After the publication of Professor Swingle's article three criticisms were received. One of them, abusive and probably libelous, was returned; one by Dr. Norman E. Freeman was promptly printed; the third, by Dr. Britton, was too long for publication in SCIENCE, but a shorter reply was published. After this had been accepted Professor Britton wrote: "Let me again assure you of my gratitude in granting this privilege of reply in your much-esteemed journal." A counter reply by Professor Swingle containing new data was not accepted, though he was informed that a short reply would be.

Professor Britton has published within the last two years five articles in SCIENCE. Indeed the adrenal glands and the whole field of chemical physiology have received, not more attention than their importance deserves, but more space than has been given to other subjects equally important. Now it is necessary to print more words (it costs three cents each to print a word in SCIENCE) on the adrenals; but that and the troubles of an editor are obviously small matters compared with the saving of thousands of lives (see above).

J. McKEEN CATTELL

SCIENTIFIC APPARATUS AND LABORATORY METHODS

A NEW FORM OF CENTRIFUGE-MICROSCOPE FOR SIMULTANEOUS OBSERVATION OF CONTROL AND EXPERIMENTAL MATERIAL

IN centrifuge studies on the effect of substances on the viscosity or the tension at the surface of living cells, comparison of experimental conditions with control conditions is a necessity. This can be accomplished by a slight modification of the centrifuge-microscopes[1] previously described, which very greatly adds to the convenience and usefulness of the instruments. In the same field of view a perfect image of control and experimental material side by side can be obtained for any power of the microscopes (except oil immersion objectives) and for any rate of rotation that will not shatter the materials of which the instrument is made. Adaptation to the Beams air turbine is possible.[2]

As illustrated in Fig. 1 the device is a special head in the form of a bar, fitting on the ½ inch shaft (A) of a high speed electric motor. At the two ends of the bar are depressions for the special slides S, S[1], which hold the living cells, two microscope objective systems mounted horizontally, and small right angle reflecting prisms to reflect the images to the axis of rotation. Here two ½ inch right angle prisms ¼ inch wide are mounted facing in opposite directions, so as to reflect from both ends of the bar vertically to the stationary ocular (Oc.).

If the lights (L, L′) are incandescent filaments whose images are thrown on the slides parallel to a radius of rotation, the distance of S and S′ to the axis of rotation must differ by 3 to 5 mm, so that S will not be illuminated by L′ and *vice versa*. Since

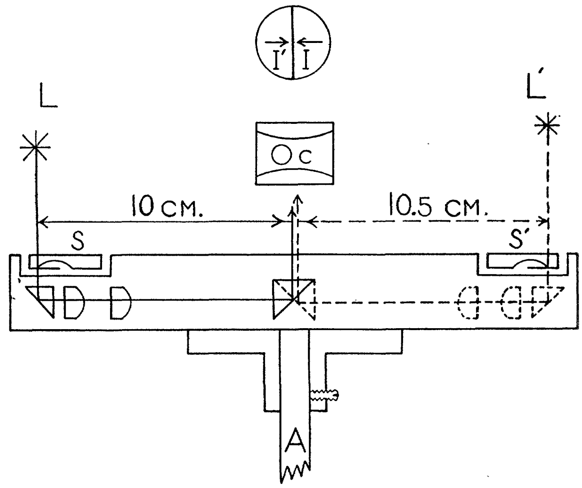

FIG. 1. Diagram of centrifuge-microscope for simultaneous observation of control and experimental material.

the radius of rotation may be 100 mm, this makes a difference of only 3 to 5 per cent. in the centrifugal force on the two slides. The image of material in S′ appears in the left field of the ocular, I′, and the image of material in S appears in the right field, I, the direction of the centrifugal force being indicated by arrows. For successive observation of S and S′, only one light need be used, say L. It is moved 5 mm further from the axis for observation of S′ and back again for observation of S.

If a high voltage condenser discharge in Hg. vapor is used as the source of illumination, L and L′, the distance of S and S′ from the axis may be exactly the same, but the contact surfaces which set off the lamps are arranged at different radial distances from the axis, so that lamp L discharges only when over S and lamp L′ only when over S′. The mercury discharge lamp gives a clearer image over the whole field of view, but necessitates a more complicated accessory mechanism.

