

FOR PRECISE  
TIME DELAYS

# DIGITAL DELAY GENERATORS

## letters

### Creationism discussion continues

I was pleased to see the report in February (page 53) that the scientific community is beginning to take a public stand against "creation science" (a contradiction in terms). I was much less enthralled by the exchange of letters on the subject in the June issue. It is clear that there is much misunderstanding concerning the nature of both science and religion.

As a physicist who is also interested in religion (I was a member of the Task Team on Science and Theology of the Presbyterian Church, U.S., during 1980-82), I am irritated whenever I find that the spokespersons for religion are anti-intellectual fundamentalists, while often the spokespersons for science are militant atheists. By airing these extreme positions, the ancient science/theology dispute is carried forward, and continued misunderstanding is promoted. Most of the public, who are neither scientists nor theologians, feel that they must choose one or the other model of the universe. The implications for political decisions and the funding of scientific research are obvious.

Religious fundamentalists who demand literal interpretations of biblical scriptures are only rarely found in the mainline religious denominations. One Presbyterian theologian says that whatever the scientific merits of "creation science," it is ridiculous from a theological viewpoint. If one must base one's account of creation on the Old Testament, one has no less than three accounts from among which to choose. Each of these creation myths illustrates particular religious truths (for example, the dignity and worth of human life, or the "goodness" of physical creation), values that are almost universally accepted (or at least given lip service) today, but which were revolutionary in Old Testament times and stood in direct opposition to the predominant Mesopotamian religions of that day. The creation myths in Genesis complement one another in their religious affirmations but differ fairly drastically in such details as the time-ordering in the creation of plants, beasts, humans, and so on.

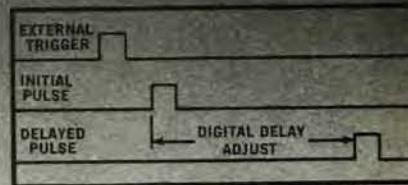
Joseph Campbell has said that modern culture, unlike any previous culture, lacks a unifying mythology. Perhaps this accounts for our lack of ability to cope with myth. If one is acquainted with the nature of myth (even on an elementary level), one is aware that even the ancient peoples who constructed them did not subscribe to a "literal" interpretation of them. The truth content of myth was considered to be higher, in a moral or religious sense, than merely a description of physical reality. For anyone in the twentieth century to ascribe "literal" reality to these ancient myths is almost too comical in itself to need further ridicule.

On the other hand, the scientist (or anyone) who dismisses religion because the idea of an omnipotent God is logically inconsistent is guilty of intellectual hypocrisy. Does he or she think that science is free from inconsistencies? Perhaps he or she is not aware of the existence of Russell's paradox or Goedel's Theorem. Actually, aside from obvious methodological differences, science and theology have much in common. Each is an attempt to model reality, founded on unprovable articles of faith. If the existence of a benign supreme being is the fundamental assumption at the heart of religion, certainly the practice of science is founded on the unprovable hypothesis that the universe is rational—that its behavior is subject to human understanding. Through science we construct highly useful models which permit us to understand the universe, in the sense of predicting its behavior. Let us not commit the elementary epistemological mistake of confusing the model with reality. Surely scientists, as well as religious leaders, should possess sufficient maturity to realize that whatever ultimate reality there may be is not directly accessible to mortal humans.

I believe that if the misunderstanding between religion and science becomes an all-out war, the scientists must lose. The potential for anti-intellectual fervor is ever present. Scientists, particularly those interest-



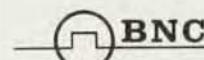
MODEL  
7030



BNC now offers six digital delay generators for precise timing applications in radar, lasers, sonar, shock wave physics or flash x-ray analysis. For example, with the Model 7030 shown above, you can select delays in 1 ns increments with an accuracy of 0.1 ns. Jitter between an external trigger and the delayed pulse is less than  $\pm 100$  ps. Delays extend to 100  $\mu$ s (longer with the Model 7033 Extender).

Other BNC delay generators offer time increments of 1, 10 or 100 ns with delays extending to 10 s. All models are remotely programmable.

For catalog on our Digital Delay Generators, phone (415) 527-1121 or write:



Berkeley Nucleonics Corp.

1198 Tenth St.  
Berkeley, Ca. 94710

Circle number 10 on Reader Service Card

# Advances in Cryopumping - I



## DISPLEX® Cryopumps Tune Out Vibration

Cryopumps are clean, fast, and reliable . . . proven effective in the demanding world of semiconductor production.

But most cryopumps vibrate . . . enough to bar their use in applications sensitive to vibration.

Now, Air Products offers the new DISPLEX LV Cryopump, the result of really innovative engineering.

In the LV Cryopump, we've "tuned out" the vibration.

In actual operation with a transmission electron microscope, image resolution of 2Å is being achieved routinely.

This powerful, yet compact pump is ideal for use in electron microscopes, electron-beam lithography, and other applications where vibration is a problem.

You'd expect Air Products to develop the LV Cryopump. After all, we offer more cryopumps, in more

sizes and pumping capacities, and for more specific uses, than any other cryopump manufacturer in the world.

Write or call for details.

**Air Products**

**ADVANCED PRODUCTS**

1919 Vultee St., Allentown, PA 18103  
Tel: (215) 481-3975 + Telex: 84-7416

## letters

ed in religion, must speak up in an attempt to educate the public, not inflame it.

HARRY W. ELLIS  
Eckerd College  
St. Petersburg, Florida

7/82

If the June letters are any indication, few physicists are aware of my published evidences<sup>1</sup> for Creation, and perhaps even fewer are aware that my published evidences<sup>2</sup> for a young Earth have enormous implications for one of the most pressing technological problems of our generation: site selection for long-term nuclear waste storage.<sup>3</sup> This problem was the *raison d'être* for the April 1978 LSU Symposium on Cosmo- and Geochronology convened by R. G. Kazmann of the Civil Engineering Department. He summarized my presentation at the symposium in the September 1978 issue of *Geotimes* as follows (with minor editing):

His [Gentry's] specialty is the study of minute halos in mica and biotite crystals and, more recently, in coalified wood from uranium-bearing sands in the Colorado Plateau and the Chattanooga Shale. The halos he discussed are created by  $\alpha$ -particles of differing energies emitted by such substances as uranium, thorium, and polonium. He presented microphotographs of an assortment of radiohalos in biotite and fluorite; and then a diagram showing the eight  $\alpha$ -emitters of the uranium decay chain, three of which are polonium isotopes.

