ity, and the regional strain pattern in Nevada, and locations and modes of genesis of tsunamis, location of Amchitka relative to earthquake foci and observed seismic radiation patterns from Longshot. . . .

GENE DAVIDSON
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Davidson misrepresents my article by seeming to suggest that I arbitrarily chose to quote only those scientists who feel some concern about the Amchitka test series. To the contrary, several of the scientists' whose views I mentioned were members of the President's Science Advisory Committee's ad hoc panel on the safety of underground testing. Two others whom I mentioned, and who also are concerned about the Amchitka tests, are members of the AEC's own ad hoc panel on seismology. If I have chosen my authorities from among scientists whose judgment is colored by political beliefs, it would seem that the PSAC and the AEC have committed a similar error.

LUTHER J. CARTER
Science

Dyons Versus Quarks

Two quite different references to particles of fractional electric charge have appeared recently in the pages of *Science*. The term "quark" was introduced in 1964 to designate hypothetical entities carrying electric charges of one-third or two-thirds the normal unit. In a "Research Topics" article (26 Sept., p. 1340), Robert W. Holcomb has reported on Australian cosmic ray observations of a few events with less than normal ionization, which were detected in very high energy showers. This has been advanced as evidence for the quark, although a more conventional explanation is also mentioned in this article.

The other reference occurs in my article "A magnetic model of matter" (22 Aug., p. 757). It is pointed out that the speculation of magnetic charge can account for the observed integral nature of electric charge in ordinary, magnetically neutral, matter, while also implying that particles carrying both electric and magnetic charges can exhibit fractional electric charges in just the way suggested by high energy particle empirics. To emphasize the fundamental dyad of

charges, electric and magnetic, I called such particles "dyons." On this view, fractional electric charge cannot exist without an accompanying large value of magnetic charge. Energetic particles of this type will ionize very strongly, until they have been slowed to a small fraction of the speed of light.

I wish to draw attention to this theoretically sound possibility, and to suggest on these grounds, rather than merely general skepticism, that occasional lightly ionizing tracks must have a prosaic explanation.

JULIAN SCHWINGER
Department of Physics, Harvard University, Cambridge, Massachusetts

Electrodes

Ryan's letter "Unreliable results" (29 Aug.) does not tell the whole story. An accurate *p*H measurement of tris buffer can be made with Beckman electrodes. Excellent results have been obtained utilizing our No. 39511 combination electrode with ceramic junction. Measurements have been made in tris buffers adjusted to *p*H 7, *p*H 8, and *p*H 9. An equilibration time of at least 2 minutes is required. Rinsing the electrode between measurements with 0.1*M* NH_4NO_3 speeds equilibration. A full report on measuring the *p*H of tris buffers will soon be published by our applications research department.

Tris buffer, a primary aliphatic amine of considerable reactivity, is a difficult sample. It has a temperature coefficient 10 times as large as *p*H 7 phosphate buffer and abnormally high junction potentials have been reported in the literature. Some Beckman combination electrodes containing linen fiber junctions (39012, 39013, 39142, 39182, and 39183) should not be used in tris buffer. Large liquid junction potential, drift, and long equilibration times in tris buffer have been observed with these electrodes. We are now aware of this situation and have taken positive steps to alert users.

Beckman manufactures a variety of *p*H meters and electrodes so that our customers can obtain optimum results with all types of samples. We also provide technical information and assistance to help the user make the proper choice.

C. RONALD DAYTON
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