

Convert or Repent.

Switch to our high performance, single-width 8075 ADC.

The 8075

- Full 8192 channel conversion gain and range
- Synchronized, crystal controlled 100 MHz clock rate
- Stability better than $\pm 0.009\%$ of full scale/ $^{\circ}\text{C}$
- Pulse pileup rejection input
- Pulse height analysis using either automatic peak detection or delayed triggering
- Analog sampling voltage analysis
- Digital offset in 128 channel increments



CANBERRA

Canberra Industries, Inc.
45 Gracey Avenue
Meriden, Connecticut 06450
(203) 238-2351

Circle number 49 on Reader Service Card

aperture for direct imaging or spectroscopy.

It is well-known that telescopes in space or in new wavelength domains result in ever-larger demands for follow-up optical and infrared observations. Far from making the largest possible ground-based telescopes obsolete, the space telescope will surely redouble demand for their use.

ROGER ANGEL
Steward Observatory
The University of Arizona
Tucson, Arizona

1/82

THE AUTHOR COMMENTS: Roger Angel's collegial vesuviation about my depreciation, en passant, of pyrex as a telescope material is absolutely appropriate. In fact, I even think he's right! However, I would like to clarify my remark about pyrex and place it into the simple context I had intended but not accomplished. To wit, it would indeed be idiocy to cast a largely solid mirror blank out of pyrex these days because we have better, albeit far more expensive, materials with which to work. Angel, however, has been pushing (and in our basement!) an exciting technology for fabricating very thin "shells," utilizing new casting and fabrication techniques, that show substantial promise as viable candidates for large and exquisitely figured primaries of the future. And, indeed, pyrex could well be the most plausible material for such mirrors. I was remiss in not massaging this point in my article, and I am grateful to Angel for flagging my dereliction.

With respect to Angel's comments about "... Franken's doubts about the value of a large ground-based telescope..." I have reread that part of my article, and I do not agree with his assessment of what is actually said. Rather than debate the matter in this column, however, let me refer possibly interested readers to the original text. I might just add, however, that what I think—or what anyone thinks I think—is going to have very little significance compared to what the Director of the National Science Foundation or other potentially interested agencies in Washington might think!

PETER FRANKEN
Optical Sciences Center
The University of Arizona
Tucson, Arizona

2/82

Nuclear physics complaint

The scene is a corridor in the basement of a physics laboratory. Lighting is dim, in the background the noise of mechanical vacuum pumps. Two physicists, slightly round-shouldered, leaning on opposite walls.

First physicist—Did you see the No-

page 160), I must take issue with two of his points regarding large optical telescopes. The first of these is his rejection of borosilicate (Pyrex) glass as modern mirror material, because of its finite thermal expansion. It is true that massive solid blanks which are slow to come into thermal equilibrium are best made from 'zero' expansion materials. However, lightweight blanks with internal honeycomb, the optimum structure for very large mirrors, actually have rather rapid thermal response. My group at the University of Arizona is investigating methods to cast large blanks of 7-8 m diameter of honeycombed borosilicate glass. Properly ventilated, these would have thermal time constants of a few minutes as compared to many hours for solid blanks. Our experience now in figuring test sections of 60-cm diameter shows rapid optical testing is indeed possible. We anticipate that thermal distortion of these mirrors, operating in ground-based telescopes, will never be significant compared to the distortion of 'seeing,' even under the best atmospheric conditions. In fact, because they follow the ambient air temperature, these mirrors reduce the convection at the mirror surface that contributes significantly to image degradation in current large telescopes which have solid zero-expansion mirrors. The mirrors also have potential application in space for longer wavelength telescopes. As a practical matter, fabrication and material costs for borosilicate honeycomb are low. On the basis of costs of our current 2-m furnace located in the Optical Sciences Center we project that mirror blanks of 8-m diameter should cost and weigh no more than the present generation of 4-m solid blanks.

My second concern is with Franken's doubts about the value of a large ground-based telescope in the era of the space telescope. Given no financial restriction, astronomers would prefer, of course, to place all their telescopes in space to avoid the limiting effects imposed by the Earth's atmosphere. It is not sensible, however, to waste time with space telescopes doing those observations that can be done at far less cost on the ground. The proposed National 15-m Telescope will be much less expensive than the Space Telescope, and have 40 times the collecting area. It will not see ultraviolet light or have tenth-arc-second resolution in visible light, but it can perform with many vital complementary observatories for which light grasp is essential. Interferometric methods will allow the reconstruction of images with an angular resolution ten times that of the space telescope in visible light. The potential exists, in the infrared, to correct actively for the atmosphere and reach the diffraction limit of the full telescope

LIGHT IN



PULSES OUT

Traditionally selecting and setting up Photon Counting equipment was an exasperating ordeal, but NOW you can get the

I D A INTEGRATED DETECTOR ASSEMBLY

For the first time!
In one unified assembly...

