

both degrades the quality of the publication.

The usefulness of a reference list—especially in a book—can be further enhanced by making it into an author index. This requires some work, but very little additional printing costs.

HANS DOLEZALEK
Alexandria, Virginia

AIP COMMENTS: To include the titles of articles in bibliographic citations could indeed be very helpful to some readers. Some of the journals published by AIP permit or even encourage this practice. Most discourage it to save space. However, since many of our journals now have a format that often results in some empty space at the end of an article, we should re-evaluate current practice. Dolezalek's comment comes at an opportune time, since AIP's Publication Board is in the process of revising the *AIP Style Manual*.

A. W. K. METZNER
American Institute of Physics
New York, N.Y.

Physics problems in fusion

We should like to correct some statements concerning controlled fusion contained in the lead letter on page 9 of the April issue. ["The energy crisis: what physicists can contribute" by Tau Yong Chiang.] The letter states, "The problems in plasma and laser fusion [meaning, presumably, the magnetic and inertial confinement approaches] are largely engineering in nature but there are some problems [meaning physics problems?] as well." It then cites the need for increasing $\beta = 8\pi nKT/B^2$ (which is principally a problem for tokamaks) and several technological issues associated with the (still quite speculative) electron-beam pellet approach to fusion.

There is no question that the engineering and technological problems that must be solved before we achieve usable energy from controlled fusion range from formidable to staggering, dwarfing even those of the Apollo program. However, there are also a wide range of extremely subtle and challenging physics questions whose understanding will make a vital contribution to the extrapolation from present experiments to the first working fusion reactor and to the development of more advanced systems involving "clean fusion" (having only, or largely, charged reaction products); direct conversion of particle kinetic energy to electricity (avoiding or minimizing thermal cycles); and so on. For the most part, these problems are essentially classical in nature, involving electrodynamics and the non-equilibrium statistical mechanics of nonlinear, cooperative, collective, many-body phenomena, and hence are some-

times characterized as "applied," in contrast to the "basic" question of elementary-particle physics. Nonetheless, these problems are difficult as well as interesting, and they are squarely centered in physics, rather than engineering or any other discipline.

Theoretical problems include anomalous transport of particles and energy across magnetic fields; large-amplitude wave interactions with particles and with other waves; nonlinear beam-plasma interactions, and stability of exotic magnetic-field plasma configurations. Expertise in mathematical and computational physics is also required in the development of good, physically accurate numerical models for simulating the multitude of complex interrelated physical phenomenon occurring in hot plasmas. On the experimental side, one of the major problems that has inhibited progress towards fusion is our inability to make precise and detailed measurements of what is actually happening in a plasma. In almost all cases, advances in complex areas depend on our ability to measure what is going on. The high temperature and low density for magnetic fusion and the extreme density and short times for pellet fusion make plasma diagnostics an extremely challenging area for experimental physicists.

The compelling advantages of controlled fusion as one of the most satisfactory long-term solutions to the energy problem are too well known to warrant repetition here. Its principal disadvantage is just the multitude of challenging technical problems, both physics and engineering, that must be overcome. In wartime, our most talented scientists have concerned themselves with pressing problems of national urgency, such as the Manhattan project and the development of radar. The problems of energy are just as real, although less dramatic, and the fusion program could benefit greatly from increased involvement by our best physicist, both new PhD's and nature scientists.

JOHN M. DAWSON
BURTON D. FRIED
University of California, Los Angeles

Support for rebuttals

We would like to support the suggestion made by C. LePair¹ recently and by Robert L. Chaplin² earlier for improving the peer-review system in NSF and perhaps other government funding agencies. The modification proposed is that, after the reviews are received by the agency and before they are acted on by the program director, they are sent to the principal investigators to defend themselves and/or to clear up any misunderstandings. Such a rebuttal statement becomes then a part of the data the program director has to work with. The time honored peer-re-

view process in journals obviously incorporates this feature. Indeed, it is hard to see how peer review can be used meaningfully without the opportunity to rebut what may be a simple misunderstanding or error on the part of the reviewer.

