuning-fork, and its tip vibrated in a cork. By pulling a strip of adding-machine paper over the cork while the tuning-fork was in operation, the fork punched timing holes as accurately as it ever traced a curve. An electric bell, with the gong removed, and with a pin on its arm, likewise will give a series of perforations for as long as the circuit is closed. Thus any method of closing the circuit through the electric bell for an instant or for long times will give a record.

Mr. Joe Alexander, a graduate student in the psychology of athletics, has applied this principle to a study of reaction and total time in running. He records the firing of the gun, the start and the finish, by making contacts which momentarily close the circuit of the electric bell interrupter. The 100 dv. fork gives him his finer measures, and a one-second timer the grosser. He can record all six runners in the 100-yard dash at the same time.

This basic method of recording by perforating may be used to replace many types of fountain pen and pencil recordings, and may especially be used in reaction time work. There are no adjustments or refillings of any kind to the recording instruments, and our present device is relatively fool-proof.

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SPECIAL ARTICLES

THE STIMULATION OF METABOLISM BY ALCOHOL

THE foods serve several functions in the body. One of the functions is to be oxidized to give rise to heat and energy, and another to increase metabolism, or oxidation. The animal body is continually producing heat and giving it off to the surrounding air.. Previous to the time of Lavoisier (1780) it was a most difficult problem to explain this heat production by an animal. Lavoisier solved the problem when he showed that the heat of the body is derived from the oxidation of the food materials.[1] How this oxidation is brought about in the body seems to be as perplexing now as was the problem of how heat was produced in the body before the time of Lavoisier. Lavoisier also showed that the ingestion of the food increased oxidation and heat production. Rubner[2] found that the ingestion of protein increased metabolism more than sugar or fat. Lusk found that the amino acids increased heat production, and he attributed the stimulating effect of proteins to the amino acids resulting from the digestion of the proteins.[3] Later, however, he attributed it to the organic acids resulting from the deaminization of the amino acids.[4]

It is already recognized that alcohol can serve at least one function of the foods, namely, that of being oxidized in the body to give rise to heat. In fact, alcohol is more easily oxidized than ordinary foodstuffs, and for this reason it is used in critical periods of sickness and in weakened conditions of the body. The object of this investigation was to determine if alcohol can also serve another function of the foods, namely, that of stimulating metabolism, or more specifically, sugar metabolism.

The respiratory quotient is the index usually used to the amount of sugar metabolized in the body, a rise in the quotient indicating an increase in sugar metabolism; and a fall, a decrease in sugar metabolism. In this investigation sugar utilization, as well as the effect of alcohol and the foodstuffs on this utilization, was determined directly. This was done by adding these materials to sugar solutions in which were placed goldfish and making sugar determinations from time to time. A mixture of glycerole with equal portions of sodium palmitate, stearate and oleate was used for the fat. The alcohol used was ethyl alcohol. Instead of protein a mixture of equal portions of the following amino acids was used: glycine, dl-leucine, dl-valine, d-glutamic acid, dl-isoleucine, l-tryptophane, l-cystine, l-tyrosine, l-leucine, dl-alanine, arginine, dl-phenylalanine and l-aspartic acid. Three cubic centimeters of alcohol were used. One cubic centimeter was added at the beginning of the experiment and one half cc was added subsequently at intervals of five hours until 3 cc in all had been added. One hundred mgs of the mixture of fatty acids and glycerole as well as a hundred mgs of a mixture of the amino acids were used.

The following is the description of a typical experiment. Five hundred cubic centimeters of 0.1 per cent. dextrose solution were prepared, sterilized and divided into four portions of 125 cc. Each portion was introduced into a 200 cc beaker. Two goldfish of approximately the same size and with a combined weight of approximately 5 gms were introduced into each beaker. Air was bubbled through the sugar solutions to insure an adequate supply of oxygen to the

[1] A. L. Lavoisier, "Memoire sur la Chaleur," Mem. Acad. Sc., 355–424. 1780.

[2] M. Rubner, "Die Gesetze des Ergieverbrauchs bei der Ernährung," 322–323. 1902.

[3] G. Lusk, "The Influence of the Ingestion of Amino Acids Upon Metabolism," *Journal of Biological Chemistry,* 13: 155–183. 1912–1913.

[4] G. Lusk, "An Investigation into the Causes of the Specific Dynamic Action of the Foodstuffs," *Journal of Biological Chemistry,* 20: 555–617. 1915.