(III) We do not feel competent to judge the validity of the assumptions underlying the different theories; we have, however, tried to verify one consequence of the new theory proposed by Bhabha, according to which the following reaction is possible: $p + p \rightarrow p_2 + n$, the minimum energy required is 35 Mev. and the cross-section for such a process is 3.2×10^{-25} cm.², which is expected to occur when a fast proton traverses about 45 cm. of water. We have examined the plate kept under 20 cm. water for 202 days for tracks of such double-charged protons. The latter will ionize like α -particles, and in order to distinguish them from the latter we have looked for such dense tracks of length greater than 10 cm. of air. In an area of 1.05 cm.², no such track was observed. The negative result may be due to the small number of high-energy protons present in the cosmic ray.

We are indebted to Dr. R. C. Mazumdar for directing our attention to Bhabha's paper.

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¹ Bose and Chowdhry, *NATURE*, **145**, 894 (1940).

² Heitler *et al.*, *NATURE*, **144**, 283 (1939); **146**, 65 (1940).

³ Williams, *Proc. Roy. Soc., A*, **169** 531 (1939).

⁴ Helms and Wilkins, *Phys. Rev.*, **54**, 783 (1939).

⁵ Bhabha, *Proc. Ind. Acad. Sci.*, **A**, **11**, 346 (1940).

⁶ Heitler and Ma, *Abst. Proc. Roy. Soc.*, July 18, 1940.

⁷ Heisenberg, *Z. Phys.*, **113**, 61 (1939).

Effective Frequencies of Sensitive Flames

BROWN¹ showed in 1932 that if a graph of flame-height against frequency of the sound were plotted, there occurred a large number of maxima and minima, and that the frequencies of these maxima and minima were independent of the gas velocity, the shape and size of the jet, and the amplitude of the sound; and further, that those for hydrogen were indistinguishable from those for coal-gas. From his theory of edge-tones he has recently concluded that the reaction of the external air (the only constant factor) cannot be neglected². In order to exclude the effects of resonance of all kinds, Brown repeated his experiments with entirely different apparatus in a different laboratory, but the frequencies remained unaltered.

Some recent observations of mine support Brown's results. They were made in the Department of Applied Physics in the University of Basle in Prof. Zickendraht's laboratory. The apparatus consisted of a Siemens-Halske oscillator, an amplifier and a 'Blue Spot' loud-speaker. Differently shaped brass jets were used, and the response to the sound was observed by measuring the change in the height of the coal-gas flame. The change in output of the oscillator-amplifier set was checked by a galvanometer placed in series with the moving coil of the loud-speaker, and care was taken to ensure that any maxima and minima of the output were eliminated by a sliding resistance.

It was found that the occurrence of the main maxima and minima of response depended only upon the frequency. The main minima were at frequencies of 1,200, 1,490 and 2,140, and the main maxima at 1,180, 1,470, 1,680 and 2,960. Comparison with Brown's detailed results shows good agreement. No marked maxima or minima occurred at higher frequencies with the jets used.

It seems, therefore, that, difficult as these results are to explain theoretically, they cannot be attributed to resonance either in the laboratory or in the apparatus.

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¹ Brown, G. B., *Phil. Mag.*, **13**, 161 (1932).

² Brown, G. B., *Proc. Phys. Soc.*, **49**, 519 (1937).

Glaisher's Table of Powers

Is there any contemporary of Dr. J. W. L. Glaisher who can throw light even now on the mystery of his suppression of completed tables? The basis of the Table of Powers just published by the British Association [see p. 219 of this issue of *NATURE*] is a table of the first twelve powers of the first thousand integers compiled by Glaisher. This table was finished in 1873 and was stereotyped, but it was not published. The plates were presumably destroyed, and the proofs seem to have been systematically hunted down. One copy survived in secret; Mr. H. J. Woodall found it among papers left by Lieut.-Colonel A. J. C. Cunningham, recognized its value, and presented it in 1935 to the British Association Tables Committee.

A similar story is attached to the Number-Divisor Tables prepared last year by the same Committee. Glaisher completed a set of tables for the Cambridge Philosophical Society in 1884, type was set up, plates made, and proofs pulled, and there the matter rested until ten years after Glaisher's death.

Also among Glaisher's papers were found volumes of manuscript tables of four theta functions, the denominator and the three numerators of the Jacobian elliptic functions, computed at degree intervals of the modular angle. This is an enormous piece of work, and apparently Glaisher was content that nobody should benefit from it. Why?

It is easy to account for the abandoning of an unfinished enterprise. The only obvious reason for the suppression of a finished table is the discovery of a systematic error, and Glaisher had not this reason. The British Association Committee submits all its material to the most drastic checks, and Glaisher's work was almost perfect: a missing digit in one table, a few accidental errors that his own process of checking would have detected in another, is the whole tale of faults.

In the preface to the Number-Divisor Tables, I wrote: "It is as if Glaisher knew too well the distance that separates accurate manuscript from faultless print, and could not force himself to the irrevocable step of authorizing publication". But this is sheer conjecture. Can no mathematical confidant, no reluctant printer, speak from knowledge?

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Sir J. J. Thomson, O.M.

I AM collecting material for a life of the late Sir J. J. Thomson, master of Trinity College, Cambridge. If any readers of *NATURE* have letters from him containing matter of interest, I should be very grateful for the loan of them. They would be copied and returned as soon as possible.

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RAYLEIGH.