fertility also occurred with a moderate incidence of loss of litters due to cannibalism. After five generations breeding markedly decreased.

In view of the fact that Williams[3] stated that as much as from 160 to 1,000 γ of vitamin B_1 daily could be given without any toxic effects when rats were fed a Sherman breeding diet (one third whole milk and two thirds whole wheat), it seemed probable to us that interference with some other essential factor in the diet may have induced the manifestations observed in our experiments.

It is known that deficiency of manganese in the diet presents similar toxic effects on the maternal instinct and reproduction.[4] It was reasoned that perhaps manganese is essential as an oxidative catalyst in the utilization of vitamin B_1 in the tissues. If this is so the available manganese in the tissues may be exhausted by an excess of vitamin B_1, and analogous manifestations would occur as is observed with a deficiency of manganese.

To test our hypothesis we added small amounts of manganese to the diet. Rats which had shown loss of maternal instinct and cannibalism now bred and raised normal litters. The studies were then extended. Rats were raised on the normal diet and given parenterally 200 units of vitamin B_1 daily. Others were given the same diet and vitamin B_1, but the diet was supplemented with 2 mg of manganese as $MnCl_2$ per day per rat. In those receiving the vitamin B_1 alone, cannibalism and interference with lactation occurred in a high percentage in the P and F_1 generation in successive litters (13 of 22 litters). In those receiving in addition supplements of manganese in the diet, none of these toxic symptoms were apparent and the normal maternal instinct and normal lactation were preserved (in a total of 25 litters). In our normal stock observed during the same period no loss of litters occurred.

These results demonstrate that manganese is essential in the utilization of vitamin B_1 in the tissues and is intimately bound up with the role of vitamin B_1 in the physiology of the organisms. It also suggests that variations in certain constituents of the diet, such as manganese, may greatly affect the vitamin B_1 requirement. With the use of large amounts of vitamin B_1 in therapy, an adequate supply of manganese must be made available. As yet it is not known whether the protective effects observed with manganese are specific for manganese as such or would be obtained with other oxidative catalytic metals such as cobalt or copper.[5]

DAVID PERLA

SCIENTIFIC APPARATUS AND LABORATORY METHODS

THE USE OF THE NEON GLOW LAMP IN THE PHYSIOLOGICAL LABORATORY FOR THE ELIMINATION OF MAKE INDUCTION SHOCKS

IN the use of an induction coil as a source of electrical stimuli for living tissue, in the physiological laboratory, it is often desirable to prevent the "make shocks" (the E.M.F. induced in the secondary coil when the primary circuit is closed) from passing through the tissue, and various devices are in use for short-circuiting the secondary coil while the primary circuit is being closed. While entirely satisfactory in performance, such devices, if arranged to operate automatically, are generally complicated and expensive.

While seeking a simple means of automatically eliminating make shocks, that would be suitable for use in the students' laboratory, we hit upon the idea of connecting a neon glow lamp in series in the secondary circuit. It happens that the Harvard coil and some of the other coils manufactured for physiological use in this country when used with one or two dry cells give make shocks that are too weak to ionize the gas in the lamp and are, therefore, not conducted through it; the break shocks, however, are readily conducted.

Since there is some loss of energy in the lamp, due to resistance, a high capacity lamp without auxiliary resistance gives best results. We have provided our students with two-watt glow lamps without resistance in the base. For convenience and sturdiness of mounting, lamps with radiatron base were obtained on special order from the General Electric Vapor Lamp Company of Hoboken, N. J. The sockets are recessed in small cast-iron blocks; suitable binding posts are provided for making connections.

The method has but one serious disadvantage. Since the secondary is not short-circuited and is open-circuited only for low voltage impulses, chatter or vibration of the key used to control the primary circuit must be avoided at the make; otherwise a succession of rapid makes and breaks occurs which induces a high enough potential in the secondary to pass through the lamp. Chatter is easily avoided with hand-operated keys, and electrically operated keys or relays should, in any case, be so designed as to close without chatter. Inciden-

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[3] R. R. Williams and T. D. Spies, "Vitamin B_1 and its Use in Medicine," p 286. Macmillan Company, New York, 1938.

