It must be concluded that heating sodium citrate solutions does not increase their osmotic pressure, and that solutions containing 2.9 g per 100 ml—whether they have been heated or not—are not isotonic with bull's blood which, according to Salisbury *et al.* (1948), has a mean freezing point depression of 0.56° C.

Nevertheless, in making up egg yolk-citrate diluents for semen, the use of solutions containing 2.9 g of $Na_3C_6H_5O_7 \cdot 2H_2O$ per 100 ml appears *theoretically* sounder than that of solutions containing 3.6 g (as earlier recommended by C. B. Knodt and G. W. Salisbury [*J. Dairy Sci.*, 1946, **29**, 285]) for which a freezing point depression of 0.645° C was found by the Hortvet technique. Since egg yolk has an average freezing point depression of 0.60° C (Needham, J., and Smith, M. *J. exp. Biol.*, 1931, **8**, 286), mixtures of equal parts of yolk and 2.9% citrate solution with a freezing point depression of 0.526° C are likely to be nearly isotonic with fresh bull's semen which has an osmotic pressure equal to, or slightly higher than, bovine blood (Salisbury *et al.*, 1948). Mixtures of equal parts of yolk and 3.6% citrate solution, on the other hand, are clearly hypertonic to semen. Whether this point is of *practical* importance, however, remains to be seen. The good results of artificial insemination obtained in the past with 3.6% citrate solution suggest that, within limits, bull's semen is not very sensitive to variations in the tonicity of the diluent.

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A Simple Method for Opening Quartz Capsules Containing Radioactive Materials

The authors encountered considerable difficulty in opening capsules containing either irradiated red phosphorus or phosphorus pentasulfide obtained by service irradiation at Oak Ridge National Laboratories on authorization from the Atomic Energy Commission. These materials were submitted for service irradiation sealed in quartz capsules of less than 3 in. in length and ½ in. in diam, packed under nitrogen at less than atmospheric pressure. The phosphorus was obtained in 1-g lots with an activity of 50 mc, and the phosphorus pentasulfide was obtained in a 4-g sample with an activity of 150 mc.

The apparatus shown in the accompanying drawing was used to open the sample of P_2S_5 without any laboratory or personnel contamination and also served to minimize the exposure of the operator's hands. (The survey meter read less than 2 mr/hr outside the case.)

After unpacking, the quartz capsule (Fig. 1, *4*) was placed in a hole of the proper dimensions in a lucite rod (Fig. 1, *5*) 1½ in. × 2½ in. A cement of lucite dissolved in chloroform was used to secure the capsule in the lucite rod. This lucite rod was placed in a lucite box (Fig. 1, *7*) 4 in. × 4 in. × 4 in. with walls ½ in. thick. This box was equipped with a retaining screw for holding the lucite rod and with a filter packed with glass wool (Fig. 1, *8*) to remove any radioactive materials that might be dispersed when the capsule was opened. The filter was connected to a vacuum source to insure a flow of air into the box through the shaft opening and at the junction between the cover and the box. The sliding cover (Fig. 1, *2*) was of ½-in. lucite, 6 in. × 6 in. A Dremel Moto Tool, or equivalent, was mounted on the sliding cover with the shaft projecting into the box. A carborundum cutting disk (Fig. 1, *3*) was mounted on the shaft, which was positioned in the chuck so as to bring the cutting disk in proper alignment with the quartz capsule. The cover was then placed on the box slightly off center so as to bring the edge of the carborundum disk into contact with the side of the quartz capsule. The sliding cover was then moved slowly so that the carborundum disk cut a groove completely around the capsule.

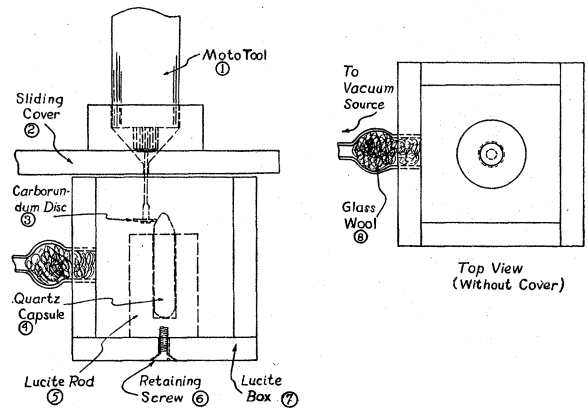

FIG. 1.

The authors have found it desirable to cut the top off completely with the cutting tool rather than break it at the groove by a sharp blow, since the sudden rush of air into the capsule tends to disperse the radioactive material. After the top is sawed off, the retaining screw is loosened and the lucite rod is removed with tongs to transfer the radioactive materials to the reaction flasks.

For gamma emitters the box and sliding lid can be constructed of lead, with lucite employed for the side of the box away from the operator in order to provide light. A lead-glass observation window in the front or a mirror placed behind the box would enable the operator to observe the position of the carborundum disk and the progress of the cutting operation.

