

als are among the most sensitive persons in our society. Any group of individuals, however, no matter how delineated, cannot be presumed to represent the interests of a larger population.

If Davis wants a voice in government circles for the scientific community, let scientists hire professional lobbyists or, even better, solicit public support and involvement. Davis's editorial theme can be construed as an example of the type attitude, discussed by R. N. Chan [Bull. APS 17, 74 (1972)] that encourages short-circuiting public involvement in the making of technological decisions.

EDWARD L. CHANEY  
University of Colorado  
Denver

## Physics for children

I was delighted to see the June issue devoted to physics for children. For the last four years or so, I have been fooling around with the idea of scientific creativity in very young children. I even spent some time in kindergarten and pre-school settings, including one labeled "emotionally disturbed," experiencing the joy and challenge of little kids.

I'd like to share with your readers a statement attributed to J. Robert Oppenheimer by Marshall McLuhan *et al* in the book *The Medium is the Massage*:

"There are children playing in the street who could solve some of my top problems in physics, because they have modes of sensory perception that I lost long ago."

KENNETH FOX  
The University of Tennessee  
Knoxville

•

As a physicist who is presently teaching 8th grade physical science, I am somewhat disturbed by your notion of the role of the physicist in elementary and secondary education. In your June editorial (page 84) you suggest that the role of the physicist could be that of a science advisor, who trains and motivates teachers in developing programs and materials. While I do not dispute the fact that there is a crying need for the continued education of existing teachers, I seriously question the physicists' ability to step in as some "Deus ex Machina" to train and advise educators. However it seems to me that this is what you are suggesting, even though you readily admit that many physicists would not belong in the classroom with young children.

It is my strong contention that before the physicist can make meaningful contributions in the area of pre-college education, he must first have extensive experience as a secondary or elementary school teacher. To support this contention I can offer my own experiences in the classroom with 8th grade students. I have learned in my two years of teaching many things that I was totally unaware of concerning the everyday life of a teacher. What, for instance, does an individual, inexperienced in secondary teaching, know about classroom management, range of abilities, motivation, learning disabilities, and the psychology of the exceptional child? Is such an individual even aware of the effectiveness of present science teaching methods? Does he possess the intangible, intuitive ability to communicate and relate to young children?

Educators would certainly welcome any physicist who desires to enter their profession. Nevertheless let the physicist be aware that it is he who must be retrained by virtue of direct contact with young children. Then, and only then, can he make lasting, relevant contributions to the area of pre-college education.

ANTHONY R. DE MEO, JR.  
Pearl River Middle School  
Pearl River, New York

## Deformable particles

In a recent letter (May, page 11) Howard Robbins raises the question of whether or not a charged tachyon could have a trajectory that is consistent with relativity. He points out that motion must be accelerated because of Cerenkov radiation and that rectilinear, accelerated motion is not an invariant concept and thus the trajectory of a charged tachyon could not be predicted with knowledge of its position and velocity at any one time. This question has also been raised in some detail by H. K. Wimmel<sup>1</sup> who concludes that no satisfactory answer exists at present.

It should be pointed out, however, that this problem is not unique to tachyons but arises in any problem that includes radiation reaction as a significant ingredient. In such cases the differential equation of motion includes the time derivative of the acceleration, and hence the initial value of the acceleration must also be given (this is the "new dynamical quantity" suggested by Robbins).

It can be shown<sup>2</sup> that a properly Lorentz invariant classical theory of Cerenkov emitting, charged tachyons may be given in terms of an extended, Lorentz deformable particle. Such a

*continued on page 49*

# Spectroscopy Molecular Beams AC Polarography Semi- Conductors

**Q. What do they have in common?**

**A. The Ithaco 353 lock-in amplifier.**

ONLY THE 353 PROVIDES:

- Automatic phasing. Measure signals with changing phase, without touching the phase controls. Vector amplitude and phase outputs.
- Log, ratio or log-ratio. Make absorbance and dual beam ratio measurements simply and economically.
- In-phase and quadrature. Simultaneously measure two quadrature signals—or their ratio.
- Signal and derivative. Is the 2nd harmonic of your output signal a derivative? The 353 measures both simultaneously—or their ratio.
- Modulated carrier signals. Measure carrier amplitude with linear or log response—and simultaneously measure the modulation signal or depth of modulation.