The polonium halos, especially those produced by  $\text{Po}^{218}$ , are the center of a mystery. The half-life of the isotope is only 3 minutes. Yet the halos have been found in granitic rocks in many parts of the world, including Scandinavia, India, Canada, and the United States. The difficulty arises from the observation that there is no identifiable precursor to the polonium; it appears to be primordial polonium. If so, how did the surrounding rocks crystallize rapidly enough so that there were crystals available ready to be imprinted with radiohalos by  $\alpha$ -particles from  $\text{Po}^{218}$ ? This would imply almost instantaneous cooling and crystallization of these granitic minerals—and we know of no mechanism that will remove heat so rapidly; the rocks are supposed to have cooled over millennia, if not tens of millennia.

His studies of halos in coalified wood bear directly on the meeting's topic: geochronology. There

he and his co-workers were able to define the tiny uranium centers and to distinguish the various halos produced by different  $\alpha$ -emitters.

However, since the deposits from which the coalified wood was obtained are considered to be of Triassic and Jurassic age ( $> 2 \times 10^8$  years), the ratio between  $\text{U}^{238}$  and  $\text{Pb}^{206}$  should be low. Instead, some such halos have been found with uranium-lead ratios ranging from about 2200 to over 64 000. If isotope ratios are to be used as a basis for geologic dating, then presently accepted ages may be too high by a factor of greater than 100 000, admitting the possibility that the ages of the formation are to be measured in millennia. Thus ages of the entire stratigraphic column may contain epochs less than .001% the duration of those now accepted and found in the literature.

Kazmann's own conclusion was: "...that cosmochronology and geochronology are far from reliable in yielding ages...that many engineering structures or designs based on such considerations...would be questionable if not downright hazardous...[and] that intense effort in the area of geologic dating would be needed before engineers could develop designs that would be safe for the required periods."

Since that symposium I have not only easily rebutted<sup>4</sup> the two criticisms<sup>5,6</sup> of my results, but moreover have proposed an experimental test which in theory could falsify my view that the Precambrian granites are primordial rocks, or rocks that were created during the initial creation event. That test is the laboratory synthesis of a hand-size piece of granite or biotite.<sup>4</sup> Apparently I have found strong evidence for creation because there has been no response to this challenge in three years. Further, my evidence for a young Earth has just been reinforced by studies of Pb retention in zircons taken from deep granite cores at 313 °C.<sup>3</sup> Diffusion calculations show that 50-micron zircons should experience 1% Pb loss in  $3 \times 10^5$  years at 313 °C. Since no Pb loss was detected, this value is an approximate upper limit to the age of these Precambrian granites. Evidence for an even lower upper limit has been submitted for publication.<sup>7</sup>

In this respect I find it interesting that scientists who claim that creation science is undermining science education in America<sup>8</sup> generally fail to mention my results or their implications for nuclear-waste storage. If I have indeed uncovered factual scientific evidence that conventional geological or radio-

# 100Watts of RF Power from 1.5 to 400 MHz...



## ENI HAS IT COVERED.

This single unit is so incredibly versatile it can replace several you may be using now. It's an extremely broadband high power, solid state, Class A linear amplifier. It's rated at 100W from 1.5-400 MHz. But it can provide 200 Watts from 1.5-220 MHz. All you need with the 5100L is any standard signal or sweep generator and you've got the ultimate in linear power for such applications as RFI/EMI testing, NMR, RF Transmission, ultrasonics and more.

And like all ENI power amplifiers, the 5100L features unconditional stability, instantaneous failsafe provisions, and absolute protection from overloads and transients.

The 5100L represents the pinnacle in RF power versatility. There's nothing like it commercially available anywhere.

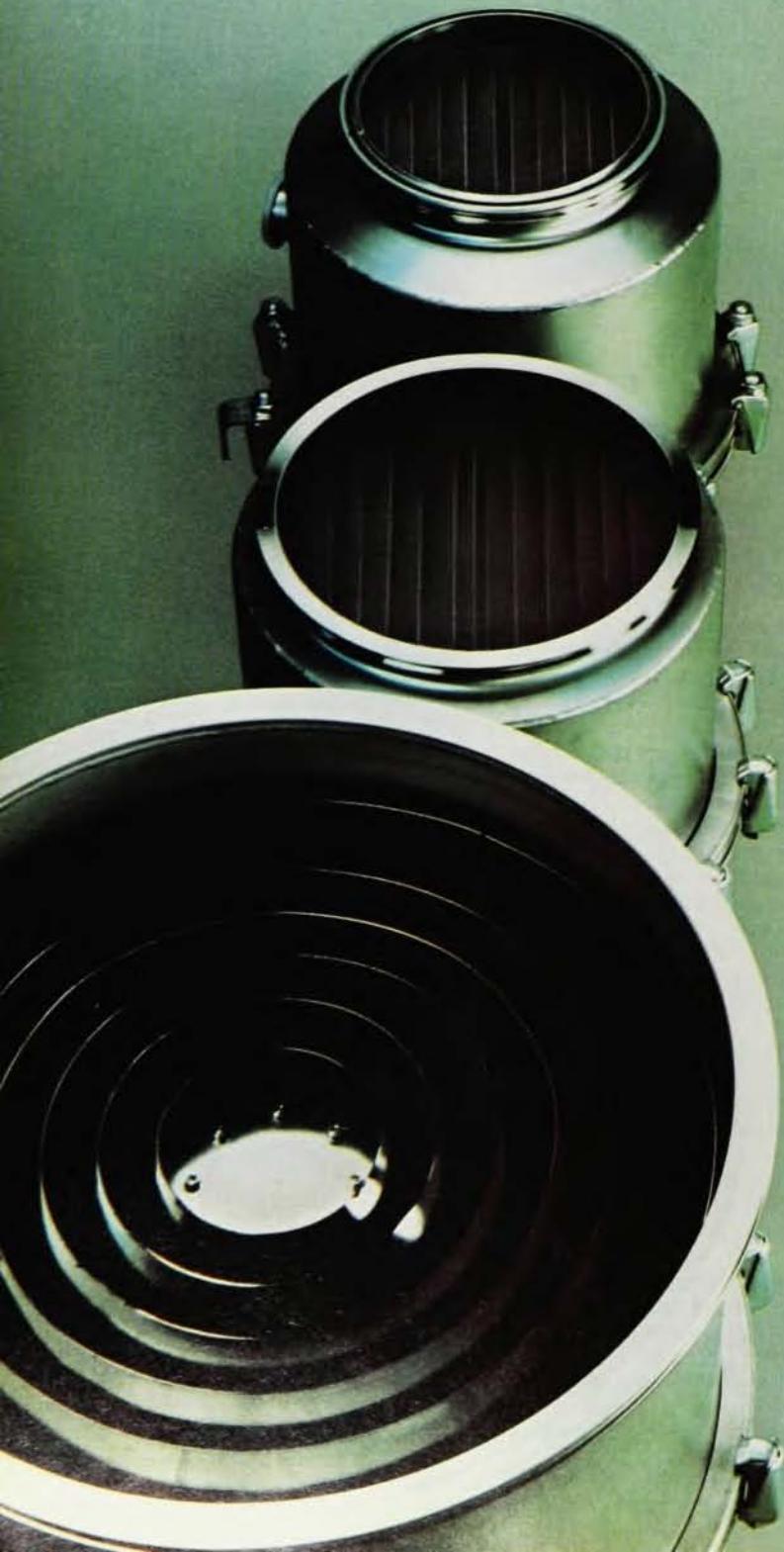
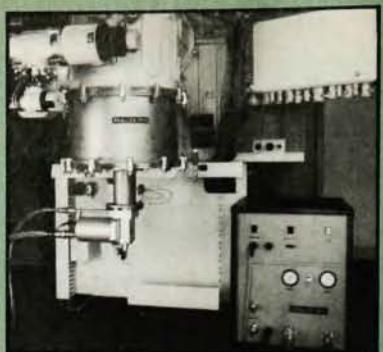
For more information, a demonstration, or a full line catalog, please contact us at ENI, 3000 Winton Road South, Rochester, NY 14623, Call 716/473-6900, or telex 97-8283 ENI ROC.

