IN THE LABORATORY

A Method for Measuring the Speed of Centrifuges

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The method to be described has been used to measure the speed of rotation of an air turbine.[2] It can be modified, however, to measure the speed of most rotating objects and so may be used in many instances where a tachometer or stroboscope is not readily available.

The principle is very simple and direct: A soot-covered surface is moved parallel to the axis of rotation so that each revolution is recorded; simultaneously, a record of the rate of vibration of a tuning fork is obtained on the same surface. Fig. 1 illustrates the metal frame (in this instance, brass) used

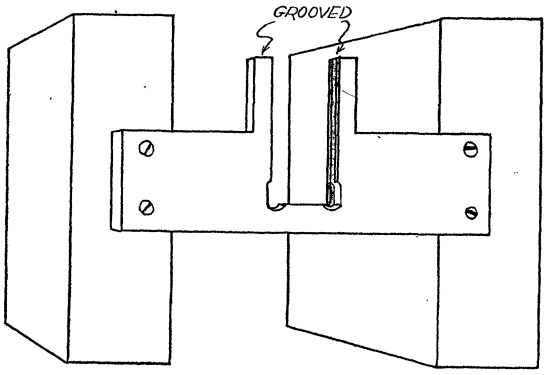

FIG. 1. Frame for holding microscope slide.

to guide the movement of the sooted surface. The two vertical supports are grooved to hold a microscope slide. The horizontal upport is fastened to a wooden block on each end so that the upper surface of the rotor is a short distance below the upper end of the microscope slide when it is in place in the brass frame. For recording, a fiber is glued (using speaker-cone cement) in a horizontal position on the upper surface of the rotor so that it extends $\frac{1}{4}$ inch beyond the periphery. A similar fiber is glued to the tuning fork. The choice of fibers may be varied, but a portion of a bristle from an eraser brush was found to be satisfactory for several tracings. A small length of phosphor bronze wire would be more durable. In order to reduce the deformation of the fiber, since at very high speeds there might be insufficient time for a markedly bent fiber to return to its initial position, a glass rod is sealed lengthwise to the microscope slide with De Khotinsky cement.

[1] Acknowledgment is due Dr. Hans Weltin, Department of Physics, University of Oklahoma, who suggested the method and constructed the apparatus.

[2] One of the authors (F. R. H.) is indebted to the Faculty Research Fund of the University of Oklahoma for this piece of apparatus.

The tuning fork need not be mounted to make the measurements, although a simple support could easily be made if desired. Both surfaces of the microscope slide (including the rod) are blackened, and it is placed in the metal frame with the rod side toward the turbine. The rotor is started, and the frame is moved close enough so that the fiber just marks on the rod. The tuning fork is started and touched to the plain surface of the slide, which is pulled up out of the frame. Measurements are then made on the two sides of the slide. If one makes both measurements, starting from the marks made before the slide is moved, the tuning fork does not have to be lined up with the fiber on the rotor. No error is introduced by acceleration of the slide. If a more rapid rate of slide movement is required, the frame could easily be modified to incorporate a rubber band or spring to be substituted for hand pulling. Velocities of 300 r.p.s., using a tuning fork of 512 c.p.s., were measured easily without any conscious effort to pull the slide rapidly.

A Biologically Absorbable Surgical Glove Powder

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These investigations were initiated by increasing emphasis in the medical literature (*2*) that talc as a glove powder has serious limitations and that a nonirritating, biologically absorbable substitute might be indicated.

Our experience with the controlled heat denaturation of gelatin (*1*) led us to investigate the possibility of rendering gelatin flour relatively water insoluble yet amenable to *in vitro* proteolytic digestion. Such alteration of the protein molecule might yet leave it susceptible to phagocytosis and hence biologically absorbable by the tissues.

Finely ground gelatin was subjected to electric oven heating at 145° C. for the periods of time indicated in Table 1. The

TABLE 1

PROTEOLYTIC DIGESTION OF PROGRESSIVELY DENATURED GELATIN

Heating time (hrs.)	0	4	20	25	29	45	93
Pepsin digestion time (min.)	10	5	15	25	55	90	135

protein became progressively less soluble in water at room temperature. In addition to nitrogen analysis of the supernatants, a practical test of the relative tackiness of each fraction on the damp hands indicated that solubility approached a minimum after about 25 hours of heating.

