Information Services

In his letter (13 Aug., p. 586), Robert S. Willard of the Information Industry Association describes Philip H. Abelson's editorial "Essential federal information services" (28 May, p. 937) as being one-sided. Willard alleges that the National Library of Medicine (NLM) does not recover full costs of its online MEDLINE system and that NLM has in fact subsidized commercial organizations by $1 million over the period from January 1980 to June 1981. My purpose is to provide correct information on the pricing practices of NLM.

First, a General Accounting Office (GAO) audit of NLM charges released on 14 May 1982 found that NLM was recovering 96 percent of the costs of access to MEDLINE in its current price structure and that it was in conformance with guidelines in the Office of Management and Budget circular A-25 for charges to both profit and nonprofit organizations.

With respect to the allegation of a $1-million subsidy of commercial users by NLM, the list of 20 commercial users includes two who have been under contract with federal agencies that ultimately pay the bill. A third has established a special free information service for research investigators and clinicians among its clients and accounts for about 90 percent of the use by that company. If these "commercial" users are excluded, it reduces by one-third the commercial use referred to by Willard as being subsidized.

Also, it appears that Willard has not used the current pricing structure of NLM, which has been in effect since October 1981. The data he refers to go back 2½ years.

The so-called private sector charges which he uses for comparison are based on a hypothetical average of the maximum charges without considering discounts of up to 50 percent that could and would accrue to these users. If the lowest (rather than the highest) charge for obtaining similar services from the private sector were used, charges would be reduced by a factor of 4 and the difference between charges made by NLM and those made by the private sector would be only a small fraction of those alleged.

Regarding subsidizing charges for MEDLINE searches to foreign users, NLM does not provide these services. They are provided by foreign agencies, selected by their respective governments, or by U.S. commercial vendors. These organizations pay for use of NLM tapes or for access to our computers. The fee schedule for users is set by the agencies providing the service. A search for which the NLM domestic charge would be $7.28 exclusive of telecommunication charges would translate to a charge for foreign users that could range from $9 to $25. This does not support Willard's allegation that NLM is also subsidizing information services to private foreign health professionals.

Willard's complaints are similar to those raised by a foreign commercial company that is seeking to force higher NLM charges. Physicians and scientists may legitimately ask whether NLM charges are too low or whether the charges of some commercial information services are too high.

JOSEPH LEITER
National Library of Medicine,
Bethesda, Maryland 20209

Solar Gel Ponds

We read with interest Thomas H. Maugh II's article "Solar with a grain of salt" (Research News, 11 June, p. 1213). Solar ponds have the potential for providing domestic and low-grade process heat and electric power in a remarkably cost-effective manner.

As Maugh indicates, salt gradient ponds and the more recent concepts involving liquid layers of any kind suffer from a number of disadvantages. These include (but are not limited to) loss of stratification because of diffusion and convective mixing; the large environmental hazard posed to many locations by the tons of salt required; the need to maintain the gradient (requiring external processing of saline); and the development of turbidity, color, and optical opacity due to suspended dirt, debris, and occasionally algal and fungal growth. Mixing can also result from boiling, encroachment of the bottom (convective) zone onto the top (nonconvective) zone, withdrawal (surface evaporation) and injection of fluids, and even large falling bodies.

The gel pond concept was recently developed (*1*) at the University of New Mexico in an attempt to negate many of these difficulties. The gel solar pond consists basically of two zones. The bottom (convective) zone is homogeneous and nearly saturated saline. The top (nonconvective) zone consists of a very viscous or even solid, elastic, optically transparent polymer gel, with density less than the saline. This top gel layer acts as thermal insulation yet passes solar radiation to be trapped in the underlying saline. It prevents any dirt or debris from entering, providing control of opacity, turbidity, and other related factors. Loss of stratification due to mixing is no longer a consideration, and no external saline processing is required to maintain the salt gradient. A layer of a few inches of fresh water is circulated over the top of the gel to prevent drying and to flush off surface dust and debris.

Selection of the appropriate polymer gel was a major problem. A suitable gel must satisfy many stringent requirements: it must be highly transparent to solar radiation, stable under ultraviolet light and in the operating temperature range, nonbiodegradable and nontoxic, less dense than saline, viscous enough to prevent convection, and easily preparable from readily available components at low cost. During development of the gel pond at the University of New Mexico, hundreds of polymer materials were evaluated, and a few dozen of those were tested. We have developed a low-cost polymer that meets or exceeds all the stringent requirements. Our experimental gel pond has been in operation for a year, and stability of the polymer has been demonstrated for this time period. Work to date has focused on preliminary efficiency determinations and optional gel thickness. We are beginning heat extraction and plan to demonstrate electric power generation contingent on further funding. The gel pond is adjacent to Bryant's salt gradient ponds, so we can compare performance of the two approaches at one location (for example, the gel pond has shown itself to be roughly twice as efficient on a unit area basis as the salt pond as a collector of solar radiation). The exact composition and manufacture of the polymer gel is proprietary at present, as a patent has been filed. The patent covers not only the specific polymer we use but also the concept of the gel pond in some generality. An industrial gel pond of some 70 square meters is being constructed near Las Cruces, New Mexico, to provide process heat for animal feed manufacture.