# ENI



The advanced  
design line of  
power amplifiers

# Superior Cryopumps from a Committed Vacuum Company. Balzers.



For 40 years Balzers has been a leader in, and committed to, the vacuum industry. Designing the best vacuum evaporation and sputtering systems. Manufacturing superior vacuum instrumentation and quality components. Developing innovative and production-proven vacuum processes for thin film coating systems.

Using this extensive vacuum experience, Balzers has designed a new series of cryopumps. Cryopumps superior in performance, reliability, and operating efficiency. The only cryopumps completely designed and produced in the U.S. by a company totally committed to the vacuum industry. The only cryopumps to meet the critical performance demands of our toughest customer: Balzers Thin Film Coating Equipment Division.

These cryopumps have significant design enhancements in both the compressor and refrigerator subsystems which provide faster pumping, faster cooling, and higher gas throughput. The compressor is hermetically sealed so there's no possibility of oil leakage. And an integrated monitoring system provides precise vacuum control with minimum operator involvement.

Balzers cryopumps can replace large capacity diffusion pumps in existing installations or be included in new process equipment. A wide selection of flow rates and flange sizes makes replacement simple.

The most significant feature of these cryopumps is that they are totally designed, built, and serviced by a dedicated vacuum company. For the vacuum industry.

Balzers has an established worldwide service organization with field service offices in the U.S. and Europe to help you with all your vacuum needs.

Write or call us about the new Balzers Cryopumps.

**BALZERS**

8 Sagamore Park Road, Hudson, NH 03051  
(603) 889-6888 / TWX 710-228-7431

AVS Show Booth 104, 105, 106

Circle number 13 on Reader Service Card

## letters

metric age dating techniques are in error, this has enormous implications for nuclear-waste containment. That is, if the salt domes in Louisiana and Mississippi are really only several thousand years old instead of the hundreds of thousands or millions of years estimated by current uniformitarian concepts, then these sites, which have been judged safe repositories of nuclear wastes *on the basis of these long-age estimates*, just might in reality be the poorest type of repository for nuclear-waste storage. Thus to plan nuclear waste containment in salt domes without further investigation could lead to problems of unknown proportions several decades from now.

### References

1. R. V. Gentry, *Science* **160**, 1228 (1968); *Science* **173**, 727 (1971); *Science* **184**, 62 (1974); *Annual Rev. Nuc. Sci.* **23**, 347 (1973); R. V. Gentry, *et al.*, *Nature* **244**, 282 (1973); *Nature* **252**, 564 (1974); *Nature* **274**, 457 (1978).
2. R. V. Gentry, *et al.*, *Science* **194**, 315 (1976).
3. R. V. Gentry, *et al.*, *Science* **216**, 296 (1982). See also *Sci. News* **121**, 296 (1982).
4. R. V. Gentry, *EOS* **60**, 474 (1979); *EOS* **61**, 514 (1980). See also *Sci. News* **121**, 44 (1982).
5. P. E. Damon, *EOS* **60**, 474 (1979).
6. Derek York, *EOS* **61**, 514 (1980).
7. R. V. Gentry, *et al.*, Submitted for publication.
8. R. Sinclair, *Sci. News* **119**, 67 (1981).

ROBERT V. GENTRY  
Columbia Union College  
Takoma Park, Maryland

8/82

In connection with the recent debate in these columns on the creation-evolution controversy, I would like you to print, for the benefit of all readers, the following excerpt from the Rig Veda, an ancient Hindu religious text. As translated by A. L. Basham, it reads:

But, after all, who knows, and who can say whence it all came, and how creation happened? The gods themselves are later than creation, so who knows truly whence it has arisen?

When all creation had its origin, he, whether he fashioned it or whether he did not, he, who surveys it all from the highest heaven, he knows—or maybe even he does not know.

Nobody really knows exactly how old the Rig Veda is. It has been estimated to be at least 5000 years old. But the above hymns appear as true today as they were then. They do great credit to the thinkers of that lost era. The tremendous advances made since then in science, technology and other fields

of human thought have not altered the basic truth of these statements from the Rig Veda.

7/82

T. RAYA HALEMANE  
State University College  
Fredonia, New York

After reading a spate of virulently anti-creationist articles and letters in your publication, I decided that something less virulent and more thoughtful should be said.

As we might all easily agree, it isn't very scientific to make assumptions dogmatically and then accept only evidence in favor of these assumptions. It is the practice of this precept that separates the unbelievers from the believers, sheep from goats, and so forth. Most of us, history says, will test as goats. Therefore, a word of caution: How much do we actually know (other than that it has something to do with someone's religion) about this set of ideas we are calling "creationism"? I shall confess that I know next to nothing. Will any of the noisemakers out there also confess?

