letters

The various quantities are: m_e (the electron rest mass) $= 10^{-27}$ gm, $\hbar = 10^{-27}$ erg sec (Planck's constant), α_E = electromagnetic fine structure constant = $1/137$, α_S = Pion–nucleon strong coupling constant = 14, G_N = Newton's gravitational constant = 6.7×10^{-8} cgs units, G_F = Universal Fermi weak interaction constant = 1.5×10^{-49} erg cm^3. *M thus turns out to be a gram*! We note that the expression for M does not involve any arbitrary numerical factors or factors of π. The dimensionless constants α_E and α_S occur in their lowest power. The proton being subject to decay, the electron rest mass is more appropriate. Thus the equation is a simplest possible combination.

It is also clear that no matter what units are chosen for the dimensional constants (like G_N, m_e, G_F) M will always have the magnitude of a one gram mass. It therefore appears that there is some justification for recommending the gram as a fundamental unit of mass!

C. Sivaram
Indian Institute of Science
1/26/81 *Bangalore, India*

Physicist productivity

I read with a certain degree of amusement the comments concerning the longevity parameter W/H^2 and most recently the oblate spheroidal condition given by G^2/H (December, page 72) and their relation to the life expectancies of physicists.

We have never measured physicists by how long they live, but by what they produce, and a relation between productivity and the above parameters might be interesting. A good physique is the result of physical activity and good physics is the product of mental activity, and for a physicist there must be some correlation between mental and physical activity. Thus if we set $\Delta H \simeq 0$, that is, all physicists are of the same height, then

$$W \propto G^2 \propto (BS)^2 \propto 1/P$$

where BS is belt size and P is the productivity.

S. I. Salem
California State University
1/22/81 *Long Beach, California*

Physics and geometry

The relationship between physics and geometry, discussed in the letter of Robert Hermann in November (page 11) and the article of C. N. Yang in June (page 42), is interestingly illuminated by considering the article on

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letters

neutron interferometry by Samuel A. Werner in December (page 24).

Werner describes an experimental test, proposed by Asher Peres,[1] to determine whether quaternionic structures should be used in quantum field theories. Stephen Adler has used quaternionic structures to describe the strong–color, weak and electromagnetic fields.[2]

Feza Gursey, M. A. Jafarizadeh and H. C. Tze have used quaternionic structures to describe the gravitational field.[3]

The physics of Adler and Gursey and his collaborators is directly related to the mathematics of J. A. Wolf[4], in which Wolf shows that the only 4-dimensional complete simply connected Riemannian symmetric spaces with quaternionic structures are precisely the three used by Adler to describe the electromagnetic, weak and strong-color fields, plus the one used by Gursey to describe the gravitational field.[5]

Wolf's geometry may give rise to physical theory explaining why our world has four kinds of fields. That physical theory may be given a critical test by the neutron interferometry experiment described by Werner.

This letter does not atempt to list all work in quaternionic field theory, but it is interesting to note that one of the early figures in the area is C. N. Yang.[6]

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4. J. A. Wolf, J. Math. Mech. **14** (1965) 1033–1047.
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6. D. Finkelstein, J. M. Jauch, S. Schiminovich, and D. Speiser, J. Math. Phys. 3 (1962) 207.

FRANK D. SMITH JR.
Cartersville, Georgia

1/26/81

Correction

March 1981, page 9—Inadvertently a number of editorial changes failed to appear in the Guest Comment "Physics—used and unused" by Lewis M. Branscomb. Fully corrected reprints are available from PHYSICS TODAY or from L. M. Branscomb, IBM Corp., Armonk, New York 19504. □