As Maugh points out, solar ponds are site-specific, and much remains to be discovered. For example, scaling rules and correlations useful for practical designs are lacking. Construction of a heavily instrumented, larger gel pond (perhaps 50 feet in diameter and 8 feet deep) would provide sorely needed experimental data for which the ongoing and low-cost theoretical modeling is no substitute.

EBTISAM S. WILKINS
MICHAEL G. WILKINS
MOHAMED S. EL-GENK
Chemical and Nuclear Engineering Department, University of New Mexico, Albuquerque 87131

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Grant Funding

The continuing deterioration in grant funding makes it more and more important for the peer review system to work with high fidelity. The two stages that determine the quality of peer review are selection of review group participants and the scoring of grants by reviewers. There are difficulties in both these areas that could profit by some discussion.

At the National Institutes of Health (NIH), reviewers are chosen by the executive secretary of each study section. Selection procedures vary from one executive secretary to another and can be as judicious or as arbitrary as the individual makes them. I am unaware of any measure of accountability or self-correcting feedback that is exercised at this most critical stage of the peer review process. Although the two executive secretaries I have worked with were both impressively able, I believe that the variable and mysterious processes used by them and others in selecting review group members would benefit from some open and informed discussion. Similar questions can be raised concerning the National Science Foundation (NSF) system, where program directors (the equivalent of the NIH executive secretaries) not only choose review group members but have the power to override review group scoring and make independent funding decisions.

With respect to the peer review evaluation itself, attention should be directed at minimizing the noise level in these judgments. It is not easy to score multifaceted grant applications onto a one-dimensional priority scale. I believe that a lot of variability in the ranking of grant applications arises from the fact that the scoring scale itself is too undefined, too soft. This softness is apparent in the variable scoring criteria applied by review groups from one grant to another and one meeting to another, in the fairly wide divergences that appear in the scoring levels of different review groups, and in controlled trials that have been performed with test grant applications. The fuzziness of the scoring criteria reduces the effectiveness of novice panel members and loads them and seasoned members as well with an even heavier burden of uncertainty.

Criteria for calibrating the priority scale, which I learned to appreciate during my study section experience and which have since been found useful by a number of my colleagues, can be codified as follows. The scale is made linear by giving roughly equal weight to three criteria of worth.

1.0—solid science; innovative; high potential importance;

1.5—two of the above;

2.0—one of the above (or the equivalent, for example, moderate importance plus fair solidity);

2.5—fairly mundane but with a significant level of quality;

3.0—may contribute something to science, but the chances of doing so are problematical;

3.5 and down—generally poor (interestingly, a disproportionately large share of study section time seems to be spent in subfractionating the space between priority scores 3 to 5).

Among these criteria, innovation is of foremost importance for the progress of science, yet it is remarkable that innovation in grant applications is often penalized. Most good grantsmen have learned to provide a mix heavy in solid science and light in innovation because inexpert reviewers tend to focus their critiques on the lack of certainty that any innovative idea or experiment will succeed. This overworked cliché is simply not a valid criticism of applications that otherwise rank in the top (fundable) categories.

These specific criteria for assigning priority scores are still incomplete. There are, in addition, two major general touchstones that should be considered. One is the track record—the applicant's demonstrated skill in and past contributions to science. Here the reviewer must transcend mere publication counting and assess "quality" and "contribution." It is essential to appreciate that the reviewer's job is not to grade the application itself; the exercise is to gauge where on the above scale the *research to be done* will fall. In trying to predict the future, an analysis of the past can be of great help.

Another determinant that should, in my opinion, be folded into the final score is the level of funding requested, or rather the funding judged necessary to do the better part of the work. There is still left over from the easy money days the philosophy that quality and funding should be judged separately in a kind of double-blind way. However, in a time of limited funding, applications of equal scientific promise but disparate price have to be distinguished because the expensive project will unavoidably preempt funding from other potentially fruitful research. Further, the best way to encourage prudent laboratory economics (and responsible budget proposals) is to enunciate this principle.

S. WALTER ENGLANDER
Department of Biochemistry and Biophysics, University of Pennsylvania, Philadelphia 19104

Erratum: In the article "White House steps into lead fight" (News and Comment, 27 Aug., p. 807), John V. Diepenbrock should have been identified as chairman of the finance committee in California for Ronald Reagan's presidential campaign.

Erratum: Figure 2 (left) in the report "Transformation induced by Abelson murine leukemia virus involves production of a polypeptide growth factor" by D. R. Twardzik *et al.* (21 May, p. 894) was incorrect. It showed transforming growth factor (TGF) purified from human melanoma cells rather than from the Abelson virus-transformed rat cells. The correct figure from the very same gel is shown below. Although one portion of the gel was used rather than another, none of the conclusions reached in the report are affected. Both rat and human TGF's have molecular weights of 7400 and have very similar amino acid compositions and NH_2-terminal amino acid sequences.