

letters

continued from page 15

work together for the common good of their science and its practitioners, rather than slandering those who succumb to our fickle government's policies.

WILLIAM J. MEGGS
University of Miami
Miami, Florida

6/28/78

THE AUTHOR REPLIES: M. Martini seems to think I'm downgrading industry. That's nonsense. Most of my experience is in industry. I have found it challenging and rewarding and may return to its despite having the sacred tenure, which my critics value so highly. My original letter (June, page 48) simply referred to the tenure question and Yaes's statement (February, page 83) that *older* and, by implication, *duller* professors should be forcibly retired to make room for *younger* and, by assumption, *brighter* researchers. (Try less politics and harder work and you may be an "older duller" professor someday.) Instead of thinking a PhD entitles one to a tenured job (no further work of course) at a university, explore industry and government. Explore other fields. Start your own field. Universities cannot absorb the PhD's being turned out. Industry *does need people who are good* (I have just returned from a consulting trip and every division head I spoke to mentioned their urgent personnel needs). No one is guaranteed a particular kind of employment. If all you know is the area of your thesis and there are no jobs there, adapt or be unemployed. Of course psychologists, social reconstructionists, and egalitarianists may quarrel about the significance of IQ tests as Martini does. It is nevertheless true that some people are much brighter and more capable than others and demonstrably so. However, I did not advocate hiring only 200-IQ graduates. (Neither would I go as low as 120 or 130). Brightness is not correlated with chronological age and cannot even be eliminated by the public school system. My sentence was conditional and pointing out the irrational connection of "bright" with "young" and a tongue-in-cheek corollary that if, indeed, everyone degenerates at 40 or 50, then we should start high. If that appears illogical, why are you in physics?

Where cosmology is on the frontier is irrelevant to my statement. (I find neither the big-bang theory nor a simple satellite measurement impressive. So NASA allowed someone to put a voltmeter on one of their vehicles. Big deal.)

William Meggs's letter charges me with the "incredible statement" that good people are still being hired. We are hiring good people! The corporations I consult for are hiring good people! Meggs says I would have everyone believe

that "all is right with our American system." Ah hah! Now maybe the problem is clearing up. Meggs or his friends could go to Sweden; they could vote for me in 1980 instead of Carter, or take one of a dozen other alternatives, but I can't reply more specifically to irrationalities and irrelevancies. Apparently he believes in guaranteed employment. They have that in China.

Fewer PhD's should be turned out. A PhD does not mean automatic tenured employment. Notice how physicians hold their number down. Many persons who would like to cannot become physicians. Allen Bakke, for one, was prevented from realizing his aspirations by the social reconstructionists despite ability. How far would a young intern get who demanded that the senior surgeons be retired so he could move up? I have slandered no one and do not believe in the unions that Meggs apparently wants. If we get them, seniority rather than merit will be the criterion. I believe in only merit as a criterion. Meggs and Martini and Yaes apparently believe in inverse seniority.

It is illogical to demand that the young graduates get jobs at the expense of present job holders (who earned it without the help that the former demand) simply because they are younger. Meggs's anecdotes are of no significance. Did no one want his friend anywhere? If so, Q.E.D.

Read my letter again in the context of Yaes's letter. Try to find a field in which your abilities are needed rather than expecting security. Security is an illusion. It is not found in our system, and its price would be too high. Unless you would seriously propose firing Richard Feynman or C. N. Yang to make room for a young PhD, then you agree on the basic premise. If you *would* propose that, I'm not interested in replying to idiots. I'm tired of those who would destroy our universities or those who think the goal of the profession is full employment.

If you can solve problems, you can get a job. If you can't, you will understand what you can use your PhD diploma for.

G. ADOMIAN

University of Georgia
Athens, Ga.

7/25/78

Sins of authors and referees

The "ongoing and pervasive situations" which, in two separate instances came face-to-face to David Eimerl ("Referee Standards", February, page 15) are indeed rather common, as probably many a colleague knows who is often asked to review papers for journals or proposals for grants. The dangers could be even greater than Eimerl suggests, and I should like to add a third and a fourth "situation" of similar type.

