TABLE III. *Mass differences in terms of 10^{-4} mass unit.*

DOUBLET	$H_2'-D^2$	$D_3^2-C^{12++}$	$C^{12}H_4'-O^{16}$	$C^{12}H_2'-N^{14}$
Aston	15.2 ±0.4	423.6 ±1.8	360.1 ±1.6	124.5 ±0.7
Bainbridge and Jordan	15.3 ±0.4	421.9 ±0.5	364.9 ±0.8	127.4 ±1.1
Mattauch	15.39 ±0.021	422.39 ±0.21	364.06 ±0.40	125.81 ±0.23
Asada and Others			364.2 ±0.9	125.7 ±0.6
Jordan				125.6 ±0.15

have been measured as yet, it seemed worth while to publish this value in view of the fact that it was obtained on an instrument which not only has extremely high constants but also differs radically from any of the others in use at the present time. Other measurements on the light element doublets are in progress.

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[1] E. B. Jordan, Phys. Rev. **57**, 1072A (1940).

Cosmic Rays and Comets

The conjecture that the comets are contraterrene bodies,[1] which accounts, if only in a rough qualitative way, for some of the more conspicuous features of comets, can be properly tested as follows: (a) by investigating its usefulness in detailed quantitative interpretation of the now known properties of comets; (b) by performing experiments, involving cosmic-ray measurements, during meteor showers known to be of cometary origin; and (c) by performing appropriate cosmic-ray experiments while a sufficiently active comet is sufficiently near to the earth. Method (a) is indirect; and since it involves detailed study of the intricacies of cometary behavior, as well as a knowledge of the distribution of meteoric material within the solar system, it is difficult. Method (b) implies the acceptance of the idea that certain meteor showers are of cometary origin, but is otherwise quite direct; and the requisite experiments can be done, for example, almost every August. Method (c) is in principle the most direct; but the occasions on which it can be tried are very rare.

One purpose of this note is to call attention to the fact that if the comet recently discovered by Cunningham proves sufficiently active, it might, within the next few weeks, provide opportunities for performing the experiments involved in method (c). Lacking the appropriate data, however, the writer is at present unable to venture an estimate whether, if comets are contraterrene, the cosmic-ray effects of Cunningham's comet would be sufficiently intense for experimental purposes.

If comets are contraterrene, their activity depends not only on the solar energy that they receive, but also on the rate at which they encounter ordinary meteoric matter. In the absence of a theory of interaction of terrene and contraterrene matter, it is impossible to say with certainty what the primary products of their mutual annihilation would be. It is reasonably safe to guess, however, that among these products there should be photons having energies of about a billion electron volts. Therefore experiments designed to determine whether any high energy photons do originate in a comet should best be performed in the upper atmosphere.

The second purpose of this note is to mention that among the products of mutual annihilation of terrene and contraterrene matter there may be free mesons. This possibility is of interest not only in view of the present conjecture concerning comets, but also in connection with cosmic rays in general; for it suggests that: (1) The continual release of mesons at the top of the earth's atmosphere may be caused by contraterrene matter coming from interstellar space and impinging upon the atmosphere, and (2) the non-ionizing particles which release mesons deeper in the atmosphere may be contraterrene neutrons, which have themselves been set free in the earlier stages of the annihilation of the impinging contraterrene atomic nuclei.[2]

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November 4, 1940.

[1] V. Rojansky, Astrophys. J. **91**, 257 (1940). We call "contraterrene" a body composed of hypothetical atoms consisting of negatively charged nuclei surrounded by positrons; an ordinary body we call "terrene."

[2] The possibility of production of high energy photons in the upper atmosphere by the annihilation of negative protons arriving from interstellar space was discussed by F. Zwicky, Phys. Rev. **48**, 169 (1935). See also F. Zwicky, Proc. Nat. Acad. Sci. **22**, 266 (1936), esp. Section *F*.

Erratum: On the Angular Distribution of Fast Neutrons Scattered by Hydrogen, Deuterium and Helium

(Phys. Rev. **58**, 590 (1940))

The captions of Fig. 3 and Fig. 4 on page 592 should be interchanged.

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