The *in vitro* proteolytic digestion of these heat-denatured protein fractions was ascertained as follows: A solution was prepared by dissolving 2 grams of U.S.P. pepsin in 100 cc. of 0.37 per cent HCl. To 100 mg. of the protein was added 100 ml.

of this pepsin solution, and the flask suspended with agitation in a constant temperature bath at 37° C. When by visual examination with transmitted light no solids could be seen in suspension upon vigorous agitation, the protein was considered digested. The data in Table 1 show that with prolonged dry heating (dehydration ?) of the protein powder it becomes less readily lysed by enzymatic action—a property which paralleled the physical phenomenon of decreasing water insolubility.

Gelatin powders such as those which were heated 25 hours or longer have been injected into the peritoneal cavities of rats for preliminary investigations. Animals sacrificed after 4–5 weeks showed no granulomata or adhesions; no trace of the injected gelatin powder was in evidence.

Since several of these denatured protein fractions appeared to serve satisfactorily as a rubber glove powder for lubrication, the physiological aspect of this problem is being investigated further and will be reported later in greater detail.

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A Method of Drying Partial Protein Hydrolysates and Other Hygroscopic Materials for Nutritional Studies

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Drying a protein hydrolysate by lyophilization is a procedure that often is desirable as a means of preparing diets for studies of the nutritive value of the hydrolysate. Unfortunately, the tendency to fuse during lyophilization and the hygroscopic nature of the dry material detract from the usefulness of the lyophile technique for this purpose. It has been found in this laboratory that these difficulties are overcome largely by concentrating the solution *in vacuo* and adding dextrin to the concentrated solution. Of the common dietary carbohydrates, only dextrin or starch is suitable; sucrose or cerelose does not aid in subsequent lyophilization.

The vacuum concentration of protein hydrolysates is difficult with ordinary types of distillation apparatus because of the severe foaming usually experienced. With an apparatus of the type described by Mitchell, Shildneck, and Dustin (*1*), distillation rates up to 5 l./hour may be attained at temperatures below 50°C., without any antifoaming agent. An efficient condenser is necessary. A copper water-heater coil, surrounded by a water jacket, was found to be convenient and adequate for this purpose. With this apparatus typical hydrolysates were concentrated to at least 50 per cent solids.

The concentrated hydrolysate is placed in bottles, and dextrin is added and mixed by shaking, after which shelling and lyophilizing are carried out in the usual way. The volume of hydrolysate in each bottle should not be over 10 per cent of the total volume of the bottle. In this laboratory, sufficient dextrin is added to give 30–50 per cent protein in the dry product. The lyophilized material is easily powdered for incorporation in diets.

The same procedure is useful in drying hygroscopic materials, such as liver extract, for use in experimental diets.

Reference

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Synergistic Insecticides

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During the recent war an added war had to be fought against an army of insects in order to keep our fighting men from falling prey to disease. In this connection the well-known, freon-propelled "aerosol" bomb (*3*) made its appearance. Since the end of the war the ease of handling and effectiveness of this bomb have caught the public's fancy, and it may be expected that it will be used as an additional weapon in the expanding war on insects on the home front.

Contrary to some popular misconceptions, the rapidity of knockdown action of the "aerosol" bomb on insects has been due solely to the presence of pyrethrins, which have the unique property of quickly paralyzing insects and other cold-blooded animals while being innocuous to warm-blooded animals.

Because of the high cost of the pyrethrins, many attempts have been made to replace them, and the patent literature of the last few years describes a host of synthetic organic compounds which are highly toxic to insects. None of these, however, possesses the outstanding property of the pyrethrins.

A more promising approach was initiated through the interpretation by Haller and his co-workers of the discovery by Eagleson (*1*) that the addition of sesame oil to pyrethrum extracts increased their effectiveness (*4*). These investigators linked the increased effectiveness with the synergistic effect of the sesamin present in the oil and later with the presence of a methylene-dioxy-phenyl group in the sesamin. They subsequently synthetized the amides of 3,4-methylene-dioxy cinnamic acid and found them active as synergists with pyrethrins (*2*).

These products, however, did not find practical application because of the difficulty of preparing them in quantity and because of their limited solubility in freon and in petroleum hydrocarbons, which are used as vehicles for insecticidal sprays.

O. F. Hedenburg, of the Mellon Institute, Pittsburgh, had been independently investigating compounds containing the methylene-dioxy-phenyl group as insecticides. The results with the chemicals alone did not appear too promising because of the poor knockdown property of the compounds, but when they were tested in combination with pyrethrins, a different result was obtained. While the majority of the compounds tested, including safrole and isosafrole, esters, etc., displayed little or no activity, a new product with outstanding activity was discovered. This was obtained by the condensation of the alkyl-3,4-methylene-dioxy-styryl ketones with ethyl acetoacetate (*5*). The insecticidal effect of this product is apparent