to have the manuscripts for such a debate prepared far enough in advance so that all the speakers would have opportunity to read them before they were delivered. The questions at stake could thereby be brought actually to concrete discussion with less waste of time or failure to meet issues.

A further scheme for control might serve to solve many of the difficulties suggested above. Might not the control of all practical exploitation of discovery be vested in one authoritative body for the nation? Whether it be by patent or by the sanction of widespread agreement, no manufacturer would be allowed to sell a drug unless its production and sale were according to definite ethical standards. Income from such sales could be used to provide a royalty for the research funds to support investigation in whatever laboratories needed assistance. This concept would be extended to any phase of scientific work desired. The creation of a single controlling body for the country would do much to remove the danger of jealousies between institutions. The opportunity would be open for all laboratories to profit from discovery in general, as a fair return for the admitted fact that every discovery is based on the previous work of countless investigators. Control of the product of our research would be accomplished with as broad a social vision as such a central organization could furnish. The commercial interests could be adequately protected at the same time.

It may be mentioned that the American Medical Association has made a beginning of a non-legal control of drugs and foods involving part of this social protection. Perhaps the National Research Council might be made the holder of all such patents or the central body to control the application of research in commercial production. The council has already developed a wide acquaintance with the needs of American laboratories. It has provided opportunities for many students to continue investigation. Its limited funds have been dispensed by a changing group of men from the ranks of scientists themselves. The council has earned the respect of the investigators of the country. In this organization, already set up, may be the basis for an unselfish authority to advance research and its prompt application in the life of men even more effectively.

ELMER L. SEVRINGHAUS
DEPARTMENT OF MEDICINE
UNIVERSITY OF WISCONSIN

POTASSIUM PERMANGANATE AS AN ANTIDOTE FOR SNAKE VENOM

FOR many years one of the most generally recommended antidotes for snake poison has been potassium permanganate. More recently, considerable doubt has been expressed as to the efficacy of this chemical in cases of snake-bite.

At intervals for the past two years the writer has been experimenting with white rats in the endeavor to get some experimental evidence upon the subject. An abundant supply of dried venom of rattlesnake was obtained through the courtesy of the Antivenin Institute of America. This dried venom dissolves readily in normal salt solution and may thus be injected into the animal with an ordinary hypodermic syringe. Subcutaneous injections were made, owing to the difficulty of injecting directly into a blood vessel in so small an animal; this requires a larger quantity of venom for each animal, but the effect is quite promptly evident, death in some cases occurring within an hour and generally, if it occur at all, within twenty-four hours.

The animals were etherized for ease of manipulation, and the permanganate in the form of a 1 per-cent. solution in distilled water was injected immediately after the venom and at the same spot.

The rats were found to be, relative to their size, highly resistant to the Crotalus venom; and within a comparatively wide range the size of the rat had little relation to the amount of venom necessary to produce death.

Two hundred and sixty-seven rats were used, but in the endeavor to find a minimum lethal dose of the venom many were killed without gaining any direct information upon the main object of the research. More than a dozen were used to prove that injection of the permanganate solution alone is not nearly so harmful to living tissues as has been claimed. There was so much variation in the individual susceptibility of the rats to the venom that it seemed impossible to determine a minimum lethal dose, and after many trials it was found that 20 milligrams of the dried venom was about the smallest amount that could be called a "certain lethal" dose, and in some cases this failed to be lethal. About half of the rats were injected with the venom alone, and in the other half the venom was immediately followed by an injection of the permanganate.

In the chief experiment, where the rats were given 20 mg of venom, the results seemed to show a distinct value for the permanganate. Of 48 rats given the venom without the permanganate only 7 rats, or 14.6 per cent., recovered; while in the 47 rats in which the permanganate followed the venom 13 rats, or 27.7 per cent., recovered. Also the average number of hours that the rats which died survived was 21.3 in the case of the rats without the permanganate and 31.3 in rats which had received the permanganate; in

other words, the permanganate delayed death for ten hours, on the average.