[1] E. N. Harvey and A. L. Loomis, SCIENCE, 72: 42, 1930; E. N. Harvey, *Jour. Franklin Inst.*, 214: 1, 1932. I express my sincere thanks to Mr. Alfred L. Loomis for the generous hospitality of his laboratory at Tuxedo Park, N. Y., where the new head was made. The Bausch and Lomb Optical Company will place the standard centrifuge-microscope on the market.

[2] J. W. Beams, SCIENCE, 74: 44, 1931; E. N. Harvey, SCIENCE, 75: 267, 1932.

In this manner the remarkable difference in behavior under the influence of centrifugal force of unfertilized and just fertilized sea-urchin eggs can be observed, and quantitative comparison made of the effect of any substance on the viscosity or form of living cells.

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THE AGITATION OF MATERIAL IN AERATED WATER

IN a recent issue,[1] McCutcheon described an apparatus for circulating and aerating material. The purpose of this note is to describe an arrangement that has been found particularly useful for difficult material, and is successful in a number of cases where other methods have not been entirely satisfactory.

It consists of a circular flat-sided flask (a standard Kolle culture flask serves admirably) filled with water, into which is inserted a glass tube bent and connected with a compressed air outlet.

The bubbles of air, rising at one side of the flask, set up a circular motion in the water, the rapidity of which can be adjusted at will by controlling the stream of air, so as to keep the material continuously circulating.

The apparatus is especially useful when the shape or size of the objects circulated renders them likely to become tangled or lodged against obstructions in their path. The smooth, circular motion, with a minimum of subsidiary vortices makes for a very efficient utilization of the air current. A relatively small amount of air is sufficient to keep light objects submerged and circulating, and objects with a specific gravity considerably greater than water circulate freely.

The use of a filter pump to supply the air current is feasible if the joints of the apparatus be made air-tight.

The addition of two siphons, with their outer ends immersed below water surfaces of properly adjusted height, will provide for a gradual change of water in the flask, and convert it into an efficient washing apparatus.

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[1] SCIENCE, November 4, 1932.

SPECIAL ARTICLES

THE ATOMIC WEIGHT OF LEAD FROM KATANGA PITCHBLENDE

THROUGH Professor A. C. Lane, chairman of the Committee of the National Research Council on the Measurement of Geologic Time, we have recently received a fine specimen of Katanga pitchblende, a gift from Radium Belge. Petrographic examination by Professors Lindgren and Newhouse, of the Massachusetts Institute of Technology, showed the black base to be permeated with microscopic veins of yellow material which Davis has already found to be readily soluble in dilute hydrochloric acid. Extraction of the very finely powdered material with dilute hydrochloric acid removed 22.8 per cent. of the original. Approximate analysis of the residual black pitchblende and of the extract yielded the following percentages of uranium and lead. Other analysts have found similar material to be nearly if not quite free from thorium.

	Per cent. U	Per cent. Pb	Pb/U
Pitchblende	74.9	6.7	0.089
Extract	58.5	8.4	0.144
Whole	71.2	7.1	0.100

Lead was extracted from both portions and was purified chiefly by many crystallizations as nitrate in quartz and as chloride in quartz and platinum. Next it was twice distilled in dry hydrogen chloride, and finally it was fused in nitrogen containing hydrogen chloride in a weighed quartz boat.

Analysis of the chloride was effected by solution and comparison with a solution of nearly equivalent quantity of pure silver. The end point of the comparison was found by the equal opalescence method with the aid of hundredth normal silver and chloride solutions and a nephelometer. For comparison, samples of chloride similarly purified were prepared from common lead (Coeur d'Alene) and from Bedford cyrtolite[1] and analyzed.

The result for common lead agrees closely with that commonly accepted (207.22) and that from Bedford cyrtolite with the value previously found by ourselves (205.92). The varieties from Katanga pitchblende both apparently possess atomic weights appreciably lower than that found by Hönigschmid and Birckenbach,[2] 206.05, with lead extracted from secondary minerals associated with Katanga pitchblende. If the original untreated pitchblende is considered as a whole the average atomic weight of the lead is 205.99. Aston[3] has found Katanga lead to be com-

[1] See Baxter and Alter, SCIENCE, 76: 524, 1932.
[2] Ber. 56: 1837, 1923.
[3] *Nature*, 129: 649, 1932.