

letters

Gupta (February, page 86) must be protested.

The comment that "Marshak never made any really great contribution to physics" is unfair. His work on weak interactions and N-N scattering satisfy most theoretical physicists as being important contributions. His taste and judgement in both science and people account for his "influence" and possibly explain the lack of such influence of Gupta.

Bragging about his critical evaluation to CCNY officials in *PHYSICS TODAY* reflects far more adversely on Gupta than on Marshak. Finally, this letter writer is not a student, nor a present or former coworker nor a colleague of Marshak. I did, however, largely agree with his Guest Comment (May 1983, page 9).

BRIAN DEFACIO

*Institute for Theoretical Physics
Chalmers University of Technology
Göteborg, Sweden*

3/84

Don't forget Thomson

Writing in *PHYSICS TODAY* (November 1981, page 69), Victor F. Weisskopf tells the remarkable story of the development of field theory throughout the last 50 years. The triumph of Dirac's quantum electrodynamics was, however, left in sharp contrast by the awesome remarks that "we have no explanation for the mass of the electron; that is, the smallness of the ratio ($1/1836$) between the electron mass and the proton mass" and "there is not the slightest indication why electrons with different masses should exist." Here Weisskopf had in mind the normal electron, the τ -electron and the muon.

Forgotten, it seems, in these modern developments is the classical basis of electrodynamic theory developed by J. J. Thomson. Thomson gave a formula specifying the energy of the electron as $2e^2/3a$, where a is the radius within which its electric charge e is confined. He did not know about muons and antimatter, but it needs little imagination to write $\mu^+ + \mu^- = Q^0$, where Q^0 is an energy quantum formed from the mutual annihilation of a positive and negative muon. Adding energy to such a quantum could well produce a pair of Thomson-sized charges, including Q^- . Thus, for charges e and $-e$ in touching relationship, the total energy, including that of the Coulomb interaction, is:

$$W = P^+ + Q^- - e^2/(x+y) \quad (1)$$

where $P = 2e^2/3x$ and $Q = 2e^2/3y$. Eliminating x and y :

$$W = P + Q - 3PQ/2(P+Q) \quad (2)$$

Given a background source of muon

pairs and an amount of energy P used to create N protons, we have N systems given by equation (2), NP constant and NW tending to a minimal value, for optimum stability. We can therefore differentiate W/P with respect to P to find its minimum. This occurs when $P/Q = [(3/2)^{1/2} - 1]^{-1}$ and tells us that $P \approx 1836$ because $Q \approx 2\mu \approx 413$ in electron mass-energy terms.

This is such a remarkably simple result based on the Thomson formula, that one really must exclaim, "Let us not forget the heritage he left us."

Proton creation follows naturally from the existence of the dimuon energy quantum. Also remarkable is the fact that W is exactly half the mass energy of the τ -electron (half of 1.782 GeV or 1743 electron units). Put $P = 1836$ and $Q = 413$ in equation (2) and W is 1743.

Such results cannot be fortuitous; bear in mind that the formal derivation of the proton-electron mass ratio using equation (2) in terms of a theoretical determination of Q gave 1836.1523. This was published in 1975 in a paper I coauthored¹ with D. M. Eagles of CSIRO in Australia. It antedates by eight years the measurement by Van Dyck, Moore and Schwinberg,² which puts the ratio at 1836.152 470(80). The discrepancy is one part in ten million, but even this is explicable from the basic theory as it stood in 1975, as I have recently shown.³ Using the same Thomson formula, the muon-electron mass ratio of 206.7683 has also yielded to theoretical explanation at its one-in-a-million level of measurement. Classical electromagnetic theory can, therefore, be usefully combined with quantum electrodynamics to solve some of the mysteries of particle mass.

References

1. H. Aspden, D. M. Eagles, *Nuovo Cimento*, **30A**, 235 (1975).
2. R. S. Van Dyck Jr, F. L. Moore, P. B. Schwinberg, *Bull. Am. Phys. Soc.* **28**, 791 (1983).
3. H. Aspden, *Lett. Nuovo Cimento*, **38**, 423 (1983).
4. H. Aspden, *Lett. Nuovo Cimento*, **38**, 342 (1983).

H. ASPDEN

*University of Southampton,
3/84 Highfield, Southampton, England*

Unions of the campus

I have read with interest the debate involving Edward Harrison and Charles Nissim-Sabat about unions in the universities (January, page 11; June, page 11; October, page 11) and I wish to contribute a few remarks from a somewhat different viewpoint. Italy

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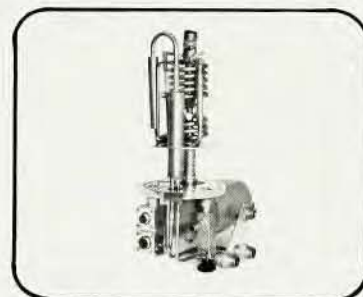
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