changing problems that required agricultural research. A second objective was to *increase* the ability of ARS to work closely with the state agricultural experiment stations on mutual research responsibilities. That there were "political" and administrative activities related to achieving these objectives is to be expected but does not make those activities a substitute for the objectives. To leave the impression that this reorganization was solely "politically" motivated does a disservice to the many ARS employees who view the reorganization as an opportunity to make improvements in the system and who have responded with dedication in trying to do so.

Similarly, the conclusion that "Things will have to become a lot worse before they get any better" does not acknowledge a growing cognition among agricultural scientists, among both state and federal research administrators, and among members of the Congress of a need for changes in the system. That one could obtain differences of opinion on what those changes should be is obvious because of the wide-ranging activities and disciplines of agricultural research. However, these differences and the sharpness with which they are expressed is, to many of us, real evidence of the interest in bringing about improvements.

Knowing the large number of institutions and people involved, the consequent potential variations in responsibilities, and the progress which has been made in identifying and moving cooperatively toward coordinating mutual responsibilities, I cannot help but be encouraged and optimistic about the present attitudes and efforts for changes in agricultural research. Such changes will ensure future successes comparable to the many achieved in the past.

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1. *Report of the Committee on Research Advisory to the U.S. Department of Agriculture* [PE 21338 (main report), PE 21339 (appendices), National Technical Information Service, Springfield, Va., 1973].

The Blind Technique

At a recent meeting at the National Academy of Sciences entitled "Conference on carcinogenesis testing in the development of new drugs" (23 to 25 May), it was suggested by Robert Elashoff, a statistician, that pathology specimens be sent to the pathologist blind (unidentified). A spirited discussion ensued between proponents and opponents of this viewpoint. The response of the audience clearly indicated a polarization either for or against the viewpoint proposed. Any discussion of this important matter should take into account a number of philosophical considerations which are familiar to pathologists but may be less well known to other scientists.

1) Many statisticians consider the examination of pathology specimens and slides analogous to the examinations in a double-blind clinical study. There are, however, important differences. The placebo factor in treating patients who are easily influenced by psychological factors and expectations

of being made well is absent in pathologic studies. Histopathologic diagnoses are based upon patterns of cellular reactions in disease states which are considerably less influenced by subjective factors than, for example, symptoms or clinical responses to drugs.

2) In studying his material, a pathologist will often review the slide material from the control animals first for use as a yardstick to measure the changes in the experimental animals. He thus obtains a baseline orientation of natural or extraneous diseases occurring in the untreated control group. Use of a blind technique would result in a loss of the baseline provided by an initial review of the control tissues and thus would deprive the pathologist of a valuable tool.

3) Although it is seldom mentioned, the degree of objectivity possessed by each pathologist is somewhat variable (irrespective of whether or not the experiment is blind). The pathologist views the slide through the distortions of his own "background noise" which may be analogous to the noise generated by an electronic high-fidelity system. Some pathologists can view lesions with great objectivity regardless of what is told them, while others may spin a web of fantasy even though the slide is not identified. This ability of the pathologist to see objectively is a weighty factor in the achievement of objectivity.

4) The blind technique is a rigid system when properly employed. The pathologist cannot change directions because of serendipitous findings; he cannot explore interesting new research clues. He is locked into an unyielding method of review, and the advantages of a flexible system are lost.

5) Since the origin of the specialty of pathology, pathologists have struggled hard to become informed about the patients they autopsy, the surgical specimens they examine, and the experiments on which they work. Good pathology practice requires careful correlation of clinical or toxicologic data with pathologic findings. Few competent pathologists will render a signed report in the absence of correlative information. We must be careful that the word "blind" as applied in pathology does not become a code word for keeping the pathologist in ignorance. This can only have a serious adverse effect on the quality of the practice of pathology.

6) It is true that bias may unconsciously creep into the observations of the pathologist. But what form does the bias take? It is most unlikely that clearly defined lesions (for example, granulomata, tumors, or inflammations) will be missed in either the experimental or control groups. The pathologist, however, may concentrate on the experimental groups to the neglect of the control group. The resulting bias will therefore be a weighting of the findings toward the treated groups. This weighting is more likely to occur in cases where the lesions have a low grading, for example, those that are graded 1 to 2. I have found the blind technique, in which the labels are covered on slides from both the treated and control animals, of most value in the evaluation of lesions of this type. If under these circumstances the slides from treated animals can clearly be differentiated from those from control animals, the effect can then be attributed to the test agent with greater confidence, and the blind technique has proved to be useful.

Blind evaluation is one of many factors that enter into and profoundly affect the quality of a pathologic examination, and its ranking is of a relatively low order. It is outranked by the technical competence or skill of the pathologist, by his ability to see objectively (irrespective of the information he has), and by his imagination and creativity.

In collaborative studies, the use of blind techniques should be left to the discretion of the collaborating pathologist. He should not be asked to use a method which is foreign to his method of examination or one which he finds objectionable. He is, after all, a professional and as such should determine how his specialty will be applied.

These views are my own and do not necessarily reflect those of the Food and Drug Administration.

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Trees

Your correspondents (Letters, 25 May, p. 813) miss the purpose of the synthetic tree in Disneyland; it is there, not as a substitute, but because it is unique and artificial. People go to Disneyland (which is not to my taste) to indulge in fantasy. Early man drew pictures of animals on the walls of caves and on cliffs. Modern man loves pictures, and cherishes trees as well as uses them. We strive to save the giant redwoods, but a knapsack trip in Pfeiffer State Park left me convinced that there must be more redwood trees, of countless sizes, in California than people in the United States, and that *sempervirens* will outlast *sapiens*. In the Sierra Nevada, there are hundreds of millions of *Pinus murrayana* in rocky fastnesses where the saw is never used. California trees that were formerly rare or localized, such as the Monterey cypress and the giant sequoia, have been spread by man to both hemispheres. The deodar, from the Himalayas, flourishes in Washington, D.C., and in many other American cities.

More appropriate than the doggerel from "Big Yellow Taxi" is the following verse by Yeats (*1*), describing the human tendency to make images of natural objects:

> Once out of nature I shall never take
> My bodily form from any natural thing,
> But such a form as Grecian goldsmiths make
> Of hammered gold and gold enameling
> To keep a drowsy Emperor awake;
> Or set upon a golden bough to sing
> To lords and ladies of Byzantium
> Of what is past, or passing, or to come.

We may be sure that people will continue to visit Disneyland, to admire sculptures, and that they will go on planting and caring for trees.

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References

1. W. B. Yeats, "Sailing to Byzantium," lines 25–32.

The Price of Books

The price of scholarly books has increased drastically in recent years. The books reviewed in *Science* of 1 June cost 5.0, 5.3, 6.3, 7.2, 7.7, 8.8, 8.9, and an incredible 11.0 cents per page. As the cost of copying has dropped in recent years, one can copy a book at 5 cents a page in most libraries on public copiers and, by copying two pages at a time, reduce the cost to 2.5 cents per page. Of course, this is an infringement of the copyright but, at today's prices, a practice that will become increasingly common. Book publishers appear to be urgently in need of technological advances that will cut the cost of production.

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