► The classical concept that the author

of a scientific paper has fulfilled his obligations towards other scientists who have published related material earlier, simply by quoting a number of references, has lost an important precondition on which it was founded. For quite some time now, we have not been justified in assuming (or pretending to assume) that the reader of a scientific paper will automatically recognize the quoted papers of other scientists. There are too many papers, and the scientists during their studies and later work have too little time to know them all. In many cases, this disappearance of the truly well-read colleague is of no consequence for our referencing habits: If we directly quote a scientific fact and then add the name of the scientist who found it or described it, we have done our duty. There are, however, other cases in which, most often near the beginning of a paper, there is a presented list of references that relate to former work on the same or a neighboring topic, without any specific reference to the one or the other item to be discussed in the paper. This habit than allows the author to represent his material as if he were the one who has found the essential facts. Instead of going on by saying that A described a hypothetical effect in this or that way and arrived at this or that conclusion, and then confronting the other scientist's findings with his own, the author just presents his own findings and does not disclose how much he really owes to the other scientist or scientists. This practice is widespread, and one is sometimes in doubt, whether or not this "trick" is applied innocently. Not only are older sources frequently suppressed; even recent discoveries by younger colleagues are denied the acknowledgment they deserve and often urgently need for their own deserved promotion. I certainly hope that by bringing this to the attention of future authors and future reviewers I can contribute to reducing this seemingly honorable dishonesty.

► The damage done by bad scientific work is sometimes much larger than even Eimerl states. Reviewers often let bad papers pass, either because the reviewer is too permissive and does not realize that he is in fact doing damage not only to science but also the reviewed author in the long run, or because a reviewer is too permissive towards himself and does not admit the fact that the content of a paper or proposal is indeed outside of his own expertise. In both cases there is the danger that such permissiveness may contribute to the creation of a wide pseudo-scientific practice, even a pseudo-scientific community. One example may be found today in the domain of the problem of atmospheric electricity's influences on biological systems including humans. Such a situation can grow to become either very grotesque or frightening. The authors of such pseudo-scientific papers quote each other, have their

own conferences and their own journals; their papers have scientific-looking diagrams and only experts see that sometimes not even the most simple laws of physics seem to be known to the authors. In this way, any serious work in these fields is severely hampered.

▶ The damage done by the attempt to make every piece of science look "relevant" again may be greater than Eimerl indicates. If an author has found some new fact by measurement, he is tempted not only to report it but also to demonstrate any practical consequence he can think of. This often leads him to discuss speculations, qualitative possibilities without consideration of numbers. Again, this contributes to bad science. We should realize that, for example, a screw is a very irrelevant thing. Even if it is used to hang one's hat on, a nail would do the same job cheaper. A chair, yes, that is relevant; one can sit on it. But a screw can only hold a chair together; it is, as such, not relevant. We should be honest enough to point out that exactly the same reasoning applies to many a scientific work. Eimerl is correct when he says that the referee can help in this regard. Just yesterday I turned down a paper because the author, not satisfied with reporting some very interesting and important measurements, felt that he had to embark on a series of unfounded hypotheses to give a more "relevant" color to his findings. I pointed out that without these additions, the paper would be a good one.

HANS DOLEZALEK
Office of Naval Research
Arlington, Virginia

4/4/78

Lasers for fusion

I suggest that the Nd:glass laser should be included in the list of candidate advanced lasers in "Laser Fusion" by C. Martin Stickley in the May issue (page 50). In this article, CO₂ lasers are considered the leading candidate for a fusion-power-plant laser, but other lasers are reported to be under study in case target/laser-beam interaction studies find that shorter wavelength lasers are needed. Thirteen candidate lasers are listed including Tm:glass and flashlamp pumped iodine. Stickley states that Nd:glass lasers could be made to operate with high average powers only with the perfection of techniques that have not yet been demonstrated. It should be pointed out that none of the "candidate lasers" are now suitable for driving fusion reactions. As with Nd:glass lasers, all lasers will require the perfection of techniques that have not yet been demonstrated.

