tial. With no holds barred in how you connect things and alloy them, new ideas, insights, and possibilities are infinite. In children's play (and in the play of those fortunate adults who have retained this ability), anything can be anything and new combinations can be arrived at; similarly in the dream. Indeed, it is in play that children train their creative abilities. It is the research scientist, the artist, the writer who has the ability to play with ideas and perceptions who make the real advances and contributions." [*Thus LeShan quotes Michael Polanyi:* "Creative thinking is thinking as a child with the tools of logical structuring given by maturity."]

"The necessity for these modes for human beings is seen particularly in two ways. First, it is used in every culture and time we know of. Every group of functioning human beings we know of use it extensively. Second, we can see what happens when we prevent one use of it, the dream. In the dream we use primarily the mythic modes. We now have the technical ability to prevent people from dreaming, but to permit dreamless sleep. When we do this, the person undergoes profound negative personality changes and becomes psychologically quite ill."

"Essentially, the mythic modes seem to serve a vital function in keeping us fresh and alive to the excitement and wonder of our being in the world. They keep us interested in our lives, curious, and creative. When we do not use these modes, we become blasé, bored, uninventive, unmotivated. *All work and no play makes Jack a dull boy* is an insightful and valid maxim. Anyone who looks seriously at his or her own dreams (or own play) is surprised and delighted at his own creativity. The mythic modes keep the world charged with meaning and as fresh as this morning's sunrise seen through the eyes of a child. Without them the sunrise, work, our daily lives, and even sex is a dull affair."

"Literally, as long as we are able to play we are never bored. Without the use of these modes we undergo serious psychological deterioration—as we have seen in the experiments in which dreaming is prevented."

The above excerpts don't do justice to all of LeShan's ideas; however, they help us in making the point that man in general and scientists in particular need time to think, to dream, to make the interconnections necessary for creativity. When that time to play with ideas is eliminated from the working day by requirements imposed by accountability, we believe that the scientific community "undergoes serious psychological deterioration" with a corresponding uncertainty in creativity.

Our leaders should be aware of the great penalties our country has and will suffer in lost ideas and productivity by insisting upon the extreme accountability of recent administrations. . The "managerial uncertainty principle" must also become a tool of modern management, a tool that urges moderation in employing "management by objectives" practices.

FREDERICK ROTHWARF
Toms River, New Jersey
ARTHUR TAUBER
2/14/77 *Elberon, New Jersey*

Presidential postscripts

Two postscripts to my APS Presidential Address reported in the April issue (page 33) are in order:

▸ (page 35) It is fair to say that President Carter did not forget the word "immediately" in his campaign promise concerning the office of science adviser to the President. Frank Press went to work in the Executive Office of the President in February and was confirmed as Director of the Office of Science and Technology Policy by the Senate on 27 April.

▸ (page 34) A cable was received on 10 March from Academician A. P. Aleksandrov, President of the USSR Academy of Sciences, in reply to my letter to him concerning the Moscow Seminar on Collective Phenomena (Bull. APS **22,** 241, 1977). The cable read:

> DEAR PROFESSOR FOWLER: MARK AZBEL MENTIONED IN YOUR CABLE AND LETTER DOES NOT WORK IN THE ACADEMY OF SCIENCES OF THE USSR. I HAVE NO INFORMATION OF THE SO CALLED SEMINAR OF MARK AZBEL. A. P. ALEKSANDROV ACADEMICIAN PRESIDENT USSR ACADEMY OF SCIENCES.

This reply gave me considerable concern, but later I was happy to learn from *The New York Times* of 21 April and Nature **266,** 668 (1977) that Azbel was permitted to conduct a three-day international symposium in his apartment in Moscow. Perhaps the letter POPA prepared, and which I signed for the Society, played some role in this development. I hope it augurs well for the future. In any case APS must stand fast on human rights throughout the world.

WILLIAM A. FOWLER
Past President
The American Physical Society
5/13/77 *New York, New York*

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In his article William Fowler discussed the lack of proper perception of the work

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letters

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of physicists by the general public. Although the printed media contribute to this problem, a more drastic distortion occurs on TV, especially in the programs aimed at young viewers. The Saturday-morning offerings frequently portray the scientist as the fiend (usually with a foreign accent) who would destroy mankind but for the intervention of superhero. If any other occupation or minority were thus portrayed, the networks would quickly hear complaints. Perhaps some of the current antiscientific attitude in this country may be a consequence of this early brainwashing. It may be appropriate for APS to take a hard look at this problem.

JAMES A. WEINMAN
The University of Wisconsin
5/16/77 *Madison, Wisconsin*

Author's revision

In a recently published book,[1] I devoted one chapter to describing the discovery[2] of the cosmic background radiation. In keeping with the aims of the work, I attempted to describe the significance of the experimental results in relation to the state of understanding at the time it was done. I have recently learned that, in so doing, I gave a distorted picture of the development of that understanding. I wish to present here an improved version of the material contained in lines 8–15 on page 284 of reference 1. The pertinent literature includes papers by George Gamow[3] and by Ralph Alpher and Robert Herman.[4]

The big-bang theory was proposed by Gamow as early as 1946, and by 1948 he recognized that the initial stages of such a universe would be dominated by thermal radiation. Alpher and Herman immediately took note of the fact that a remnant of the radiation would still be present—now truly blackbody radiation, as the severe nonequilibrium conditions of the initial explosion no longer held. The continued expansion of the universe would have reduced its temperature to a value at the present epoch, which they initially estimated at about 5 K, a value not affected significantly by further refinements of the theory.

