

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,<sup>1</sup> 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 airtight.

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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## SPECIAL ARTICLES

### THE ATOMIC WEIGHT OF LEAD FROM KATANGA PITCHBLEND

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<sup>1</sup> 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 Birekenbach,<sup>2</sup> 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<sup>3</sup> has found Katanga lead to be com-

<sup>1</sup> See Baxter and Alter, *SCIENCE*, 76: 524, 1932.

<sup>2</sup> *Ber.* 56: 1837, 1923.

<sup>3</sup> *Nature*, 129: 649, 1932.

<sup>1</sup> *SCIENCE*, November 4, 1932.

THE ATOMIC WEIGHT OF LEAD  
*Katanga Pitchblende*

Wt. of PbCl <sub>2</sub> in vacuum g.	Wt. of Ag in vacuum g.	Ratio PbCl <sub>2</sub> :2Ag	At. wt. of Pb.
4.57229	3.56261	1.28341	206.00
6.20083	4.83143	1.28344	206.00
4.45462	3.47094	1.28340	205.99
Average			1.28342 206.00
<i>Katanga Pitchblende Extract</i>			
2.62575	2.04615	1.28326	205.96
3.75342	2.92474	1.28333	205.98
3.28347	2.55867	1.28327	205.96
3.19222	2.48745	1.28333	205.98
Average			1.28330 205.97
<i>Bedford Cyrtolite</i>			
0.59044	0.46015	1.28315	205.94
<i>Common Lead</i>			
2.56818	1.99234	1.28903	207.21
4.34481	3.37050	1.28907	207.22
Average			1.28905 207.21

posed of the isotopes Pb<sup>206</sup> and Pb<sup>207</sup> in the proportions of 14 to 1. From this evidence the isotopic weight of Pb<sup>206</sup> would seem to have the surprisingly low value 205.90–205.93.

It is difficult to explain the difference in the atomic weights of the lead from the black and yellow portions of the original mineral. If the veins were formed by infiltration, an external source of lead of atomic weight 205.97 is required. If, as seems more probable to us, the yellow material is an alteration product, it might indicate a different rate of decay of uranium isotopes, as v. Grosse has recently proposed.<sup>4</sup> But since then the yellow material must contain on an average older lead than the black, this hypothesis would require a higher rate of decay for U<sup>238</sup> than for U<sup>239</sup>, a conclusion which is contrary to v. Grosse's.

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#### FREE POSITIVE ELECTRONS RESULTING FROM THE IMPACT UPON ATOMIC NUCLEI OF THE PHOTONS FROM TH C''

THE discovery of the fact that free positive electrons are present among the secondary particles resulting from the disruption of nuclei by the cosmic radiation,<sup>1</sup> together with various kinds of evidence

that the primary cosmic radiation at sea-level consists largely of photons, made it appear of value to study the hard  $\gamma$ -rays of natural radioactive substances for similar effects. Experiments have been carried out which gave conclusive evidence that positrons<sup>2</sup> are ejected from lead by the  $\gamma$ -radiation of Th C''.

Near the bottom of a vertical Wilson cloud-chamber operating in a magnetic field of about 400 gauss a plate of lead was placed through which a collimated pencil of  $\gamma$ -rays from Th C'' was allowed to pass. About 5 cms above the lead was inserted an aluminum plate of 0.5 mm thickness for the purpose of differentiating between particles of positive and negative charge, a method previously used by the author and later by Blackett and Occhialini for the same purpose.

Out of 1,500 exposures three photographs were obtained, each one of which showed a positron ejected from the lead, the direction of ejection being nearly in the direction of the incident  $\gamma$ -ray beam. The positrons penetrate the aluminum plate and emerge with an appreciably lower energy; in all three photographs the tracks cross practically the whole chamber, and their curvatures are readily measurable and of the right order of magnitude. The general indications are that the positrons are not very rare among the electrons ejected from the lead.

These photographs offer unambiguous evidence that photons when absorbed by nuclei do eject both positive and negative electrons quite in accordance with the evidence which has appeared in cosmic-ray studies. Further, many of the tracks which we have obtained from the  $\gamma$ -rays of Th C'' resemble the showers such as those obtained by us<sup>3</sup> and particularly emphasized in the photographs of Blackett and Occhialini.<sup>4</sup>

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#### METHOD OF EXTRACTION OF SUPRA- RENAL CORTICAL HORMONE-LIKE SUBSTANCE FROM URINE

IN view of the physiological significance of the possible presence of a substance in the urine that raises the resistance of suprarenalectomized rats to histamine poisoning,<sup>1</sup> the exact method of extraction of this substance is given below:

<sup>2</sup> The contraction positron is here used to denote the free positive electron.

<sup>3</sup> C. D. Anderson, "Cosmic-Ray Bursts," *Phys. Rev.*, 43: 5, 368, March 1, 1933.

<sup>4</sup> *Proc. Roy. Soc.*, 139, 699, 1933.

<sup>1</sup> D. Perla and J. Marmorston-Gottesman, *Proc. Soc. Exp. Biol. Med.*, 28: 1024, 1931.

<sup>4</sup> *Phys. Rev.*, 42: 565, 1932.

<sup>1</sup> *SCIENCE*, 76: 238, 1932.