Letters

Moondoggle

One notes increasing congressional resistance against requests to raise the level of federal spending for "research." It seems high time that scientists speak out more frankly about the inordinate waste of federal funds in certain parts of what Congress vaguely regards as the scientific community. In my own field of the atmospheric sciences I have been shocked by details of some of the high-budget, low-caliber proposals recently submitted to federal agencies by science-and-technology corporations that have burgeoned in the recent years of scientific affluence. Scientists primarily concerned with sound and promising research rather than with bigger contracts and fatter budgets must speak out more frankly and critically about each new scientific boondoggle as it comes along, lest support of legitimate and important scientific research soon suffer from indiscriminate congressional reaction. Congress cannot be expected to be capable of easily distinguishing the good from the bad (until it's too late). Congressmen see only the huge volume of federal funds they are being asked to pour into what they lump together as "research and development." They are growing worried, as they should. Consider the following illustrative case. (On a separate enclosure, not for publication, appear the names of the individuals and organizations referred to.)

Last week the director of the space-sciences division of a large West Coast aircraft company telephoned to invite me to serve as a consultant on a "small team of knowledgeable scientists" it is assembling. The object: This company had been invited by a Washington space-oriented agency to bid on a contract to do a 6-month study of scientific missions for a lunar-exploration project. The very idea of regarding as scientific research anything that was planned by a firm which happened to be successful bidder on a contract to do a 6-month study of "scientific missions" would seem unbelievably ludicrous were it not all too ordinary a part of the present-day picture of Big Science.

My expression of surprise that a specialist in cloud physics should be considered a prospective member of a team to suggest ideas for the bid on this lunar study brought the reply that the company thought a program of observations of terrestrial clouds by moon-based scientists would perhaps be a good thing to propose. My jaundiced reaction only led my caller to ask next what I thought about the chances of getting either Dr. X or Dr. Y to help in writing up this lunar cloud-observing portion of the bid. This query clearly revealed the director's complete ignorance of the scientific field involved, for it was necessary to point out to him that Dr. X is primarily expert in the physics of the solar corona and that Dr. Y is a geophysicist primarily interested in problems of the earth's interior! I was next asked if I could suggest anyone else as a possibility; and so on finally to his desperate query as to whether any West Coast schools might have anyone who would be likely to be interested in clouds.

The truly distressing part of that telephone conversation is that it is by no means unrepresentative of what is going on all over the country now that big science means big money. Poorly conceived and poorly executed marginally scientific activities are swallowing ever larger portions of federal funds for what passes, at least in Congress and in many agency annual reports, as "research." Those activities lead chiefly to expensively multigraphed project reports containing almost nothing that adds to the stock of scientific knowledge. If such free-wheeling and overfunded activities carried out in the name of "science" are not more openly criticized, the entire scientific community will inevitably suffer.

JAMES E. MCDONALD
Institute of Atmospheric Physics, University of Arizona, Tucson

Skepticism and the Noble Gases

The closed-shell, closed-mind dogma has undoubtedly been a stumbling block in the development of the chemistry of the noble gases, and in his account Gross (*1*) has provided a timely appreciation of academic skepticism. Yet in certain respects his remarks fall wide of the actual historical situation.

Immediately after the discovery of the noble gases, many extensive attempts to effect reaction of these gases with other chemicals met with failure. Similar, but sporadic, work over the past 70 years had firmly established a paradoxical situation, in which the six elements, helium, neon, argon, krypton, xenon, and radon possessed no chemistry. This followed despite chemical forecasts, notably those of Pauling, suggesting several fluorides and salts of xenon. To level the charge of skepticism at chemists for not undertaking more experiments in the face of overwhelming evidence, much of it obtained by eminently capable chemists, is quite unfair. To carry Gross's suggestion to its logical conclusion, it would be necessary to indefinitely pursue any series of experiments to no purposeful result despite contrary evidence. A degree of skepticism is valuable, but too much is, of course, ridiculous.

Gross's point concerning the restriction of academic freedom among scientists "under present conditions of highly organized and programmed scientific endeavor" has already been taken up by Claassen (*2*). The fact that 17 scientists can be switched to a collective study of any problem is surely as important as academic freedom, and such staff mobility must have greatly facilitated the preparation of xenon (IV) fluoride and other noble gas compounds. An even better example of the principle of collective study is the recent report in *Physical Review Letters*, by no less than 33 authors, on the omega-minus particle.

Gross implies that the success at the Argonne National Laboratory was due to skepticism concerning the many previous negative results with the noble gases. This surely cannot be true, since Bartlett had pioneered the way to removing the existing skepticism, if any, by the facile realization of xenon hexafluoroplatinate (V), as described in his publication of June 1962 (*3*). Any well-equipped laboratory with experience of fluorine manipulation could have repeated and extended Bartlett's