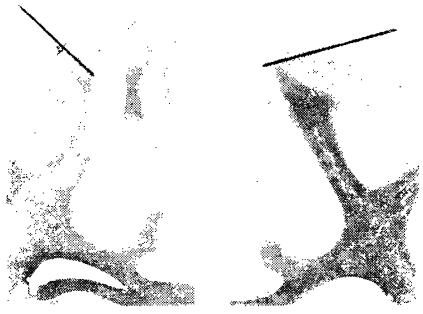

Fig. 2. Ultrasonic lesion in the subcortical white matter of a cat brain exhibiting a central region of dark-staining fibers and some invasion of neighboring gray matter. (PTAH stain) Fig. 3. Small ultrasonic lesion in the cortical gray matter of a cat brain. (PTAH stain)

lar spaces are dilated, and some separation appears between the fibers. Within 6 to 12 hr (depending on the dosage) the myelin sheaths break down into separated spheres. During this same period axis cylinder fragments increase in the lesion area. These changes are followed by the hematogenous and microglial responses until all of the debris is cleared away. Other neuroglia then form a glial scar.

A greater dosage (53 atm acoustic pressure and $4.9(10)^3$ cm/sec acoustic particle velocity for 1.50 sec) produces a slightly larger lesion containing a central normal staining area or island of myelinated fibers surrounded by a zone or moat containing completely disrupted nerve tissue and large clear fluid-filled spaces (Fig. 2). No hemorrhage is present. These more severe lesions may involve neighboring gray matter, causing changes that are described in the following paragraphs. Lesions of the same order of size can be produced in fiber tracts at any depth in the brain without affecting the intervening nervous tissue.

Figure 3 illustrates a small lesion produced by ultrasound in the cerebral cortex of a cat. To produce such a lesion in gray matter, greater dosages of ultrasound are required than for white matter. When a region of gray matter is irradiated with a single exposure at a dosage (53 atm acoustic pressure and $4.9(10)^3$ cm/sec acoustic particle velocity for 2.50 sec) above the minimum required to produce a lesion, the effects that appear first (10 min after exposure) are a lightening in the staining ability of the background matrix and a slight dilation of the perivascular spaces. Nerve cells stain more faintly than normal within 1 hr. Many contain large clear vacuoles in their cytoplasm; others have ruptured cell membranes, and only ragged strands of cytoplasm remain around the still intact nucleus. The nerve cells have disappeared by the end of 1 day. The background contains many clear spaces, and in the more severe lesions large fluid-filled clefts may appear in the tissue. The myelin sheaths and axis cylinders of nerve fibers begin to break down within 1 hr and undergo the afore-described changes for white matter. Some blood-filled capillaries are present at 1 hr. The hematogenous response is manifest within 6 hr by the presence of leucocytes. Microglial multiplication is evident at 4 days, and 12 days after irradiation the glial response is well developed.

The ultrasonic method of producing localized selective lesions in the central nervous system constitutes a unique and potent tool for experimental neurological and neurosurgical applications (*6*). The technique is currently being used in this laboratory in a variety of neurological studies.

W. J. Fry
J. W. Barnard
F. J. Fry
R. F. Krumins
J. F. Brennan

Bioacoustics Laboratory, University of Illinois, Urbana

References and Notes

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11 April 1955

Basic Research versus Pure Research

The recent article by Spaght (*1*) reemphasizes the need for a formalization of concepts concerning words used to describe research and science. Spaght distinguishes between "pure" and "basic" research, although many persons would probably consider the two as equivalent. Spaght's "basic" research is equivalent to the "pioneer," or Edisonian, research as I defined it (*2*).

The current integration of science into the social structure is being highly hindered by the misuse of these and many other terms (*3*). Scientists realize generally that the vocabulary of science must be defined explicitly. Yet many will use terms loosely when they are considering general problems of science. How many scientists could give a satisfactory answer if they were asked to explain what this science of theirs is? Is it any wonder then that nonscientists are confused in their "understanding of science"?

Most efforts in this direction have been made by professional philosophers, to whom much credit is due. Yet the result has been that articles on science, such as those in leading encyclopedias, are almost unintelligible to practicing scientists. Problems and concepts of great importance have been left unconsidered because they could be apparent only to actual research workers.

No criticism of individuals is intended. Spaght and others have the right to define terms as long as no general agreement has been reached. The scientific profession as a whole, however, has been highly lax in developing its own understanding of the general operations and concepts of science.

Is it not time for some scientific organization, such as the AAAS, to assume this obligation? An active committee of representative and qualified persons could do much to expedite the integration of science into society. A possible name might be "committee on the philosophy and social integration of science." Without some such action, scientific research will continue at its organizational level to flounder and to operate highly inefficiently.

Ward Pigman
Biochemistry Department, University of Alabama, Medical Center, Birmingham

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More on "Unpublished" Material

The recent attention in *Science* to the problem of citing unpublished material in scientific literature prompts me to applaud.

As an editor in the field of the medical and public health sciences, I would like to add to the accumulation of data on this subject. *Public Health Reports*, official journal of the U.S. Public Health Service, 3 years ago began to insist of its authors that all citations and bibliographic references must be published material.

On occasion, if an author properly qualifies a personal communication to the satisfaction of the editors, he may include it in his text but not in the bibliography. We feel rather strongly that no bibliography should contain material inaccessible to the student and researchers. I find no difficulty in concurring with editor Daniel I. Arnon in his summation [*Science* **121**, 835 (1955)] of the case against the personal communication in reviews.

Taft S. Feiman, *Managing Editor Public Health Reports, U.S. Public Health Service, Washington, D.C.*