Arrange for a demonstration of Ithaco's versatile 353 lock-in.

Write or call

Don Munroe, Ithaco, Inc.,  
735 W. Clinton Street, Ithaca,  
New York 14850. 607-272-7640

# ITHACO

Circle No. 14 on Reader Service Card



# NEW PAR<sup>TM</sup> LIGHT CHOPPER

5 Hz to 5.5 kHz



## FEATURES:

- Broad frequency range
- Brushless DC motor to minimize RFI
- Manual or voltage-controlled frequency selection
- Minimal chopper heat output
- Special mounting minimizes vibration
- Provides reference signal for lock-in amplifiers or for synchronizing other systems

If your experiment requires light modulation and you operate at more than one frequency or want to vary the operating frequency during your experiment, have a look at the new PAR<sup>TM</sup> Model 191 Variable Speed Light Chopper. It provides long, virtually maintenance free service and offers design features which help minimize the common sources of error in light measurements. Call or write now for a free no-obligation demonstration in your laboratory. Price of the 191 is \$1195. Blade cover is \$50 additional.

If you don't need a variable frequency chopper, we recommend our Model 125 which offers a broad selection of fixed frequencies between 2.1 Hz and 2 kHz and is priced at only \$575.

Call or write now for complete information. Princeton Applied Research Corporation, P.O. Box 2565, Princeton, New Jersey 08540. (609) 452-2111. Telex: 84-3409.

P  
A  
R

PRINCETON APPLIED  
RESEARCH CORPORATION

202

Circle No. 26 on Reader Service Card

## letters

continued from page 15

particle follows a law of motion given by

$$\frac{d^2U}{ds^2} - \left( \frac{\kappa e^2}{ma_0^2} \right)^2 U = 0$$

where  $U$  is the tachyon's space-like 4-velocity,  $ds$  is the increment of invariant length of the world line,  $m$  is its mass,  $a_0$  its "size" and  $\kappa$  a constant of order unity depending on the details of the charge distribution. Such a law of motion is clearly covariant, and the special class of frames in which the particles motion is rectilinear are picked out by the initial conditions, not by the law of motion.

## References

1. H. K. Wimmel, *Nature Physical Science* 236, 79 (1972); *Lett. Nuovo Cim.* 1, 645 (1971).
2. F. C. Jones, (to be published)

Frank C. Jones

NASA-Goddard Space Flight Center  
Greenbelt, Md

## Ecological proposal

In these times of overall economic concern and rising publication costs, I think the American Institute of Physics could set a worthy example by printing all its journals in nontoxic ink on edible paper (for example, rice paper). By so doing, it would benefit the physics community and the public in general in at least the following ways:

- Scientific controversies would proceed on a more rational plane since it would be easier for an author to eat his words.
- Those rare papers that do not provide food for thought would at least give material sustenance to the subscribers, quite likely at a cost to them competitive with supermarket items.
- It would demonstrate the concern of physicists for the conservation of natural resources such as trees.
- Disposal of unwanted issues could proceed through the usual channels for organic wastes.

I submit that this scheme would be a significant first step toward the upgrading of the public image of physics and physicists, showing that we do indeed have a multitude of talents for contributing to the welfare of society. Perhaps we could get NSF funding for such a project. Can the AIP afford to overlook a proposal of such obvious merit?

HARVEY S. PICKER  
Trinity College  
Hartford, Conn.

□

# ITS TEA FOR YOU



If you are planning to build a high-powered TEA laser you will find the most complete line of pulse energy systems, capacitors, and triggering devices in our new catalog.

Take our ESB-128 for example: This pulser will deliver a 40kV, 60 joule pulse to your laser with a rise time of 25 nanoseconds and a jitter of less than 10 nanoseconds from a 250 volt pulse input. Not only is it reliable and field tested — it's unequalled in performance!

Find out why TOBE has an international reputation for product reliability and integrity by letting us solve your pulse-energy problem.

TEL: 617 828-3366

**TOBE**  
— DEUTSCHMANN —  
**LABORATORIES**

CANTON, MASSACHUSETTS 02021

Circle No. 27 on Reader Service Card