I wish to apologize to Alpher and Herman for having obscured in my book their role in the above developments.

References

1. G. L. Trigg, *Landmark Experiments in Twentieth Century Physics*, Crane, Russak, New York (1975).
2. A. A. Penzias, R. W. Wilson, Astrophys. J. **142**, 419 (1965).
3. G. Gamow, Phys. Rev. **70**, 572 (1946), Nature **162**, 680 (1948), and K. Dan. Vidensk. Selsk., Mat.-Fys. Medd. **27**, No. 10 (1953).
4. R. A. Alpher, R. Herman, Nature **162**, 774 (1948), and Phys. Rev. **75**, 1089 (1949). See also R. A. Alpher, R. Herman, Proc. Am. Phil. Soc **119**, 325 (1975).

GEORGE L. TRIGG
The American Physical Society
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4/14/77 *Upton, New York*

H. G. Wells foresees isotopes

The nomination of Isaac Asimov as an armchair discoverer having fallen through (February 1976, page 11 and November 1976, page 93), I submit the late H. G. Wells for consideration. The following passage is taken from an essay, "The Possible Individuality of Atoms," originally published in the *Saturday Review* of 5 September 1896, **82**, pages 256–257, and reprinted by R. M. Philmus and D. Y. Hughes, "H. G. Wells: Early Writings in Science and Science Fiction," University of California Press, 1975. The experimental work referred to was by Edward C. C. Baly ("A Possible Explanation of the Two-Fold Spectra of Oxygen and Nitrogen," Proceedings of the Royal Society, **57**, 1895, pages 468–469) who reported a separation of oxygen into fractions of slightly different densities by an electric discharge. Wells writes:

"This is really a very remarkable result indeed. Unless some experimental error has been overlooked, one of two things must follow. Either oxygen is not an element (nor nitrogen, nor argon), and the electric spark decomposes it, or there are two kinds of oxygen, one with an atom a little heavier than the other. And this opens one's eyes to an amazing possibility. The suggestion was made some years ago that, after all, atoms might not be all exactly alike, that they might have individuality just as animals have. The average man weighs (let us say) twelve stone, but some men are down to seven and others up to eighteen. Taken haphazard, however, you can safely say that a million men will weigh (with the minutest margin of error) twelve million stone. Take, however, some force to sort out your men—say, for instance, the stress of economic forces—and take one sample of a million coal-heavers and another of a million clerks, and one will be above the average and another below. Now it may be the electric spark traversing the gas has an analogous selective action. Your heavier atoms or molecules get driven this or that way with slightly more force. Clearly the oxygen in one direction will become a little denser than that in another. It is at least an odd suggestion (for which Baly must not be held guilty). We offer it merely as a dream. This is indeed a time for dreaming. There cannot be the slightest doubt that we are at last in the dawn of a period of profound reconstructions in the theory of chemistry. And where the threescore and ten *Elements* will be at the end of it even our speculative enterprise hesitates to guess." [*The reference to prior suggestion is to a philosophical essay by Wells.*]

It would therefore appear that Wells has a reasonable claim to have introduced the concept of an isotope. I would appreciate hearing from those more familiar with the early history of physics whether there are earlier suggestions and what the ultimate result of Baly's work was.

WILLIAM SQUIRE
West Virginia University
2/15/77 *Morgantown, W.Va.*

Corrections

The March issue (page 45) states that H. Tracy Hall "began working at General Electric's Research and Development Center in 1948 and served as director of research, 1955–67."

The reference to "director of research" apparently was meant to apply to a position held by Hall at Brigham Young University after he resigned his position at General Electric in August 1955.

C. Guy Suits served as General Electric vice-president and director of research, and as head of the General Electric Research Laboratory, from 1945 until his retirement in 1965. Since that time Arthur M. Bueche has been GE vice-president for research and development, a position that includes responsibility for directing the work of the General Electric Research and Development Center, successor organization to the former Research Laboratory and Advanced Technology Laboratories.

R. NED LANDON
General Electric Company, Research and Development Center
4/11/77 *Schenectady, New York*

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A somewhat misleading statement with regard to the PEP Project appeared in the March issue (page 20), "in-brief" heading, paragraph 2, line 4:

". . . ERDA has approved a $28-million contract for the design and construction of housing for research equipment."

Although less brief for "in brief," a more accurate statement would be:

". . . ERDA has approved a $28-million contract for the design and construction of the PEP conventional facilities. This includes all sitework, the main tunnels for the storage ring-magnet systems (≈1.4 miles in circumference), electrical and mechanical utilities, technical support buildings, and interaction halls (experimental areas) for colliding-beam experiments."

TOM ELIOFF
Stanford Linear Accelerator Center
4/18/77 *Stanford, California*□