[4] E. R. Orent and E. V. McCollum, *Jour. Biol. Chem.*, 92: 651, 1931.

[5] The vitamin B_1 for these experiments was kindly furnished by the Department of Medical Research of the Winthrop Chemical Company.

tally, since the lamp glows each time an impulse is conducted, chatter of the key and other defects in the electrical system are easily detected. It may be, also, that making the electrical impulse "visible" will prove to have advantages for teaching purposes.

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USE OF THE LUNDEGARDH SPECTROGRAPHIC METHOD

A survey of the spectrographic methods used in this country for the quantitative determination of small quantities of mineral substances reveals the fact that the Lundegårdh[1] method is not employed here. In this method the emission spectrum is excited by means of the flame of a special air-acetylene burner, for which the acetylene and the air are supplied at constant pressure. The air is forced through a few milliliters of the solution of the substance under analysis, thus spraying the solution into the flame uniformly. In this way the spectra of 32 elements at different concentrations have been photographed and, from the intensity of a certain line in each, it has been found possible to make fairly rapid, quantitative determinations of great accuracy and dependability. This is especially true when the Lundegårdh system of constructing both a plate correction curve and a concentration curve for each plate is followed.

The problem of the determination of the mineral constituents of citrus fruits and of some vegetables has been in progress in this laboratory for some time. The material has been dried and ashed quantitatively and then the per cent. of calcium, copper, iron, magnesium, manganese and phosphate in the ash has been determined by micro-photometric or micro-volumetric methods. It has been necessary to use large quantities of the materials in order to obtain sufficient ash to carry through the above analyses. For instance, in the case of orange juice, a liter would be required. This process is long, subject to many sources of error, and dependent upon complicated technique, all of which are in great contrast to the Lundegårdh spectrographic method.

Professor Lundegårdh very kindly gave me the opportunity of working in his laboratory at the Agricultural College of Sweden this summer, and I was able to do some preliminary work on the determination of the mineral constituents of orange juice. By concentrating 100 ml of the juice nearly ten times and oxidizing the organic matter by one of several methods, for instance, by nitric acid and perhydrol, it was possible to obtain results for copper, iron and manganese which were of the same order as our photometric methods. (See Table I.)

TABLE I
Millemols Per Liter Juice

Oranges	Copper	Iron	Manganese	Method
Blue Goose	0.0061	0.042	0.0039	Lundegårdh
Sunkist	0.0072	0.030	0.0039	“
Valencia	0.0065	0.030	0.0043	“
South Africa	0.0068	0.043	0.0033	“
Average[2] for California and Florida oranges	0.0069	0.025	0.0044	Micro-photometric

[2] Honors paper of Annette Florence, Wellesley College, 1936.

It was also possible to determine such metals as potassium and calcium which are present in much larger quantities without concentrating the juice, but by refluxing with hydrochloric acid, filtering out the solid material—really a form of wet ashing—and then spraying into the flame.

In this laboratory at the present time we are continuing the study of the various ways of preparing these solutions, as well as the spectrographic and photometric procedures. It is especially important to carry out careful blank determinations because of the possible contamination from chemicals and apparatus when such small quantities of some elements are to be determined. We also expect to use this method for the determination of mineral constituents in various biological materials, for which it is particularly well adapted.

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BOOKS RECEIVED

Babcock, E. B. and G. L. Stebbins, Jr. *The American Species of Crepis.* Pp. 108. 34 figures. Carnegie Institution of Washington.
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Stefansson, Vilhjalmur. *Unsolved Mysteries in the Arctic.* Pp. xi + 381. Macmillan. $3.50.

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[1] H. Lundegårdh, "Die quantitative Spektralanalyse der Elemente II." Jena, 1934; *Lantbrukshögsk:s Annaler,* Vol. 3, s. 49.