I do know what we do not know about creation: almost everything. Science, like religion, is not a physical thing itself, but a non-material set of ideas. It is an ideology and is not exempt from the scrutiny to which we subject other ideologies. Science, if it is to progress, must be fed the fuel of inspired thinking—brainstorming, if you will. Religion has generally been the repository of things we felt must be true, in some sense knew were true because we existed ourselves, but which we could not demonstrate rationally or understand. Sometimes the inspiration that sparks great scientific progress has been religious. Other times a dogmatically held religious concept has stifled the development of the very inspiration that it may have been meant to provide. The point is that we have never been very good judges of this and, as scientists living in an age that has history books telling of both atheistic Nazis who purported to worship science, and Spanish Inquisitors, who purported to be doing God's will, that we be a bit more humble and lower our voices.

We have several things to gain by lowering our voices. One is the possibility that paying attention to some radically different ideas, however wacky, may suggest to us an insight into science that we do not expect. For instance, we do not have a thoroughly rational, tested hypothesis about the origin of our species. Indeed, we haven't even been able to agree upon a biological classification system for primates. Somewhere buried in the creationist arguments may be the right

continued on page 103



## A Complete Low Temperature Characterization System for

**\$2995\***

A convenient system for characterizing small samples and electronic devices from 100°C to -196°C (77K) using MMR's patented MicroMiniature Refrigerator.

### Features

- Single knob temperature control
- Automatic temperature stabilization
- LCD readout in degrees C and K
- Rapid temperature response

### Applications

- Optoelectronic detectors and lasers
- Materials and biological samples
- Low noise amplifiers and microwave devices
- Most other electronic devices

### Used in:

- Q/A labs
- Research labs
- Thin film fabrication
- OEM applications

\*Foreign prices are slightly higher.

### MMR Technologies, Inc.

1400 Stierlin Road, #A5  
Mountain View, CA 94043  
(415) 962-9620

Circle number 14 on Reader Service Card

question, one that we have been ignoring because it wasn't proper to consider it! The second thing we have to gain is our decency and humanity. I have myself sat in class after class in the sciences and humanities in which any idea remotely religious was belittled, attacked, and shouted down in the most unscientific and emotionally cruel way. I have seen young students raised according to fundamentalist doctrine treated like loathsome alley cats, emotionally torn apart, and I never thought that this sort of treatment was any better than the treatment that religious prelates, who held authority, gave Galileo. Why scream about the inhumanity of nuclear war if you are also willing to force people of fundamentalist faiths to attend public schools in which their most cherished beliefs will be systematically held up to ridicule and the young children with it? These people are mostly too poor for private schools to be an alternative. The state tries to prevent them from teaching their children at home rather than sending them to school. What choices do they have? Would you call it freedom? Do you call it fair?

Is it really a terrible thing for a textbook to mention that, aside from the Darwin theory of evolution, there have existed other ideas, many of them religious in nature? Would that not open the mind of students rather than close them to scientific possibilities? Wouldn't it make the fundamentalist student feel a little more welcome and better equip him to take an unbiased view of evolution?

Well now, I've asked a lot of questions and I do not know the answers. I would far prefer to hear physicists discussing such questions than loudly attacking straw men and expressing a Chicken Little attitude that the educational sky is falling because a few creationists want to be heard.

J. WILLITS LANE

Tallahassee, Florida

8/82

•

Neither your statements on creationism (February, pages 53 and 120) nor readers' responses (June, page 84) give any practical advice on how to cope with the creationist challenge.

A large part of the problem is that few people really know what "scientific creationism" is all about. Most creationists are biblical creationists only, and know nothing whatever about the scientific claims of "scientific creationism." I suspect that significant numbers of scientists and science teachers do not know, either.

Morris and Gish<sup>1</sup> tell us that the three basic claims of scientific creation-

SURFACE  
ANALYSTS

# ATOMIKA

## THE MOST ADVANCED TELEFOCUS ION GUN

can give you the versatility  
to meet increasing tough  
present & future requirements



The ATOMIKA Telefocus Ion Gun generates ion beams of noble or reactive gases. The unmatched versatility and unique features of this ion gun meet the most exacting state-of-the-art requirements such as those needed for Secondary Ion Mass Spectrometry (SIMS).

**Features include:**

- hot and cold cathode sources
- low operating pressure
- energy variable between 0.1 and 15 KeV
- narrow energy spread
- variable current and current density
- variable spot size from  $\mu\text{m}$  to mm

- proven reliability
- raster scanning ion beam
- mass analysed ion beam
- provision for neutral suppression
- differentially pumped
- special patented material technology for ion optics

**ATOMIKA, INC.**

614 WEST MANCHESTER BOULEVARD, INGLEWOOD, CA 90301

PHONE (213) 671-6670

*A subsidiary of ATOMIKA Technische Physik GMBH,  
Kugelmullerstrasse 6, D-8000 Munich 19, West Germany*

AVS Show Booth 185-186

Circle number 58 on Reader Service Card

PHYSICS TODAY / OCTOBER 1982

SPECIAL  
OFFER FOR  
S.H.E. CUSTOMERS\*

# ANOTHER FIRST

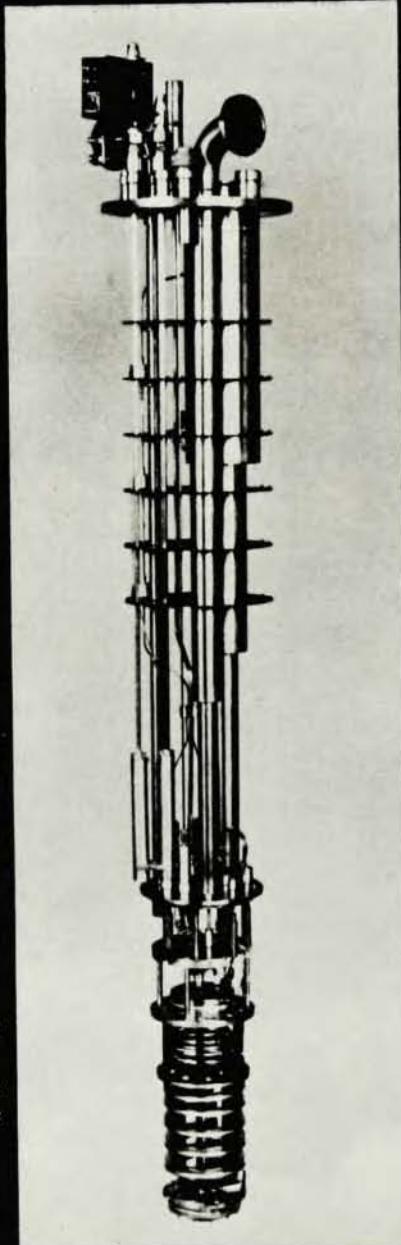
If you demand the ultimate in reliability, ease-of-use, versatility and performance, then the new S.H.E. Series 500 Dilution Refrigerator Systems are designed for you.