Some of the other experiments, with greater or less amounts of venom, gave opposite results and seemed to indicate that the permanganate has little if any value.

A tabulation of all the experiments indicates that a prompt use of the potassium permanganate had some beneficial effect under the conditions of this investigation. Whether it necessarily indicates its usefulness in cases of human snake-bite accidents, it is difficult to say; but since it seems evident that a 1 per cent. solution of potassium permanganate is practically harmless to living tissues, it is probable that the permanganate should still be used as an antidote to snake venom, at least as a first-aid treatment until other measures can be taken.

The value of incision and suction in the region of the bite is also subject to much debate, but the evidence seems to indicate that prompt and continuous mechanical suction may be of great value in removing the venom from the tissues in the region of the wound.

A more valuable series of experiments might be made with some larger animal where direct injection of venom and permanganate might easily be made into the blood vessels. Some authorities, however, claim that where the snake injects the venom directly into a blood vessel of some size nothing can be done that will effect a cure.

It is obviously not practicable to carry on such control experiments with human beings, but an extensive statistical study of cases of human snake-bite, where permanganate and other remedies are and are not used, should be of great value. India, where more than 20,000 people die each year from snake-bite, would probably be the best region in which to make such a study.

The details of this investigation will appear elsewhere.

ALBERT M. REESE

WEST VIRGINIA UNIVERSITY

UNDERGROUND WATER AS A TRANSPORTING AGENT FOR GASOLINE

ON May 30, 1930, shortly after the opening of a filling station in Wooster, Ohio, gasoline was discovered floating on the surface of the water in a dug well, located 447 feet from the station. On the same day, a five-gallon can was filled with gasoline obtained from the well. On July 18, 1930, 65 gallons were drawn off. At a later time 45 gallons were removed and large quantities drawn off from time to time, until about November, 1930, when the accumulation decreased at a constantly diminishing rate. At no time since the discovery of gasoline in the well has the water been free from the odor of gasoline or the liquid itself. A constantly flowing spring in line with the dug well, and 622 feet from the gasoline station, was polluted; gasoline accumulated in a thick layer on the surface, the excess flowing into a creek, the water of which was rendered unfit for drinking by live stock. Across the road, 141 feet from the station, and in line with the well, a hole was dug to a depth of 12 feet. Gasoline was discovered floating on the water which appeared at the bottom of the excavation. Workmen who were digging a trench on the road between the station and the dug hole reported heavy gasoline fumes at a point opposite the station.

The station, well and spring are located on a slope, the former standing at a higher elevation. The ground water is therefore moving from the station toward the well and spring. Gasoline issuing from holes in defective tanks at the station makes its way downward through the bed-rock until it reaches the ground water upon which it floats. The bed-rock is thin-bedded and well-jointed sandstone, through which the underground water can easily move. The gasoline is transported down-slope by the water, spreading out fan-like, finally reaching the well and spring. Several gallons of brightly colored kerosene were placed in the dug hole opposite the station. In 23 hours the colored material appeared in the well; the underground water had moved a distance of 306 feet in that time.

KARL VER STEEG

COLLEGE OF WOOSTER

MYOESTHESIS AND "IMAGELESS THOUGHT"

IN the course of an experimental test of the behavioristic theory of thinking there was occasion for artificially inducing minimal or "implicit" contractions of human muscles by electrical stimulation. This work yielded a result which is of interest in connection with the "imageless thought" controversy, in that it sheds further light on the non-sensorial and imageless experiences reported by Binet, the Würzburg workers and Woodworth.

To very feeble electrical stimuli our subjects responded with a "sensation of electric shock" but no perception of movement. As the stimulus intensity was progressively increased, muscular contractions were elicited which were objectively recordable and even visible to the naked eye, yet not perceptible kinesthetically by the blindfolded subjects. It was not until the movements were fairly large in amplitude that the subjects reported kinesthetic awareness of them. This result was consistent and was found to hold for both faradic and galvanic stimulation, and for both trained and untrained subjects. The implication is that the supposedly non-sensorial or "pure