- **Amplifier-Discriminator**
Extremely fast (high counting rate)
High dynamic range
Standard output pulses:
(ECL, TTL & Fast NIM)
- **High Voltage Supply**
Regulated & Adjustable
PMT Overload protection
- **Photomultiplier Tube**
For U.V., visible and extended red use
- **Tube Housing**
Ambient or Cooled

Call or write for our
IDA brochure.

EG&G
PRINCETON APPLIED RESEARCH
P.O. BOX 2200 • PRINCETON, NJ 08540
TEL: (609) 452-2511

letters

vember issue of PHYSICS TODAY? Fifty years of physics in America. A pretty impressive issue; nearly 300 pages and all those shiny ads.

Second physicist—I have it, but I haven't read it yet. Waiting for the football season to end so I can fill a cold Sunday afternoon. What is in it? I expect masterly expositions of different fields of physics: solid-state physics, elementary particles, nuclear physics, atomic physics, astrophysics, all that good stuff.

F. P.—Well, yes and no.

S. P.—What do you mean yes or no?

F. P.—What I mean is, yes, for solid-state physics, atomic physics, and so on; (except elementary-particle physics enters under the colors of unified field theory, quite good, too, as you would expect from Weisskopf) but a no for nuclear physics.

S. P.—No nuclear physics?

F. P.—That's right. There is a section on accelerators including the obligatory old-fashioned photograph of Lawrence and collaborators perched on a cyclotron, but there is nothing on nuclear physics as such.

S. P.—I don't believe it! Nuclear physics gave birth to all of modern physics. Are you sure; there is nothing on nuclear reactors?

F. P.—Nothing; they must consider that technology.

S. P.—But surely neutron cross-sections, the Breit-Wigner formula, diffusion, Monte Carlo calculations, fission, all that is physics.

F. P.—That may be so, but it's not PHYSICS TODAY. Must be Physics Yesterday.

S. P.—O.K. But how about things like nuclear reactions, the statistical model, the shell model, nuclear-matter theory, direct interactions, nuclear structure, nucleon-nucleon forces, isospin, neutrino mass, anything?

F. P.—There is a picture of Maria Goeppert-Mayer on the cover. First one, in the second row.

S. P.—How about modern accelerators, new electrostatic machines, sector focused cyclotrons, proton and electron linacs; all the modern developments for the acceleration of heavy ions. All US developments in the past 50 years?

F. P.—There is a small photograph of the German heavy-ion linac at Darmstadt—as an example of atomic physics apparatus.

S. P.—I suppose there is nothing on meson-nucleus interactions, giant resonances, states of very high angular momentum, few-nucleon systems, nuclear masses, backbending, orbiting, Hartree-Fock, Hauser-Feshbach, Bohr-Mottelson?

F. P.—You guessed it.

S. P.—Let me try a different approach. Is there no mention of the role of nuclear physics as the link between neutron cross-sections and the abundance of the elements? Or about nuclear medicine along with all the radioisotopes, detectors and analyzers that make it possible? Anything on that?

F. P.—Well a little. Rosalyn Yalow gives nuclear physics a lot of credit for developing the tools that made radioisotope tracer work in biology and medicine possible. You know her prize was for work in radioimmunoassay, which is related. Biologists seem to think nuclear physics is interesting and valuable.

S. P.—But nuclear physics as a science, nuclear technology as an energy resource, or nuclear physics as a source of diverse application to so many other sciences or to practical ends; there is nothing on that?

F. P.—Nothing.

ALEXANDER ZUCKER

Oak Ridge National Laboratory
Oak Ridge, Tennessee

1/82

Our apologies to nuclear physicists—our plans to cover their subject did not work out as we had hoped. The Editors

Astronomers in Washington

Your July cover story "Astronomers in industry" was very eye-catching, because I am one. In an effort to observe the extent of this phenomenon, I examined the list of members of the American Astronomical Society and noted members with nonacademic professional addresses in the Washington, DC metropolitan area. The following lists of public and private firms show the number of members employed by each on the right.

Federal Agencies

Arms Control and Disarmament Agency	1
Bolling Air Force Base	2
Carnegie Institute of Washington	6
Defense Mapping Agency	1
National Academy of Sciences	1
National Aeronautics and Space Administration (D.C.)	11
National Aeronautics and Space Administration (Greenbelt)	130
National Bureau of Standards	8
National Geodetic Survey	1
National Oceanic and Atmospheric Administration	2
National Science Foundation	6
Naval Research Laboratory	42
Office of Technology Assessment	1
United States Naval Observatory	34
United States Naval Sea Systems	1

Private Firms

Analytic Decisions	1
BDM Corporation	1

See us May 25-27 at Semicon West '82 Show in San Mateo, CA. Booth C22.

Circle number 42 on Reader Service Card