Our Series 500 utilizes the latest in sintered silver heat exchange technology and newly developed manufacturing techniques to assure you years of trouble free performance.

Our well-proven modular approach to these new systems allows you to select components that create a system unique to your special requirements. As the most experienced dilution refrigerator manufacturer in the world, S.H.E is qualified to handle your order for custom designed equipment too.

#### Features:

- Compact, continuous operation design which minimizes operator service requirements and liquid helium consumption while maximizing working space and accessibility.
- Hand-crafted using improved manufacturing techniques to maximize reliability.
- User oriented design which simplifies the installation of most experimental packages.
- Top loading capability — installed with your order or added later.
- Upward compatibility allowing future upgrades to higher performance levels.



- Installed and tested S.H.E. SQUID Probes and Thermometer systems.
- Performance:
  - Continuous temperatures to 3mK.
  - Cooling powers to 2.5mW at 100mK.
  - Circulation rates above 3m moles/sec.
- Two year warranty.

#### APPLICATIONS:

S.H.E refrigerator systems have been used over 12 years for such diverse applications as:

- Mossbauer studies
- Neutron scattering
- Heat capacity measurements
- First stage cooling to  $\mu$ K region
- Spin polarized hydrogen
- Infrared bolometers
- Transport properties
- Acoustic microscopy
- Superfluid  $\text{He}^3$  and  $\text{He}^4$
- Gravitational wave research
- NMR

What else would you expect from the company that has built systems producing temperatures below 8mK continuously and without trouble for well over 10 years?

\*If you are presently using an older S.H.E. dilution refrigerator, we would like to offer you the opportunity to upgrade your existing system to the performance of our new 4.5mK Model DRI-520. Call before November 30, 1982 for details and take advantage of the introductory price reduction.

#### S.H.E. Corporation

4174 Sorrento Valley Blvd.  
San Diego, California 92121  
(714) 453-6300 TELEX 697603



S.H.E. CORPORATION  
CRYOGENIC INSTRUMENTS AND SYSTEMS

In Europe:  
S.H.E. GmbH, Maria-Therese-Allee  
22, D-5100 Aachen 1, WEST GERMANY.  
Telex: 832441 Telephone: (0241) 72051

ism are as follows:

- The age of the Earth is no more than about 10 000 years.
- The Earth has undergone very little change since creation, except for the Flood and perhaps a few other catastrophes.
- Life forms have changed little since the creation except for minor hereditary changes.

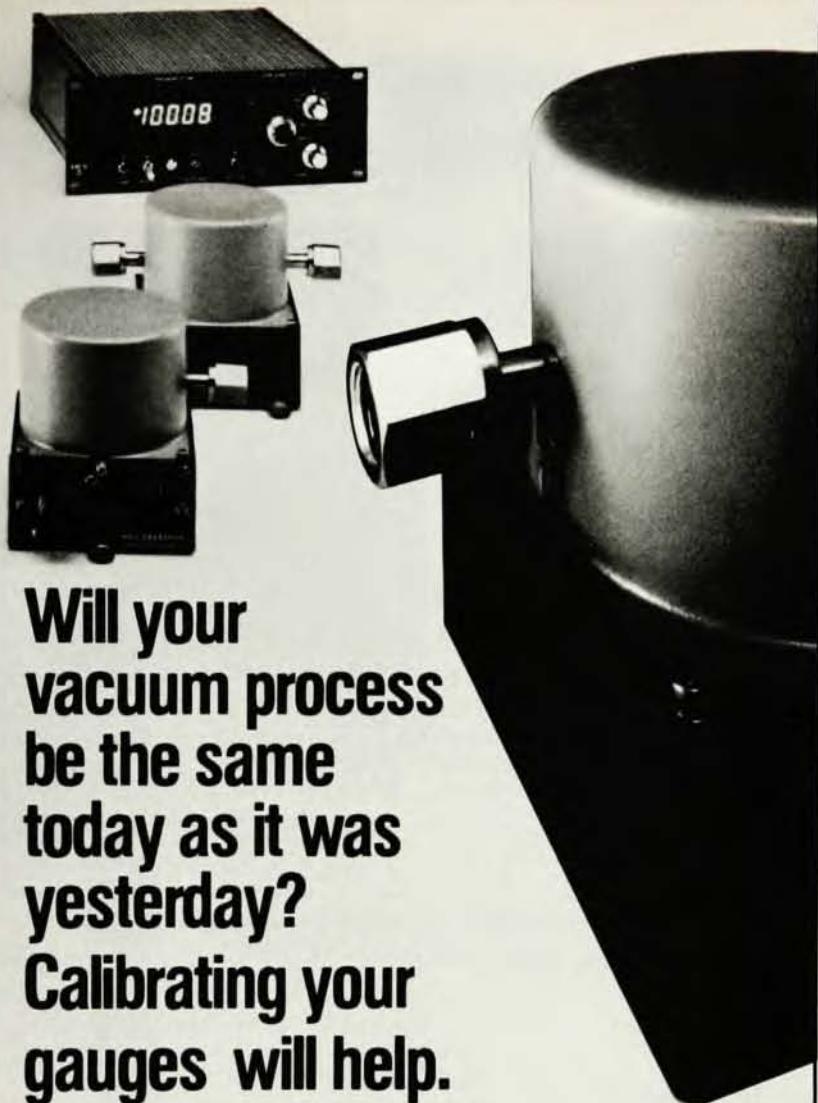
Those of us with broad scientific training know that the evidence does not support those claims, but we are not going to convince many by merely arguing that those claims are nonsense. We can win that argument only by thoroughly teaching the facts and especially the processes of science in an unbiased, non-emotional atmosphere.

Our colleagues in the life and Earth sciences will have to deal with the second and third claims, but we who teach physics are in an ideal position to debunk the first claim. We should do so only after thoroughly teaching relevant material, such as radioactivity. After students have done some half-life experiments and plotted enough decay curves to understand how exponential decay works, the question of the age of the Earth can be brought up. I like to present the problem in this way: "Some people believe the Earth is only 10 000 years old, while others claim it is 4.5 billion. What is the shortest half-life an element could have and still exist in the Earth after those periods?" Since any radioactive nuclide which is not a decay product will virtually disappear in 10 half-lives, the answers are about 1000 years and 0.5 billion years, respectively. Then I send them to the *Handbook of Chemistry and Physics* with instructions to tabulate all of the nuclides with half-lives longer than 1000 years.

