1962). In his 1932 book, *Thurso's Landing*, for example:

The learn'd astronomer
Analyzing the light of the most remote star-swirls
Has found them—or a trick of light deludes his prism—
All at incredible speeds fleeing outward from ours.

Much later, in *The Beginning and the End* (1963), appeared these challenging lines:

The mathematics and physics men
Have their mythology; they work alongside the truth,
Never touching it; their equations are false
But the things *work*. Or, when gross error appears,
They invent new ones; they drop the theory of waves
In universal ether and imagine curved space.
Nevertheless their equations bombed Hiroshima.
The terrible things *worked*.

The poet also "Has his mythology . . ."

Elsewhere in that posthumous volume, the same theme is approached in this way:

. . . Science and mathematics
Run parallel to reality, they symbolize it, they squint at it,
They never touch it: consider what an explosion
Would rock the bones of men into little white fragments
and unsky the world
If any mind should for a moment touch truth.

Jeffers, conversant with much of physics and astrophysics, could not consider them "human" in the sense intended by Weisskopf. For that very reason they attracted him.

Goethe was a masterful lord of language, who tried to recast science in the mold of his own mind—and basically failed. Jeffers, in a vastly changed era, tried to recast his thinking and myth-making to match molds provided by science.

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6/23/76

Limit on interstellar signals

Interstellar communication links at microwave frequencies will be limited to finite coherence bandwidths as a result of multiple scattering by density irregularities in the intervening thermal plasma. For example, pulsar observations indicate that multiple scattering becomes important at 1.5 GHz for paths exceeding a few hundred light years. The typical coherence bandwidth is 2×10^{-4} Hz for this distance, and proportionally larger for greater distances. Consequently, efforts to establish contact with distant civilizations at radio frequencies between the H and OH transitions near 1.5 GHz (May, page 18) must consider the characteristics of this natural and random modulation in the development of an intelligent reception, or transmission, strategy.

For perspective, the modulation of coherent signals by multiple scattering has been observed both for the ionosphere at 0.9 GHz using ATS-6 telemetry, and for the solar corona at 2.4 GHz using Pioneer 6 telemetry. The modulation of these two telemetry signals is strong at about 1 GHz for plasma column densities of merely 3×10^{13} cm^{-2} and 3×10^{16} cm^{-2}, respectively, compared to the interstellar medium, where strong modulation is expected only for column densities exceeding 3×10^{19} cm^{-2}. The difference may be attributed both to the level of turbulence on scale sizes that produce scattering, and to the thickness of the medium expressed in terms of the scale size.

Intensity modulation of the incoherent radiation of pulsars indicates that, while the typical coherence bandwidth grows linearly with interstellar plasma column density, paths exist along which the scattering exceeds the typical values by an order of magnitude for a given column density. These paths will be regions of avoidance for sub-Hz interstellar communication links at 1.5 GHz.

Finally, the severe scattering that occurs along our line of sight to the galactic center[4] may be sufficient to produce coherence bandwidth limits of many Hz due to the Doppler broadening from large-angle scattering. If so, sub-Hz communication with civilizations in the inner core of our galaxy would be limited to much higher frequencies.

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7/16/76

A referee's plea

Refereeing procedures of scientific journals are not entirely satisfactory. We desperately need a careful study that demonstrates what editors and referees are supposed to do with the papers submitted by authors. My own crude analysis is the result of refereeing for eight journals—on the average one paper every eleven days during the last two years.

A paper submitted to a scientific journal is accepted for publication when its

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estimated merit, say S, exceeds a minimum acceptable value, say S_0. Most journals, for the guidance of authors and referees, define S in terms of criteria such as "impact" or "significance." Referees are expected to evaluate the quantity S, to guess S_0 from familiarity with the journal, and to pass judgment by recommending acceptance or rejection. The referee constitutes a one-man tribunal in which he acts anonymously as the expert witness, the prosecutor, the judge and the jury. The system as it stands imposes too much on a referee and demands the execution of duties beyond his natural role of expert witness. It is not surprising that referees often disagree on the value of a paper, for their disagreement generally lies in areas outside their special field of competence.

The variable S is a function of (at least) two other variables, expressed most simply in the form

$$S = S_1 S_2$$

where S_1 is the "significance" of the technical content of a paper within a narrowly defined scientific field, and S_2 is the "significance" to the journal of the given field. The variable S_2 also embraces miscellania such as style and conformity with standards of preparation. Such a decomposition of S is desirable to apportion the responsibilities of a just system of evaluation. I suggest the referee is competent to give testimony concerning S_1, and the evaluation of S_0, S_2, and finally S, lie within the jurisdiction of the editor. Scientists tend to assign high S_2 values to contributions in their own narrow field and low S_2 values to contributions in other fields, and it is important that referees do not evaluate S_2.

A reasonable judiciary procedure might obey the following set of rules. (It is assumed S_1 and S_2 have unity as maximum value.)

- Author submits names of preferred referees with notes explaining his choices.
- Editor and advisers determine S_2. They assume S_1 is unity and if S_2 falls short of S_0 the paper is returned to author.
- Editor and advisers determine appropriate referees, and are not constrained by author's choices.
- Chosen referees are contacted by phone and informed of title and abstract. If referee is willing, the paper is sent to him.
- Referee studies the paper from a purely technical point of view. His admissible comments are limited to matters concerning S_1 on which expert witnesses agree. If the paper is wrong, he explains why it is wrong. Comments on all matters in which referees might disagree are inadmissible judgments. No referee

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recommends rejection or acceptance of any paper.

▸ Editor and advisers determine S and decide whether or not to publish.

I believe editors of scientific journals must play a more active role in the refereeing process and not hide behind anonymous overburdened referees. Editors must have larger scientifically trained staffs (retired scientists?) and their advisers (adjudicators?) must devote about as much time as a referee in the study and evaluation of a paper.

Our present system of refereeing is in dire need of reform; authors are impotent, but referees are not. In the name of justice, referees arise!

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No personal data on resumes

I wish to suggest an amendment to Raymond W. Sears's useful guidelines for preparing an effective resume. My suggestion is that personal data should not appear unless specifically requested by the prospective employer.

Information on a job candidate's marital status, religion, hobbies, national origin, and so on can be the source of biased judgments leading to discrimination too subtle for control by legislation. Although unfavorable reactions to personal data may never be voiced in a selection committee, negative feelings about nonscientific credentials act insidiously against a candidate.

It would appear that all candidates are more likely to be considered on their professional merits if extraneous data do not enter the picture. Of course, facts about candidates' personal lives will often be known anyway to those making the selection, but at least some benefit would accrue if those facts were treated as too irrelevant to appear on a resume.

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Corrections

September, page 31—Title of book referred to in reference 8 should be *Corrosion Inhibitors* instead of *Corrosion Inhibition*.

November 1976, page 103—The *1976–1977 Graduate Programs in Physics Astronomy and Related Fields* book is available at a prepaid cost of $7.50 to members of AIP-member societies, not $5, as stated. □