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PROGRAMMER



Model 5350

The Model 5350 Programmer is an electro-mechanical function generator, consisting of a digitally controlled servo-system driving a 10 turn potentiometer at a wide range of sweep rates. The Programmer finds application in the process control field with other instrumentation, whose output is controlled by a resistance or resistance ratio, such as powersupplies, magnetic generators, audio or RF oscillators as well as temperature, deposition-rate, vacuum and similar controllers.

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letters

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ness and their enthusiastic attempts to communicate their awareness and to force the reluctant established order to change peacefully. In my opinion, the youth helped start a revolution in human thought that, I hope, will bring about a transformation of our materialistic society into a humanistic society. It seems that such a transformation can be greatly aided by vigorous interdisciplinary studies until every field of human endeavor, physics too, is totally permeated with humanistic ethics.

Anatol Zinchenko
Indiana University
Bloomington

BS accreditation

I was very pleased to read William Silvert's letter (March, page 9) proposing accreditation for graduate physics departments. Something of this sort is sorely needed at the bachelor's degree as well as at the graduate level.

At a university that, even in palmier days, had trouble recruiting from the better US undergraduate programs I have seen some remarkable specimens, and I would like to offer that the real abuse is at the BS level. Most persons who possess a PhD seem to have a fairly respectable education, but there are institutions where one can get a BS (and sometimes an MS) without learning anything at all about physics.

One point, however, is that an accreditation scheme must reflect the real quality of the output, and not merely represent the fulfillment of certain paper requirements. A good example of this problem is the accreditation scheme in metallurgy, where several weak southern schools are accredited, whereas Yale is not.

M. B. McNeil
Mississippi State University
State College

The humble cathedral

In his recent letter (March, page 13) Robert Karplus quoting from Thomas Von Foerster's review of both of our books asks if it is well that students should "... stand, perhaps in awe, before the 'cathedral-like' structure of physics," as Von Foerster expects from Cooper's text." Since this statement has now been printed twice in *physics today*, I feel obligated to explain, before somebody gets the wrong idea, that it was not my intention to make anyone stand in awe of anything—just the reverse.

I do admit that a photograph of the

flying buttresses of a well known cathedral appears on the cover of my book and that there is a certain use of a metaphor (with which I was much taken at the time) relating the structure of physics to that of a cathedral. I would like to add, however, that I personally do not stand in awe of cathedrals—even the most magnificent. They are sometimes impressive, occasionally beautiful and often open, so that they can be entered, looked at, understood and even enjoyed. It was not my intention, nor did it occur to me, that anyone should regard them otherwise.

I wrote my book in the fond hope that with it the reader could enter for himself (to use that metaphor a last time) our humble cathedral, to find there a structure as well fashioned, as comprehensible and as pleasing as that of any actual cathedral, and to be able to reassure himself of its earthly origins by "touching the stones themselves."

Leon N. Cooper
Brown University
Providence, R.I.

Roentgen correction

The encyclopediae tell us that Roentgen discovered his rays while physics professor at the University of Würzburg, not the University of Giessen, as mentioned in "We hear that," March, page 75.

Harald W. Straub
Bethesda, Maryland

Impedo duality debate

There is a well known but rarely mentioned historical analog for the much contemplated questions of wave-particle duality and determinism in quantum mechanics (see "Dualism in Quantum Theory," by Max Born and Walter Biem, August 1968, page 51 and "Quantum Mechanics and Reality" by Bryce S. DeWitt, September 1970, page 30). In the days of Galileo it was agreed that a moving body was endowed with something a resting body lacked, something akin to Phlogiston, Electrification or Chalic. The something was commonly called "Impedo." But further description of Impedo presented complication. Two schools of thought arose. An English school took the description of Impedo to be mv (inertia and velocity conjointly) while the rival German school propounded mv^2 the proper description.

Surely one must prove right and one in error, because a single quantity, Impedo, can not have two clearly different descriptions, behaving to satisfy one description in certain situations and the other description in other situations. As Edward Routh¹ has written: "It is

seldom that Mathematicians can be found engaged in a controversy such as that which raged for forty years in the Eighteenth century. The object of the dispute was to determine how the force of a body in motion (Impedo) was to be measured . . . All Europe was divided between the rival theories. Germany took part with Leibnitz and Bernoulli while England combated their arguments. France was divided, an illustrious lady, the Marquise de Chatelet, being first a warm supporter and then an opponent of Leibnitzian opinion (mv^2) . . . The controversy was at last closed by D'Alembert, who showed in his treatise on Dynamics that the whole dispute was a mere question of words."