References

1. C. LePair, *PHYSICS TODAY*, May 1976, page 13.
2. R. L. Chaplin, *PHYSICS TODAY*, January 1974, page 121.

G. R. BARSCH
P. H. CUTLER
R. H. GOOD, JR.
B. R. KENDALL
L. G. LANG
E. W. MULLER
K. VEDAM
T. A. WIGGINS

The Pennsylvania State University
University Park, PA

New journals not needed

N. P. Mermin and K. G. Wilson (March, page 11) raise a valid point in questioning whether the physics community needs yet another journal such as *Communications on Physics*. This first issue of this journal completely falsifies the arguments presented by David Caplin *et al.* This issue contains four papers in solid-state physics—a field amply covered by existing journals. Two papers are from British authors who have access to excellent journals in the UK without page charges. One is from Japan that could have gone to a well established Japanese journal avoiding any need for long-distance phone calls; and the final paper is from the US and supported by an NSF grant. None of the papers (average length approximately seven pages) could really be said to have warranted rapid publishing. We need fewer journals, not more.

The solution to this problem is in the hands of the physics community. We should refuse invitations to act as referees or editors for these journals and refuse to submit papers to them. Finally, let us not forget those working in less privileged countries. Every new journal decreases their chance of catching up with the scientific community or maintaining their position in it.

BRIAN G. WYBOURNE
University of Canterbury
Christchurch, New Zealand

THE EDITORS COMMENT: Brian Wybourne's attempt to condemn *Communications on Physics* after looking at only the first issue seems to us rather hasty. Our arguments for starting the journal were presented fully in the March issue and cover most of the points that Wybourne raises. We need add only that since then we must have had more evidence of discontent with previous letter

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University of Tennessee
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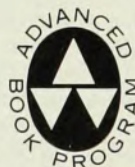
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letters

journals, and also that we have received a strongly favorable response from authors, referees and others.

The financial situation is difficult for libraries everywhere, and the subscription (starting 1977) to *Communications on Physics* is being held as low as possible by the publishers.

DAVID CAPLIN
DAVID SHERRINGTON
ROY JACOBS
Communications on Physics
Imperial College
London

A UFO by any other name

I read with interest—and some amusement—the letter by Bruce Maccabee (March, page 90), “More Lights In the Sky”. With interest because Maccabee (and Rutledge, Epstein and Heaton) are calling attention to what may be a new phenomenon, and certainly a new empirical observation—with amusement because of the careful and obviously studied avoidance of the term UFO.

Yet what else is the letter about? After all, the U in UFO simply means unidentified, and the observations described certainly fit this definition of UFO.

The literature of UFO's is replete with similar descriptions—of lights not only unidentified to the original observer, but that remain unidentified even after competent scrutiny by persons like those associated with the Center for UFO Studies in Evanston, Illinois. The Center has associated with it scientists from various disciplines (anthropology, sociology, psychology—even psychiatry, as well as physics and astronomy—we don't know to whom these new empirical observations, akin perhaps to the first observations of the fall of meteorites, or of bacteria or of cosmic rays, belong—perhaps we should include a chaplain!)

At any rate, kooks and crackpots aside (and they do obscure the issue), considerably more attention is being accorded today to the UFO phenomenon by academically trained persons. And why? Because of the incontrovertible fact that UFO reports exist, they have persisted for at least a quarter of a century, they represent a world-wide phenomenon, and the majority of the reports that fit the above definition (that is, the content of the report must remain really puzzling after serious study) are made by as responsible persons as those described by Maccabee. Isn't it time for us to recognize that a new empirical phenomenon exists (is being reported) which, whether one calls it the UFO phenomenon or not, still deserves to be studied. The Center for UFO Studies will be happy to furnish readers of *PHYSICS TODAY* with information on the nature and quality of the surprisingly

extensive literature on the UFO phenomenon today.

