

- <sup>5</sup> Burnstock, G., *Pharmacol. Rev.*, **21**, 247 (1969).  
<sup>6</sup> Campbell, G., in *Smooth Muscle* (edit. by Bülbring, E.), 451 (Edward Arnold, London, 1970).  
<sup>7</sup> Burnstock, G., and Iwayama, T., in *Progress in Brain Research* (Elsevier, Amsterdam, in the press).  
<sup>8</sup> Burnstock, G., Campbell, G., Satchell, D. G., and Smythe, A., *Brit. J. Pharmacol.*, **40**, 11 (1970).

## Milliard or Gillion?

SIR,—When a word has become ambiguous it should be discarded. Attempts

to reimpose precision could ultimately be successful, but there will be an inconvenient phase in which, though a writer may know what the word should mean, there is no certainty that readers will be in the same happy state. The word billion seems to be irrevocably lost. Boroughs's suggestion (*Nature*, **229**, 142; 1971) that the vague word "milliard" should be defined as  $10^9$  is unsatisfactory because it is already current and readers will not, for a time, know whether it is being used precisely or not. May I repeat the suggestion

(*Nature*, **220**, 312; 1968) that we should make use of the lucky accident that M is both the internationally agreed symbol for  $10^6$  and the initial letter of million. G and T are the symbols for  $10^9$  and  $10^{12}$  and could be used to form the new and therefore unambiguous words gillion and tillion.

Yours faithfully,

N. W. PIRIE

42 Leyton Road,  
 Harpenden,  
 Hertfordshire

# Obituary

## Professor A. S. Besicovitch

ABRAM SAMOILOVITCH BESICOVITCH, Rouse Ball professor of mathematics at Cambridge from 1950 to 1958 and a Fellow of Trinity College, died on November 3, 1970.

He was born in 1891 and studied at St Petersburg, later teaching there and at Perm. He left the USSR in 1925 and worked in Copenhagen with Harald Bohr, who had recently built up his theory of continuous almost-periodic functions. In collaboration with Bohr and independently, Besicovitch enlarged the concept of almost periodicity to wider classes of functions. With an appropriate definition, a generalized almost-periodic function possesses a Fourier series and it satisfies Parseval and Riesz-Fischer theorems and also a Cantor theorem of uniqueness. Besicovitch brought all these investigations into a book in 1932.

Besicovitch was one of the most powerful mathematical analysts of his generation. He has been described as a master of intricate construction. An early illustration of this gift was his example—published in 1922 in a Russian journal which did not reach other countries—of

a plane set made up of linear segments of length 1, one in every direction, having zero Jordan measure. He saw later that this set could be adapted to solve Kakeya's problem of finding the figure of least area in which a segment of unit length can be rotated through a complete revolution. By rotating a pencil on a table, the reader may guess that the figure sought is a three-cusped hypocycloid, having area  $\pi/8$ . The paradoxical truth is the existence of figures of arbitrarily small area.

In the 1930s Besicovitch wrote many papers on plane sets of points which have finite length in the sense of Carathéodory's linear measure. The density of such a set  $E$  at a point  $x$  can be defined by the limit of the linear measure of the part of  $E$  within a circle centre  $x$  divided by the diameter of the circle. Sets may be regular or irregular. A regular set behaves like a rectifiable curve, having a tangent at almost every point. An irregular set has positive density in every sector drawn from almost every one of its points. The first proofs of such theorems were long and complicated and they exemplify one of Besicovitch's aphorisms, "A mathematician's reputation rests on his bad proofs". In later

papers he replaced some of his pioneering bad proofs by more elegant good proofs.

Hausdorff measure was a topic to which Besicovitch returned repeatedly, using the concept to refine results about sets of points and real functions. Suppose, for instance, that  $x$  is a number for which infinitely many rationals  $m/n$  exist differing from  $x$  by less than  $1/n^q$ , where  $q$  is less than one; then the set of  $x$  has Hausdorff dimension  $2/q$ .

In 1945 Besicovitch's gift for intricate construction led him, to his own surprise, to another paradox. He defined in space a surface homeomorphic with a disk (or a sphere), which has three-dimensional measure equal to 1 (say) but arbitrarily small surface area in the Lebesgue-Fréchet sense of the lower bound of approximating polyhedra. This led him to the view that results based on the Lebesgue-Fréchet notion of area must be recast in terms of Hausdorff plane measure. He and his pupils carried out a large part of this programme.

In trying to convey an impression of Besicovitch's magnificent mathematical gifts, no one could forget that they were matched by gifts of humanity which endeared him to pupils and friends and especially to young children.

# Announcements

## University News

Professor G. Slaney has been appointed to the Barling chair of surgery, University of Birmingham, in succession to Professor A. L. d'Abreu who retires this year. Professor O. L. Wade has been appointed to the newly established chair of clinical pharmacology and Dr E. H. Ashton to a chair of anatomy established for one tenure only. The title of professor of reproductive endocrinology has been conferred on Dr P. Eckstein.

Dr S. R. Stitch has been awarded a personal professorship in steroid endocrinology by the University of Leeds.

Dr H. Smith, University of Manchester, has been appointed to the chair of plant physiology in the Faculty of Agricultural Science, University of Nottingham.

Dr A. T. Cowie has been appointed head of the Physiology Department, National Institute for Research in Dairying, University of Reading, in succession to the late Professor Folley.

## Appointments

Professor Alwyn Williams, Queen's University of Belfast, has been appointed a trustee of the British Museum (Natural History), in succession to Professor O. M. B. Bulman.

Dr Philippe Shubik, Eppley Institute for Research into Cancer, University of Nebraska, and James S. Gilmore, jun.,

Gilmore Broadcasting Corporation, Kalamazoo, have been appointed to the National Advisory Cancer Council of the US National Institutes of Health.

The following have been appointed vice-presidents of the Royal Society: Sir Frederick Bawden, Rothamsted Experimental Station; Sir Bernard Katz, University College London; Sir Harrie Massey, University College London; Sir Harold Thompson, University of Oxford; Professor W. R. S. Doll, University of Oxford; Professor F. Hoyle, University of Cambridge; Dr J. M. Menter, Tube Investments Limited.

## Miscellaneous

Professor P. M. Maitlis, McMaster University, has been awarded the 1970