So the word Impedo, and the monumental argument that swirled around it, faded from the language of physics to be replaced by the dual expressions: "Quantity of Motion" and "Vis Viva," which later became "Momentum" and "Energy." Galileo saw the illusive Impedo but only the shadow it cast upon the time or the space axis could be mathematically gripped. And thus it is laid before us in first-semester physics: mv describes the time integral and half mv^2 the space integral of force. Yet in the day of the celebrated debate this distinction was not apparent nor at all appreciated, and it was difficult for anyone to realize the two different descriptions were even compatible. What a familiar ring Routh's following comment¹ must have in an ear tuned to the quantum-duality question: "It was most strange in the great dispute that the same problem, solved by geometers of opposite opinions, had the same solution."

Physicists' education contains pitifully little history, but innocent of history we relive it.

References

1. Edward John Routh, "The Elementary Part of a Treatise on the Dynamics of a System of Rigid Bodies," Chapter 7, page 272, Seventh Edition, Macmillan, London (1905, first edition 1860).

Lewis Epstein

Louisiana State University in New Orleans

LAMPF-classified area

The February issue (page 19) carried a schematic diagram of the experimental areas of the Los Alamos Meson Physics Facility. As recently as August 1970, I have seen a diagram of the LAMPF project with a proposed classified-weapons research area. It should appear on the right-hand bottom of your diagram, but is deleted as you've drawn the diagram.

Marvin Resnikoff

State University of New York at Buffalo

Los Alamos comments: Resnikoff is

correct that the diagram of the experimental area entitled "LAMPF meson factory calls for beam-time proposals" was truncated on the bottom so as to exclude the "Future Pulsed Beam Line," which in fact did appear on the drawing submitted by LASL to *physics today*. The truncation was made by *physics today* and was not reviewed by us.

The area to be served by this beam line lies a considerable distance to the south of the main experimental area, and will house experiments using pulsed neutrons. The primary purpose of the area is to develop information relevant to national defense needs. A preliminary layout appears in the *LAMPF Users Handbook* and in the *Proceedings of the Fourth Meeting of the LAMPF users*, October 1970. It is also expected that basic research will be carried out in the area; however, the facility has not been authorized. Obviously LAMPF is not now calling for proposals for beam time in this area.

Darragh E. Nagle

Los Alamos Scientific Laboratory

New look complaint

You are right. I did not realize until I read the editorial at the end of the September 1970 issue (page 92) that the vertical spacing of the lines of text had shrunk in the ratio 11 to 12. I had been aware only of undue strain in reading the text. The typography used in the editorial is pleasant to read.

George B. Yntema

East Hartford, Conn.

Corrections

April 1971, page 20, right-hand column—Reference 3 to the story on x-ray parametric conversion should have included: I. Freund, B. Levine, *Phys. Rev. Lett.* 25, 1241 (1970).

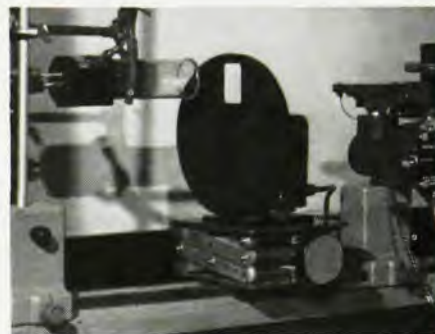
May 1971, page 71—Our report on the award of a National Medal of Science to Allan Sandage failed to make clear the fact that the Hale Observatories are operated jointly by the Carnegie Institution of Washington and California Institute of Technology.

May 1971, page 59—Price of *A Training Manual for Nuclear Medicine Technologists* should read \$1.75 (\$0.95 in microfiche). It is available from the Superintendent of Documents, US Government Printing Office, Washington, D. C. 20402.

May 1971, page 64—The name of one of the members of the "Committee to Study the Fundamentals of Amorphous Materials" was misspelled. *John Tauc* should be corrected to read Jan Tauc. □

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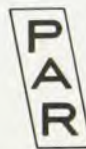


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