A STUDY OF SUPERSTITION

Do You Believe It? By OTIS W. CALDWELL and GERHARD E. LUNDEEN. 307 pp. Doubleday, Doran and Company. 1934. $3.00.

THIS meritorious volume has a divided purpose. The one is to present a general survey of superstitions as they come down through the ages, are modified and revived, together with some account of the origins of these persistent beliefs and the habit of mind, the quality of reasoning behind them. The other is to investigate the present prevalence of beliefs in superstitions and their effect upon behavior; and in view of the finding to suggest some educational measures to counteract this incongruous and somewhat weakening trend. The two purposes are not altogether consistent, nor can they follow the same treatment and style. The reader interested in the popular aspects will not follow the statistical account; and those who read it for its more serious purpose have no need to enlarge their acquaintance with popular misconceptions.

The general survey does not go sufficiently behind the scenes to add to the philosophy of the topic; that is a far-flung inquiry in its own right. The survey includes false beliefs (such as weather signs) where there is some measure of scientific approach and also folk-lore as well as doctrinal superstitions in which this is lacking.

While these two orders of false thinking should be distinguished, it is convenient to have the two aspects assembled within one pair of covers; and this contribution by Dr. Caldwell and Mr. Lundeen serves the purpose well. It will give libraries just the book to which they can refer the general reader, who, if he reads it properly, will emerge from the exercise with a wiser view of the distinction between the cautious steps of science and the vaulting leaps of superstition, untroubled by the insecurity of premises. It makes a fine correction for the vagaries of popular belief.

The statistical study proceeds by the method of selecting 100 current superstitions and false beliefs and asking the subjects—in the initial series about 700 junior high-school pupils—to indicate whether they hold this belief or do not, whether they heed it or not in their behavior. The general result, that on the average, these students approve or assent to or are affected by as many as 22 such superstitions, indicates a rather formidable hold of false beliefs in the formative educational years. The superstitious tendency diminishes somewhat with maturity; girls are uniformly more hospitable to such beliefs than boys; the more intelligent entertain fewer superstitions than the less intelligent; the contagion of belief among friends, home and immediate surroundings is the dominant factor in their spread. Introducing corrective training in the general principles of cause and effect, as illustrated in the sciences, definitely reduces the inclination toward superstitious beliefs.

These general results, for the most part readily anticipated, are about all that the statistical method can yield. They supply a somewhat objective set of data, but do not, perhaps can not, attain any greater significance. It is true of this, as of many another painstaking study in the less concrete realms of educational psychology, that their yield is small compared to the expenditure of mental energy involved. The essence of such a problem as the spread and hold of superstitions lies in the qualitative analysis of the habit of mind conducive to their acceptance. This disappears in the mass statistics, in one respect needlessly so. Crude superstitions and false generalizations are treated as one. If separated, as they could readily be, and if furthermore within the superstitious field the more venial instances were separated from the grosser violations of logic, a step or two might be taken toward an index of superstitiousness. A comparison of the ten most generally accepted with the ten most generally rejected gives the impression—despite a rather scattered distribution—that these young ideas, which are trying to shoot straight, are mostly given to the lighter types of illogicalities.

The literature of superstition has been mainly one of anthropological interest when serious, of folk-lore curiosity when in popular vein. The psychological interest forms a chapter in the comprehensive story of how the human mind groped, stumbled, drifted, fumbled in its haphazard course in learning how to think. The conflict of psychological trends with logical precepts, pointedly illustrated in wish-thinking, explains part of it; the intrinsic difficulty of the technique outside the familiar range of events accounts for another phase. Scientific thinking does not come naturally to the popular mind; those professionally devoted to its dissemination have gone through a discipline to attain their expertness.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

THE GEAR PUMP AND HOSE AS A COLLECTOR OF WATER SAMPLES FOR GAS ANALYSIS

IN our study of the gaseous content of the waters of Chesapeake Bay and its tributaries, in connection with a biological survey, it is often necessary to take samples from a depth of 25 meters or more where the water is under much greater pressure than at the surface. It is generally known that when such samples reach the surface there is a tendency for the contained gases to pass from the water to the atmosphere if the water is exposed. Those who have studied the gas content of samples of natural waters are agreed that precautions must be taken to protect the samples in some way if accurate analyses are to be made.

