were lighter, so that there would be four light flavors, the flavor group referred to by Faucher would be SU(4); the color group would still be SU(3).

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11/19/80

Quark nomenclature

Although quark nomenclature is certainly picturesque and somewhat entertaining, I think it is unduly inconsistent. Some uses of the term "charm" are in question. "Charm," itself, is consistent with other quark terminology, such as "bare bottom" or "naked beauty," but to describe a quark as "charmed" is not. "Charmed" means "lucky," not "having charm" in the sense of beauty. The term "charming" is the one required for consistency, and I propose that henceforth a quark be described as "charming," not "charmed."

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12/22/81

Sizes of recruiting posters

I would like to suggest that institutions sending out announcements about their graduate programs voluntarily limit the size of their posters informing prospective students about their programs. Over the years the size of the posters has been increasing. Today, I received one 55 cm (22") wide and 48 cm (19") long. This is too wide to fit into our display arrangement. As a result this very nice poster was not added to the information available to our students, since our display area only handles material 28 cm (11") wide.

As graduate students get scarcer, the publicity and recruiting campaigns have intensified, but I believe that it would be to our mutual advantage to limit the size of publicity materials voluntarily to 22 cm (8.5") wide and 35.5 cm (14") long.

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10/27/80

In praise of Eddington

Now that the Catholic Church is reconsidering its "conviction" of Galileo for blasphemy, perhaps it would be appropriate for the scientific community to do likewise—reconsider its conviction of Eddington for insanity. The remarkable humor of the alphas and

letters

betas not withstanding, I think that Eddington has little merited the ire and condemnation that he and his work have suffered over the past half-century.

Oh, some basis for ire is comprehensible, if not legitimate. At one time Eddington proposed that a truly intelligent physicist could find out everything about the cosmos by logic and a study of the fine structure of experiments performed in the laboratory. I need not mention his rationale that the cosmos was an inalienable partner in every natural phenomenon. The main point appears to be: since there is an abundance of truly intelligent physicists—none of whom can perform in the prescribed manner—Eddington was obviously crazy as a loon.

Surprisingly Eddington's work has a pretty good record for staying relevant, and bits and pieces of his work—often attributed to other researchers—keep popping up. I have not made a study of all of these instances, but a few of them strike out at my conscience as I encounter them at random in the scientific literature.

The most recent one—attributing the nonzero rest mass neutrino to Nakagawa—is perhaps excusable since I doubt if Nakagawa ever read Eddington's work. Nevertheless, in *Fundamental Theory*, Eddington refers to the decay of a cospin intracule (neutron) into a spin intracule (proton and electron) and a neutrino which carries the properties of the quantum tensor Z_4 denoting a particle with nonzero rest mass. Since Eddington's untimely death occurred in 1944, he preceded Nakagawa by a minimum of 19 years. Perhaps Nakagawa is actually being honored as the one millionth physicist to entertain the notion of a mass-bearing neutrino.

In relativity, credit for Eddington's many contributions continues to fade away. In one instance, the infall of particles through the Schwarzschild "$r = 2m$ singularity," he does get one half the credit although he published his result in 1924 and his work was rediscovered 34 years later. As a kindness to Eddington, this work is referred to as the Eddington-Finkelstein coordinates, even though Eddington "did not recognize" why he invented the coordinate system (see *Gravitation* by Misner, Thorne and Wheeler).

In Dirac gamma matrices, which Eddington honed to a fine edge in his sedenion analysis (*Fundamental Theory*), the anti-hermitian representation (gamma squared = -1) is attributed to Feynman even though Eddington preceded him by two decades. Eddington himself referred to these matrices as Clifford numbers, and they are related

through Pauli spin matrices to the quaternions of Hamilton—so perhaps they should be called the Hamilton-Pauli-Dirac-Clifford-Eddington matrices. As yet I have not identified Feynman's contribution (See *Modern Quantum Mechanics With Applications To Elementary Particle Physics* by Eisele).

On the subject of nonconservation of parity in beta decay, Eddington's model of finite elementary particles predicted this phenomenon long before it was observed. To expand on this point, it is space inversion and not parity which gives rise to the basic convariance. Only where angular momentum (spin) can be neglected does space inversion reduce to the parity operator. Right-handed antiparallel spin is but a convention for the lefthanded parallel spin predicted by space inversion of finite particles. The proper question was never why is parity not conserved but rather why is parity ever conserved, and Eddington provided an answer four decades ago. Eddington's model implied that time inversion is a universal physical operator in neither the macroscopic nor the microscopic realms. The failure of time inversion covariance is an Eddingtonian idea for which others have recently received the Nobel prize—and I do not deprecate their work, for making the rediscovery through kaon decay was unquestionable independent.

Eddington, alone yet adamant, repeatedly gave cogent arguments against the meson as the quantum of the strong-coupling field. He was of course totally ignored, and Yukawa even received the Nobel prize. Today I can find no one that adheres to the Yukawa view—and almost no one who can recall Eddington's solitary position.

Perhaps some of the more galling aspects of Eddington's work were the magic numbers: 2, 16, 256, 136 and 137. Eddington motivated the number of protons and electrons in the universe as $(3/2).136.2^{256}$ or 2.3622×10^{79}. Today this number is usually quoted as 10^{80} and is dissociated from its source. The 2 fundamental particles have been replaced by 3 tetrads (plus a supporting cast) and the inverse of $137(\pi)$ is very much a part of quantum electrodynamics.

The above instances are of course only allegations of neglectful abuse which must be confirmed by the scientific community-at-large. I trust that verification will suffice to introduce the issue: in view of the many instances where Eddington's work continues to be relevant to progress in science, should we not be fair enough to give him a trial free prejudice, ire and misunderstanding?

PAUL NAWROCKI

12/19/80 Indian Harbour Beach, Florida □