J. ALLEN HYNEK
Center for UFO Studies
924 Chicago Avenue
Evanston, IL 60202

Role of small physics

W. A. Sibley's defense of small physics departments (August 1975, page 9) is a solid one, but it emphasizes only the conventional role physics plays in academic and industrial research. Also I believe Sibley is wrong about what constitutes critical mass for “excellent physics”: one professor and one graduate student or two cooperating professors can constitute a critical mass sometimes, at least if one will settle for sound continuing research and not insist on an explosion.

In addition several points are not discussed by Sibley. Physics departments exist for more reasons than to do “excellent physics” or even to “do” physics. I believe the ideas and methods of physics must be appreciated by those outside the field.

First, physics is not worthy of great support simply because it is physics. Sibley suggests physics should assist industry and this can be important. But the human and cultural drama inherent in physics are also important and should be as exciting to anyone interested in the achievements of man as any other subject. Unfortunately, physics is considered by the general public as either too difficult to understand or too dry to make the effort of understanding worthwhile. Another physical science, astronomy, with all its very real difficulty and inherent uncertainties, is considered fascinating by the layman because astronomers and observatories have made the effort to explain astronomy's excitement and speculations to the general public, whereas we physicists have been so wrapped up in “excellent physics” that we have made no real educational efforts at all on this level.

As long as we continue to isolate ourselves, the gap between physics and the layman will probably grow, and without the support—social and financial—of the layman, physics can in effect collapse. If we involve non-physicists in our excitement and listen to their responses, we may find how to join the intellectual society we depend on. I believe the struggles and human frailty of Oersted's and Faraday's discoveries are potentially as exciting as the struggle Shapley, Hubble, Wright and others had to understand the nature and scope of the galaxy and the extra galactic nebulae, a struggle still going on with quasars and black holes now on stage.

If we could explain these situations, our colleagues across the campus might alter their view of physics as a dusty monolithic nonhumanity of omniscience.

A second point is the importance of the

methods and concepts of physics to subjects outside the physical sciences. Physics is not deterministic (and therefore dull) truth, even though it is treated as such in some cases. But a real difference between physics and the social sciences is one of scale and time.

A basic problem is verification. When a colleague and I recently found ourselves in disagreement over certain fundamental characteristics of the magnetic field, we were able to set up an experiment and test it for inherent symmetries within an hour or so. A similarly fundamental concept in psychology or medicine or biology might take a decade of major effort to test, and one in political science or economics a hundred years or more. It is no wonder that the rest of academia looks upon us as a field apart.

However, recent developments in modelling theory permit a variety of evaluation of various concepts and interrelationships in the “soft sciences” to be conducted in hours rather than years or hundreds of years. There now is opportunity to try alternate worlds, a quasi verification akin to that of theoretical physics. But it is dangerous, and we, as physicists, more than most recognize the dangers inherent in the theoretical process. We know we can't really believe the results that come from theoretical modelling, even as we respect and use them. The System Dynamics model of Forrester, Meadows, et al has enabled “verification” in economics and political science to move into the same time domain as that of physics, and ideas like thermodynamics and general system behavior appear in these other sciences. It is important that physicists work closely with these other disciplines so that these techniques and ideas lead to knowledge and to intuition and not to confusion or even disaster.

These crucial points will not be addressed by having “real physics” done only by an autistic residue of forty institutions or even by having a few more institutions focus their energies in certain major research areas. The mission of physics also includes all the other aspects of a versatile program—aid to industry and government, responsibility to all students, responsibility to the other disciplines that rely or should rely on the methods and cautions developed by physics, and responsibility to carry the message of physics to society and society's concerns back to physics. Many an extinct species attests with its bones that excessive specialization of mission or capability or even of excessive size is not the way to ultimate success.

RICHARD C. SILL
University of Nevada

More on monopoles

I must take issue with Daniel Zwanziger's statement in the April issue (page 83). In