The results consistently and overwhelmingly refute the notion of a young Earth. If students already know about alpha and beta decay, they can tabulate the natural abundance of the decay products of those long-lived nuclides which are not found in the Earth. Students who make these surveys after gaining a working knowledge of radioactivity are not likely to give much credence to the creationists' young Earth claim. They will quickly see why creationists "do not trust radioactivity" as a means of establishing the age of the Earth, although many creationists trust nuclear science in the contexts of national defense and the electric utility industry.

It is to be hoped that colleagues in the life and Earth sciences can come up with similar teaching strategies to counter the creationists' challenges to their fields.

It is not enough, however, merely to



## Will your vacuum process be the same today as it was yesterday? Calibrating your gauges will help.

Calibrating your gauges will give you the accurate, consistent pressure measurements you need to repeat your successful vacuum processes.

Every vacuum process is a balance between pressure, flow, gas composition and countless other variables, any one of which can render your efforts useless if it isn't controlled.

Routine calibration of your gauges insures that your pressure measurements are the same. Exactly the same. Cycle after cycle, day after day. And the system is computer-compatible using an MKS Model 288 for IEEE-488 interface.

Call us today. We're at 617-272-9255. Or write MKS, 34 Third Avenue, Burlington, MA 01803.

We'd like to show you how a Baratron Series 270 calibration system can help your process repeatability.

**MKS**   
INSTRUMENTS, INC.  
AVS Show Booth C

Circle number 60 on Reader Service Card

# Super-performance continuous flow cryostat.

Our "SuperTran" refrigerator was designed for applications requiring excellent temperature stability, fast response and trouble free operation down to 2 K.

The "SuperTran" cools your samples from 300 K to 4.2 K in 10 minutes, and provides over 2 watts of refrigeration at 4.2 K.

And not at the expense of temperature stability either. The "SuperTran" will hold your sample at any temperature below 25 K with an incredible stability of  $\pm 0.005$  K.

The "SuperTran" uses a modest 0.7 liter/hour of liquid helium. It is easy to use and comes complete with a flexible stainless steel transfer line, needle valve, evacuation valves and heater.

Call today for details.



*Janis*  
Research Company, Inc.  
22 Spencer Street  
Stoneham, MA 02180/(617) 438-3220  
Europe: Klaus Schaefer: Langen, Nozay, Zurich,  
Wantage. Japan: Niki Glass Co.: Shiba, Tokyo.

Circle number 61 on Reader Service Card

the  
**OEM**  
VUV-VIS-NIR

## Monochromator and Lightsource Specialists now combined in our firm

We have designed systems used in great numbers by **Hewlett Packard**, **Spectra Physics**, **Waters Associates**, **Gilford Instruments** and many others. Monochromators in Spectrophotometers designed by members of our crew are in use world-wide.

We are true specialists, well equipped to serve as your OEM supplier of Opto-mechanical systems and assemblies. Let us quote on some of your requirements. Consider using some of our standard components to solve your specific Spectroanalytical problem. We would be happy to send you more details.

**McPHERSON**

DIVISION OF SCHOEFFEL INTERNATIONAL CORP. 530 Main Street, Acton, Mass. 01720  
(617) 263-7733



AVS Show Booth 8

Circle number 62 on Reader Service Card

## letters

debunk unacceptable ideas. We must teach science more effectively in all areas. If we really believe that science is what scientists do, we must teach science by letting students do some real science. We must set aside or even throw away encyclopedic textbooks and let them make observations, devise "laws," invent and test models.

Physics is the very best medium for teaching how the scientific process works. Many profound concepts can be taught to even very young children with simple equipment, provided we ask the right questions. Arons and Rogers and others have given us some ideas on how to do it, and we must do it if we are to convince anyone that science is a pleasurable as well as useful intellectual activity.

It is not enough, however, merely to improve the quality of high-school and college physics courses. People in physics must find ways to improve the teaching of science at all levels of education right down to and including kindergarten.

### Reference

1. Henry Morris and Duane Gish, The Institute for Creation Research, 2716 Madison Ave, San Diego, CA 92116, have written many books and pamphlets on the subject.

JOHN E. BEACH  
Fairless High School  
Navarre, Ohio

7/82

... even more revealing of the dogmatic nature of the special creationists is the implicit assumption shared by the letters of both Russell Humphreys and the Doanes (Letters, June); that is, that evidence *against* evolution is evidence for special creation. This assumption is patently false. It ignores the great variety of other creation models which contend for popular acceptance such as abiogenesis, panspermia (recently promulgated by Sir Fred Hoyle and Chandra Wickramasinghe), cyclical evolution and the near infinite variety of religious cosmologies of the Hindus, American Indians, and so on ...

But why *should* scientists, engineers, and all academics worry about a "scientific" creationist movement? Put simply, there are special-interest groups who do not understand how legitimate science progresses, who philosophically disagree with evolution, and who wish to neutralize it in our nation's science classrooms. Thus, we have comments such as Charles Chaffey's: "Something is clearly wrong when scientists will not obey a law enacted by the majority of the people, and go to court to try to escape from having to." (June, page 88). Yes, Mr. Chaffey, the something

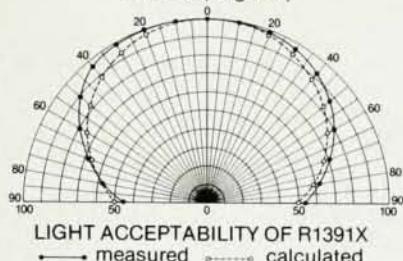
# NEW precision photomultiplier tubes for high energy physics



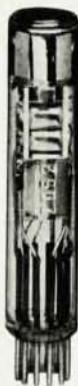
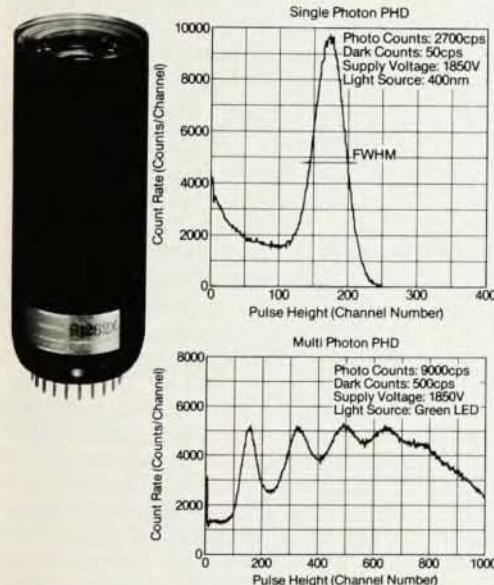
## HEMISpherical PMT's — 1/2" to 20" DIAMETER.