Approximately ten years ago Nd:glass oscillators achieved efficiencies of 8% in the free-lasing mode of operation. The same Nd:glass material in other lasers achieved 30 pulses per second repetition

rates. Over the last several years significant improvements have been made in glass composition, glass manufacturing techniques, and laser system engineering. The large amount of successful work already done on Nd:glass lasers gives a high degree of credence to new flashlamp-pumped Nd:glass laser-system designs that project efficiencies greater than 1% and repetition rates of several pulses per second. These designs do not rely on any new or unproven physics, only on careful design and engineering. With the development of new pumping technologies and/or improved laser glasses, both quite probable if pursued, suitable Nd:glass lasers should achieve efficiencies of several percent.

In searching for reasons that the Nd:glass laser did not appear on the list I considered and rejected the following possibilities:

▶ It couldn't be because it's a solid or a glass laser, because one glass laser and three other solid lasers were listed.

▶ It couldn't be because of flashlamp pumping because the flashlamp-pumped iodine laser was listed.

▶ It couldn't be because of the 1.06-micron wavelength because lasers with both longer and shorter wavelengths were listed.

▶ It couldn't be because projected efficiencies are only 1-4% because three other lasers are listed with efficiencies as low as 1%.

▶ It can't be because existing lasers were not to be listed, because the iodine laser was listed under the heading "existing lasers."

Nd:glass lasers have been the workhorse in most laser fusion research laboratories where they have had to be "up and running" while Brand X lasers existed only on paper. In the course of being scaled up to the present kilojoule levels, Nd:glass lasers underwent certain growing pains not yet experienced by other potential lasers. This emotional background may explain the omission of Nd:glass lasers from Stickley's table; the technical capabilities of Nd:glass lasers do not explain this omission.

GEORGE DUBÉ
Owens-Illinois
Toledo, Ohio

5/25/78

THE AUTHOR REPLIES: Although Nd:glass lasers have been operated in long pulse modes with reasonable efficiency and have been operated at high repetition rates with low output energies the simultaneous achievement of these attributes at powers, energies and pulse lengths of interest in laser fusion has not been demonstrated. Current Nd:glass laser systems for fusion are on the order of 0.1% efficient.

George Dubé states that the extension of Nd:glass laser technology into the high repetition rate (1-10 pulses per sec), high

efficiency (>1%), short pulse (approximately 10 nanosec) regime requires only "careful design and engineering." Our analysis, based on studies sponsored by the Office of Laser Fusion, is that the design of such systems is far from trivial, being made rather complex by the need to provide for sufficient cooling of the glass so as not to degrade the system's optical performance. Although these laser systems appear technically feasible to construct, it is not clear that the overall system efficiency (including cooling loops, and so on) will be as high as Dubé estimates.

Given the complexity of these designs and the reliance of Nd:glass lasers on flashlamp pumping, our basic approach has been to concentrate on efforts on laser systems which appear to be more promising. The advanced lasers being considered do include some solid state systems but these have been selected because they potentially can be efficiently pumped and should contribute less waste heat to the laser host material. As for flashlamp pumping of advanced lasers such as iodine, I stated in the text of my article that we are considering the iodine laser as a serious candidate only "if a considerably more efficient pumping technique than flashlamps can be developed for it." As we presently see the situation, flashlamps do not seem to be suited for use in a laser-fusion power plant from either the viewpoint of efficiency or reliability.

To sum up our position, we are not, of choice, abandoning a laser technology that has been and continues to be the workhorse of laser-fusion research. Rather, we believe we are being somewhat realistic in our view that it is not necessarily advantageous to attempt to force this technology into a regime where it appears to be ill suited. Instead we are looking to develop alternative technologies to serve our future needs.

C. MARTIN STICKLEY
Department of Energy
Washington, D.C.

6/12/78

Coal overoptimism

In my letter in December 1976 (page 9) I showed that if US coal production grew at a steady 10% per year, US coal would last between 44 and 57 years, and that if production grew 5% per year, which is the goal of the Carter administration, US coal would last between 74 and 100 years. Readers may wish to compare the results above with the following statement in an article "Coal's Clouded Post-Strike Future" under the heading "Energy" in *Time Magazine* (17 April 1978, p. 74).

Certainly the coal is there. Beneath the pitheads of Appalachia and the Ohio Valley, and under the sprawling strip mines of the West, lie coal seams