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Water-soluble Riboflavin Derivative

The recent paper "A Very Water-soluble Riboflavin Derivative" by George B. Stone (*Science*, 1950, **111**, 283) prompts us to report our own findings, which have a relation to his. During our search for water-soluble, biologically active riboflavin derivatives, which resulted in the preparation of methylol derivatives of riboflavin (Schoen, K., and Gordon, S. M. *Arch. Biochem.*, 1949, **22**, 149) we prepared in 1947 a riboflavin sulfate ester by essentially the same method as reported by Stone.

Five grams of riboflavin, suspended in 10 ml water, was cooled to 0° C in an ice-salt mixture, and 50 ml concentrated sulfuric acid was added dropwise with stirring at such a rate that the temperature remained between −5° and +10° C. After stirring for 30 min, the solution was poured on 500 g ice and brought to pH 2 with solid barium hydroxide. Sodium bicarbonate was added to pH 7 and the solution was concentrated *in vacuo* to 50 ml. A sodium salt of the riboflavin ester was precipitated by addition of 500 ml anhydrous ethanol and 200 ml acetone. A yellow, very water-soluble powder was obtained.

A solution of this product containing the equivalent of 6 mg riboflavin per milliliter had a microbiological activity of 0.25 mg riboflavin per mill liter, an activity of about 4%. This compares with an activity of 1.5% for Stone's product. Under the conditions of our experiment, it is probable that mainly the primary hydroxyl group of riboflavin has been esterified (Swern, D., *et al. Oil and Soap,* 1943, **20**, 224). As in the case of tri- and tetrasuccinates (Furter, M. F., Haas, G. T., and Rubin, S. H. *J. biol. Chem.,* 1945, **160**, 295), the sulfate is biologically active only after previous hydrolysis by autoclaving. In contrast to this behavior, our methylol derivatives are active biologically without previous hydrolysis, and autoclaving does not increase their activity.

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Erratum

In our paper "Pantothenic Acid in Copper Deficiency in Rats" (*Science,* 1950, **111**, 472), in the last sentence of the second paragraph on page 473, the daily administered dose mentioned should be "0.1 μg of copper" and not "1.1 μg" as printed.

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Foreign Publications in the Field of Organic Chemistry

I have read with great interest the article by F. S. Boig on domestic and foreign periodicals in the field of organic chemistry (*Science,* 1949, **110**, 107). Boig tabulated (see Table 2, page 108) the number of organic chemical publications in various countries in the years 1937 and 1947, measuring the organic chemical research in these countries by the volume of organic chemical publications and drawing certain conclusions from the results.

One arrives at even more interesting conclusions if one does not simply compare on this basis such very large countries as the United States and Russia with such very small countries as Holland, Finland, Sweden, and Switzerland, but instead computes the ratio of the number of inhabitants to the number of organic chemical papers in these countries.

TABLE 1

	Country*	Year	No. of inhabitants for each organic chemical publication	Rank
I.	Switzerland	1937 1947	42,000 22,000	1
II.	Germany	1937	112,000	2
	Finland	1947	125,000	3
	U.S.A.	1947	135,000	4
	British Isles	1947	139,000	5
	Holland	1947	150,000	6
	France	1947	168,000	7
	Sweden	1947	179,000	8
III.	Italy	1937	275,000	9
	Austria	1937	350,000	10
	Japan	1937	390,000	11
	U.S.S.R.	1937	440,000	12

* Category I: less than 50,000 inhabitants per publication.
" II: 100,000–200,000 " " "
" III: 300,000–500,000 " " "

Thus the countries are grouped here in Table 1 in a somewhat different manner than in Boig's table. Switzerland now achieves a unique position, far ahead of the other categories.

For several of the countries I have chosen the number of papers from the year 1937 instead of 1947, since it is certainly not logical to take for comparison the strongly war-exhausted countries like Germany and others with the greatly reduced production of the year 1947. It is perhaps also of interest to point out further that, for the time of the organic chemical *Hochkonjunktur* in Germany about 1910, this country would fall in category I.

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Use of Dried Hemoglobin in the Assay of Pepsin

A recent communication in *Science* (Orringer, D., Lauber, F. U., and Hollander, F. *Science,* 1950, **111**, 88) demonstrates the feasibility of substituting lyophilized bovine hemoglobin powder (Armour) for hemoglobin prepared from fresh blood in the assay of pepsin and trypsin by the well-known method of Anson and Mirsky (Anson, M. L., and Mirsky, A. E. *J. gen. Physiol.,* 1932, **16**, 59). The author many years ago demonstrated that dried hemoglobin "scales," as available commercially, could be used in a very simple assay of pepsin by a very slight modification of the original method which improved its accuracy (Steinhardt, J. *Kg. Danske Videnskab. Selskab., Math-fys. Medd.,* 1937, **14**, No. 11, 1; *J. biol. Chem.,* 1939, **129**, 135).

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