These PMT's provide good quantum efficiency, cathode uniformity timing characteristics and light acceptance significantly greater than  $2\pi$  solid angle. The cost per unit of cathode area is very economical, approximately \$0.50 per  $\text{cm}^2$  on large tubes.

ANGLE (Degrees)



**R1262 — A GaAsP high gain first diode PMT**  
capable of excellent single and multi-photon discrimination.

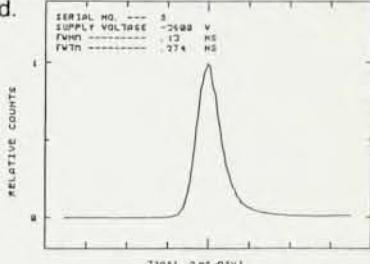


## R1635 — Compact 10mm PMT.

Uses 35% of the cubic space required by a 1/2" tube. Fast response, good coincident timing, excellent for low light level detection where space is limited.

## R1564X — Proximity Microchannel Plate PMT.

For use in high magnetic field environments requiring magnetic field immunity and high speed response such as in hodoscopes and for decay time fluorescence measurement. The R1564 provides 200 picosecond rise time plus excellent gain stability to  $10^{-1}$  coulomb accumulated charge and beyond.



Take advantage of Hamamatsu's state-of-the-art hemispherical photomultiplier tubes for precise detection of Cerenkov light in proton decay or neutrino-type experiments. Use our more traditional end-on PMT's in calorimeter, hodoscope and plasma applications.

CALL OR WRITE FOR LITERATURE

# HAMAMATSU

HAMAMATSU CORPORATION • 420 SOUTH AVENUE • MIDDLESEX, NEW JERSEY 08846 • PHONE (201) 469-6640

International Offices in Major Countries of Europe and Asia.

Circle number 63 on Reader Service Card

# UHV INSTRUMENTS

## Precision Vacuum Equipment



UHV INSTRUMENTS™ manufactures a complete line of precision accessories for the vacuum/surface specialist: precision manipulators, sample insertion and preparation devices, analysis probes, long stroke bellows devices, chambers, shear and tensile fracture devices. These devices can be used to prepare, fracture, transfer, and manipulate samples under vacuum. The accessories are compatible with most commercial analysis systems manufactured by PHI, Varian, HP, VG, Kratos, and others.

Call our sales office  
(416) 335-3103, or write for our new catalogue.

ULTRA HIGH VACUUM  
INSTRUMENTS INC.  
901 Fuhrmann Blvd., Buffalo, N.Y.  
14203

on the West Coast call our representative at Process Physics Inc. in San Jose (408) 942-1611

### letters

that's clearly wrong is that science does not test its hypotheses and theories by popular vote. When governments intervene into the contents of science, its effects may range from the ludicrous (legislating that pi equals 3), to the counterproductive (the USSR's previous adherence to Lysenkoism) and to the tragic (the Aryan physics and biology of the Nazis).

And when should such a movement be erupting? At the very time our technical education should be at its best and is instead at its worst. The next century will require a technically competent and literate populace for our country to survive in any reasonable form. It has been noted many times previously how poorly our children are educated as compared to the Japanese, the Russians and so on. To allow a pseudoscience such as creationism to enter the biology classroom is only one more dilution in our anemic secondary education. Once we allow unfalsified theories into the limited domain of scientific inquiry, we invite the entire collage of astrology, flat-earthism, pyramidology, and so on.

All observers should note that if it weren't for the book of Genesis, and the fundamental religious groups behind such laws as Arkansas' Act 590, there would be no "scientific" creationist movement. It is a transparent attempt to inject a particular religious orthodoxy into our schools. I therefore invite the "scientific" creationists who philosophically disagree with biological evolution to teach their point of view in the churches where it belongs and where science does not seek equal time.

KEVIN G. SMITH

8/82

Houston, Texas

I would like to get in my two cents worth on the creationist/evolutionist debate. As far as I can tell this is nothing more than a continuation of the efforts of certain factions within Christianity to impose their dogma by the systematic extermination of all opposition. We are, of course, all familiar with the inquisition and the persecution of such pioneering scientists as Bruno and Galileo. What is not well known, however, is some of the history of the early church which indicates that far from being the guardian of learning through the Dark Ages, the church was one of the major causes of their darkness. In the course of preparing a television program on the history of mathematics I came across the following revealing bit of information: Though the Christian leaders adopted many Greek and Oriental myths and customs... they opposed pagan learning and ridiculed

mathematics, astronomy, and physical science; Christians were forbidden to contaminate themselves with Greek learning. Despite cruel persecution by the Romans, Christianity spread and became so powerful that the emperor Constantine (272-337) was obliged to adopt it as the official religion of the Roman Empire. The Christians were now able to effect even greater destruction of Greek culture.... Pagans were attacked and murdered throughout the empire. The fate of Hypatia, an Alexandrian mathematician of note... symbolizes the end of the era. Because she refused to abandon the Greek religion, Christian fanatics seized her in the streets of Alexandria and tore her to pieces.

Greek books were burned by the thousands. In the year that (the Emperor) Theodosius banned the pagan religions, the Christians destroyed the temple of Serapis, which still housed the only extensive collection of Greek works. It is estimated that 300 000 manuscripts were destroyed. Many other works written on parchment were expunged by the Christians so that they could use the parchment for their own writings. In 529 the Eastern Roman emperor Justinian closed all the Greek schools of philosophy, including Plato's Academy."

In other words, the early church enlisted the aid of the state to destroy all opposing beliefs, and all forms of learning which might lead people to question Christian dogma. This seems strikingly parallel to the attempts of modern creationists to enlist the courts in their efforts to eliminate the teaching of evolution. And note: I say eliminate because I, at least, have no doubt that should the creationists be successful in gaining equal time their next step will be to attempt to have the teaching of such sciences as evolution outlawed. Historical Christianity (as distinct from Gnostic Christianity, which the early church also destroyed) can only flourish where there is ignorance. It does not do, for example, to have scholars point out that the myth of Christ is simply a reworked version of the myths of Osiris and Dionysus; or that according to the best empirical estimates the Earth is approximately 4.5 billion years old.

One is tempted to speculate on the reason behind the creationists efforts. Certainly they are committed to their religion; the question is why they cannot relax, enjoy life, and allow others the freedom of their beliefs. If they want their children to learn creation instead of evolution, there are fundamentalist Christian schools avail-



# First of a new breed

## ITHACO's newest programmable integrator

Our intensive research and development program is paying off for you. We're presenting two new programmable integrators with built-in microprocessor capability—Model 385 with IEEE-488 interface and Model 386 with RS232 interface.