However, a review of the literature indicates that most workers have not paid much attention to the loss of gases resulting from bringing deep-water samples to the surface. It is true that Krogh,[1] using a bottle for the collection; B. Helland-Hansen,[2] discussing the use of a pump and hose; Buch and Grippenberg[3] and others state that the loss of gases is negligible. We believed that this might be the case ordinarily, but since we wanted to use the convenient pump and hose method in an extensive series of analyses for gases in water we felt it necessary to compare samples collected in this way with those collected by an apparatus where there could be no loss.

The apparatus used was constructed as described below. A 250 cc glass tonometer (Fig. 1), such as

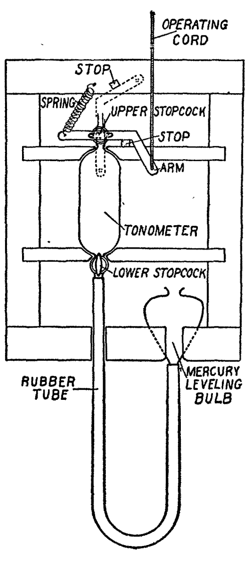

FIG. 1

the one used by Van Slyke in his gas studies, was mounted in a wooden frame of 2″ x 4″ material in such a manner that it was held in position vertically about midway in the frame. One end of the tonometer, with both stopcocks open, was connected by a heavy walled rubber tubing to a 500 cc mercury leveling bulb. The latter was slotted into the base of the frame so that it could be easily removed and replaced. About 500 cc of mercury was then poured into the mercury leveling bulb and the bulb was raised until the tonometer was filled with mercury so that no air was present, even above the upper stopcock, which was then closed. Any gases which might have been in between the mercury and the glass walls were expelled by lowering the mercury leveling bulb several times so as to produce a partial vacuum in the tonometer and then manipulating the leveling bulb and the upper stopcock, the latter being left closed finally. The leveling bulb was then returned to its place in the base of the frame. In this way the tonometer was filled with gas-free mercury.

In order to fill the tonometer with a sample of air or of water all that is necessary is to open the upper stopcock. The mercury in the tonometer then flows down through the tube into the leveling bulb in order to make the level of the mercury the same in both. When the mercury has run out of the tonometer the upper stopcock is closed. The result is a sample of air or water filling the tonometer and protected from escape above by a closed stopcock and from below by mercury.

In order to make the apparatus so that it could be opened at some considerable distance from the operator, *e.g.*, at a depth of 25 meters in the water, a metal arm was fastened to the upper stopcock. The arm was bent in such a way that a cord attached to the arm, as shown in Fig. 1 and pulled sufficiently, would rotate the stopcock through 90° and then stop. In order to close the stopcock, a stout coiled spring was attached to the other end of the arm and anchored to the top of the wooden frame. Thus the spring automatically closes the upper stopcock when the tension on the cord is released. To prevent the metal arm from moving through too wide an arc, a metal stop was placed on the top of the frame in such a position that when the arm had moved and had opened the stopcock, further rotation was prevented. Another stop was placed as shown in the figure, so that the arm would not move too far when the tension on the cord was released.

Since the apparatus just described was lowered along with the hose so that samples could be taken at the same time and depth with both the tonometer apparatus and the hose-pump apparatus it is necessary to describe the latter.

A 1-inch Oberdorfer bronze, gear pump driven by hand was used. In order to facilitate the taking of samples for different purposes, *i.e.*, for plankton and for chemical analysis, certain accessories were added. They were made of tinned brass so as to avoid chem-

[1] A. Krogh, *Meddelelser om Grønland*, xxvi: 341, 1904.

[2] B. Helland-Hansen, *Internationale Revue der gesamten Hydrobiologie und Hydrographie, Hydrographische Supplemente*, 1. Serie, 2 Heft, p. 16, 1912.