### Make your existing equipment programmable.

These Dual Channel integrators couple the output of any lock-in amplifier to your computer and provide true integrating techniques. You are able to program the bandwidth of your lock-in without troublesome switching transients.

- Direct compatibility with ITHACO's DYNATRAC® 393 Lock-in—the optimum in price, performance, speed and accuracy.
- Internal 2K Bytes of RAM—store thousands of samples.

- The ideal update for the lock-in or other dynamic measuring instrument you now have—provides the low-cost solution to computer based measurement techniques.

- Simultaneous operation at both channels—ideal for ratio type measurements.

- Internally calculates and outputs  $A$ ,  $B$ ,  $\frac{A}{B}$ ,  $\tan^{-1} \frac{A}{B}$ ,  $\sqrt{A^2 + B^2}$

- Full 100 dB dynamic range—100,000:1 Call, write, or telex today for more information or to arrange for a demonstration in your Lab.

Ithaco, Inc., 735 W. Clinton St., P.O. Box 818, Ithaca, New York 14850-0818

Phone: 607-272-7640

TWX/Telex

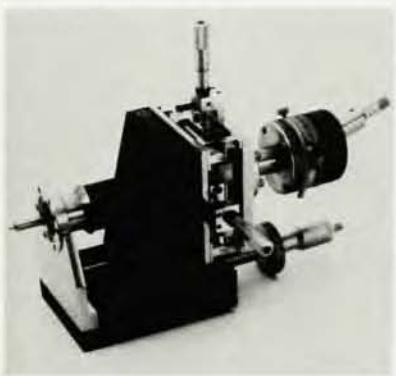
510-255-9307

ITHACO INC. ITH.

**ITHACO**

A MEASURABLE DIFFERENCE

# UHV MANIPULATORS RELIABLE



## ASK ABOUT LIQUID HELIUM COOLING

## VERSATILE

### STANDARD FEATURES

- stainless steel stages
- 300° c. bake out
- 8" z travel
- 4" diameter bellows
- feed through collar
- rapid z travel
- micrometer accuracy

### OPTIONS

- 360° continuous azimuthal rotation
- linear coax
- rotary coax
- tilt
- heating to 900° c.
- $\text{In}_2$  cooling
- substrate handling
- substrate fixturing

Look for us at  
AVS Show Booth 170, 171

For further information send for our free catalog. It contains information on this and 200 other high and ultra high vacuum products manufactured by

 **thermionics**  
**laboratory. inc.**

P. O. BOX 3711

HAYWARD CALIFORNIA 94540

Circle number 66 on Reader Service Card

110 PHYSICS TODAY / OCTOBER 1982

## letters

able. As far as I can tell, the answer involves the nature of historical Christian dogma and the personality types attracted to it. Historical Christianity is a religion based on guilt, the fear of external damnation, and the idea of vicarious atonement. In psychological terms the terror of sexual guilt centered around the Oedipus complex becomes associated with the external damnation of the soul. This fear and terror is covered by belief in historical Christian dogma which promises salvation via the sacrifice of Jesus. A person possessed by such a belief system (and possession here may be taken in the sense of demonic) will attack anything which tends to throw doubt on his belief. The historical Christian is not able to relax and enjoy life, and to allow others the freedom of different beliefs undermines the rigidity of dogma. As I see it, this is what we are dealing with in the creationist/evolutionist debate.

BURTON H. VOORHEES

*Athabasca University  
Edmonton, Alberta, Canada*

### Reference

1. M. Kline, *Mathematical Thought from Ancient to Modern Times*. Oxford University Press, New York, 1972.

This is in answer to G. F. Albrecht's scathing attack (July, page 15) on those who cannot accept the theory of evolution as the origin of life. As a Christian, I can accept any method of creation, including evolution, because God can create through any method that He wishes. As a scientist, I cannot accept a theory that proposes, without any experimental verification, that life arose by chance, violating the laws of thermodynamics and the law of probability. Experimental verification of any theory must be provided.

The theory of evolution is a catalog theory in that all evidence is based upon observation, cataloging those observations, then developing a theory to explain the items in the catalog. There is no experimental evidence of one species evolving into a new one by chance; all changes that occur are variations of a theme within a species. A theory that life was created also agrees with the data in the catalog and does not violate physical laws which have been demonstrated to be true.

I am not defending those who call themselves creationists, as many of their positions are non-biblical and serve only to distract from God's plea to us to walk in His way; however, I am a scientist and will oppose vigorously any effort by Albrecht or others to impose their religious position (blind accep-

tance of a theory which has not been experimentally verified) through the use of the scientific organizations to which I belong and pay dues.

There is one aspect of the almost hysterical insistence by the evolutionists that their theory be accepted as fact that greatly concerns me. If evolution is occurring, that implies that some humans are more highly evolved than others. Who are those more highly evolved? How would they arrange society to handle those who are not as highly evolved? Who decides the state of evolution of each individual? A repeat of the historical answers to these questions makes me shudder. I pray that the "reason" that Albrecht wishes to prevail doesn't.

ROBERT L. DUNNING  
*Petroleum Sciences, Inc  
Spokane, Washington*

This letter is apropos of the APS stand on creationism and Lincoln Wolfenstein's letter in April (page 95) stating that advocacy of creationism is part of a "well orchestrated anti-intellectual campaign... resembling those of Hitler and Stalin."

As a physicist, my training has not equipped me to decide on the correctness of the theory of evolution. However, in your May issue there was an article reporting evidence which confirms the idea that a large meteorite hitting the Earth caused a major wave of biological extinctions. Recently a book by Francis Crick, a winner of the Nobel Prize in biology for the discovery of the double-helix structure of DNA, proposed that life on Earth originated from a space ship, visiting from somewhere in outer space. There do then appear to be a large number of people, qualifying as "intellectuals," who deviate from the standard (synthetic) theory of evolution which, as I understand it, states that life arose spontaneously in some kind of primeval organic soup and developed into its present form by continuous selection of advantageous mutations. Further I believe that Wolfenstein's characterization of the Bible as "mythical" and his denigration of President Reagan's economic program do not belong in PHYSICS TODAY, which is a journal of physics.

ALVIN RADKOWSKY  
*Tel-Aviv University  
Tel-Aviv, Israel*

8/82

## Telescope misrepresented

I am writing about an error in the figure caption on page 56 of the June issue.

The fine-error sensor, or star-tracker, of the International Ultraviolet Explorer (IUE) is only sensitive in