[3] K. Buch and S. Grippenberg, *Jour. du Conseil*, 7: 244, 1932.

ical interaction between the apparatus and the water samples. All the joints between the pump and the accessories were sweated shut, thus giving a continuous metallic surface. The accessories consisted of a tee, a pet cock, a gate valve, a 1-inch pipe and a piece of block tin tubing. One limb of the tee, the opening of which may be used for priming purposes, is stopped with a removable plug. After priming, the plug is tightly screwed in. A second limb was attached to the outflow opening of the pump, while the third limb with the gate valve in it served as the main outflow of water from the tee. The pet cock was sweated into the side of the third limb and the piece of block tin tubing, 12 inches long, was soldered on to the delivery end of the pet cock.

The intake end of the pump was attached to a hose reel by means of a 1-inch pipe and a ground brass swivel joint, which enables the operator to conveniently pay out as much hose as is needed and then by means of a wrench to readily make this joint leak-proof. The hose measured 1 inch inside diameter. It is necessary that all parts of the pump and its attachment to the hose should be leak-proof or serious errors will arise due to the sucking in of air.

In order to make the final preparations for the collecting of both kinds of samples at the same depth and time, the tonometer apparatus, assembled and adjusted as described above, was firmly wired to the hose alongside of its intake end. The end of the hose was weighted with 60 pounds of lead so that the hose would extend downward as nearly vertically as possible. The hose with lead and tonometer apparatus firmly wired to it at the intake end as described were then lowered to the desired depth, the operator paying out the cord with which the tonometer stopcock may be opened.

Both sets of apparatus are now ready for the collection of the sample. In the case of the tonometer the cord upon being drawn tight will open the upper stopcock and allow the water to enter, since the mercury held in the tonometer sinks in order to adjust its level to that in the leveling bulb, which is at a considerably lower level. A release of the tension on the string after 5 minutes allows the stopcock to be closed again by the spring and the sample is tightly enclosed in the tonometer.

In the case of the pump and hose apparatus, after priming and screwing in the priming plug, the pet cock connected with the block tin tube is closed, the gate valve is opened and the water pumped up until sufficient has flowed out to yield a sample which has its origin from 25 meters. The gate valve is then closed, the pet cock opened and a sample of water is delivered either under oil in a sample bottle or preferably into a tonometer such as the one used in the tonometer apparatus but without the rubber tubing, mercury and leveling bulb.

Samples of this sort, taken by the two methods, were then analyzed, within a short time, in the laboratory, using the manometric Van Slyke apparatus. The samples can be transferred to the Van Slyke apparatus without loss of gas if the usual methods in the operation of the apparatus are followed.

A comparison of the results obtained in an analysis of two samples collected by the methods outlined above are given in Table 1.

TABLE 1

	Total CO_2 p.p.m.	O_2 p.p.m.	N_2 p.p.m.
Pump	50.5	9.1	17.8
Tonometer	51.7	8.1	17.1

It will be noted that the difference in each case is about 1 part per million. Even this difference might have been due in part to the use of oil for the pump samples. Another pump sample gave closely similar results. Earlier work, however, in which less care was taken in making the pump and hose leak-proof gave a greater discrepancy in results. It is evident, however, that when the pump and hose are properly put together and properly handled the values obtained for the gases in the water samples taken will be sufficiently accurate for physiological purposes.

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METHIONINE AS AN IMPURITY IN NATURAL LEUCINE PREPARATIONS

IN recent experiments dealing with the effects of various amino-acids in the growth of the diphtheria bacillus, differences have been found in the action of l-leucine preparations. It was recalled that in the early work on methionine considerable sulfur, probably as methionine, was always present in the crude "leucine fraction" of material obtained by concentrating protein hydrolysates. Two instances were also in mind of the occurrence of readily measurable amounts of sulfur in specially purified l-leucine, one of these, at least, prepared by the ester method.

Commercial l-leucine from three different manufacturers, two American and one German, were therefore examined. The two former gave strong qualitative tests for sulfur, and likewise a fairly heavy precipitate with $HgCl_2$. The latter gave only a weakly positive test for sulfur and very slight opalescence with $HgCl_2$. Quantitative sulfur determinations by Na_2O_2 fusion were as follows: