fee-for-service basis. The more patients a doctor has, the greater his income is. It is financially advantageous to obtain control of some type of service, such as surgery. This enticement has been too strong for some elements in the medical profession to resist. The most outstanding example is the situation that arose between general practitioners who performed surgery and the rest of the profession. These men formed a clique and were instrumental in carrying out certain measures which contributed to the fragmentation of medicine. The most detrimental of these measures was a cut-off in the free flow of training and information in surgery to all practicing physicians who wished it. This was accomplished by creating arbitrary certification requirements which excluded "preceptorship" training (the surgical training of practicing general physicians) and demanded "residence training" (the surgical training of nonpracticing physicians who will limit their practice to surgery). Similar arbitrary prohibitions followed in the other technical specialties of medicine as a direct result of willful prohibitions not necessitated by the nature of medical science per se.

The scientifically oriented physician, as opposed to the technically oriented physician, has suffered a setback. His concern is the investigation of cases. In this he must be free to utilize every technical development available for collecting and handling data. But here he meets with certain obstacles.

The collection of data about a patient involves the use of a great deal of equipment. The more extensive the investigation, the greater the number of technical devices needed. Let us consider the removal of tissue from the body for diagnostic purposes, or x-ray procedures, or the inspection of body orifices and cavities. The physician investigator cannot personally remove tissue from a living patient, because, unless he is a surgical technician, he has not been taught to do so. Adequate instruction in surgical technique has been deleted from medical school curricula and internship training programs. A parallel situation exists in the collection of x-ray data. When inspection of a body cavity is necessary, the situation becomes more complicated: each orifice and cavity lies in the domain of a separate specialist—the bladder, in that of the urologist; the respiratory passages, in that of the thoracic surgeon; the anus, in that of the proctologist.

The storage of data is very important in medicine, since the investigator may come across cases appropriate for a particular study only over a long period. He should have on hand histologic slides of any tissue removed from any patient, plus x-rays and an accurate notation on observations, and these should be observations that he himself has made. Under the present mode of operation, however, the histology slides belong to the pathologist and the x-ray pictures belong to the radiologist, while the records of the physician investigator contain only a verbal description of another physician's observations. The investigator is one step removed from his data.

Since the specialized physician is unfamiliar with the technology of more than a narrow field, he cannot intelligently interpret the raw data yielded by techniques outside his specialty. No one person has, for example, the experience necessary for interpreting such diverse data as histological preparations, x-ray pictures, and evidence of pathological change in a body cavity. We have heard a great deal about an alleged explosion in medical knowledge and its importance in preventing any one man from gaining broad competence. However, it is not an explosion in knowledge but a willful decision on the part of those responsible for medical education that is responsible for the existing limitations in the training and experience of the individual physician.

Revision of the curriculum of the medical school, so that graduates will have broad technical proficiency, as well as academic competence, is long overdue.

RICHARD D. BALDWIN
1 Montgomery Road, Skillman, New Jersey

Citations in Secondary Textbooks

Garfield's suggestions regarding citations in popular and interpretive science writing in the periodical literature [*Science* **141**, 392 (2 Aug. 1963)] may be extended to the textbook level. With all of the sciences becoming increasingly complex and the volume of research pouring from the technical journals threatening to engulf us, the role of the textbook writer as a literature abstractor is becoming increasingly important. For a variety of reasons, not the least of which is inadequate preparation of teachers in subject matter, the need for, and value of, citations in textbooks is probably greatest at the secondary level. And yet such texts seldom have adequate documentation. Citations in secondary textbooks to the more important popular articles and original research papers, and even the judicious use of research papers themselves in the class, might produce some startling results. I am convinced that secondary students can be trained to use documentation at a much earlier period than generally supposed.

ERNEST J. ROSCOE
Raymond Foundation, Chicago Natural History Museum, Chicago, Illinois

Use of Names in Concept Formation

I question the conclusions Ranken has drawn from the experiment on "Language and thinking" [*Science* **141**, 48 (5 July 1963)]. The construction of his experiment almost preordains the outcome. By assigning a different name to each of his eight figures, he tends to create a set in the subject that obscures the similarities of the figures. As a result, those subjects that were asked to form imaginal representations were given an advantage over the others in the jigsaw problem. In addition, Ranken is only assuming that the group that was instructed to form imaginal concepts did, in fact, do so. I feel that a highly verbal person would, in spite of his best intentions, tend to verbalize the shapes.

If a similar experiment were to be performed in which the names recognized the similarities of the shapes, the outcome would be very different. For example, each of the eight shapes is made up of two of four discrete contours. For the purpose of categorizing let us give each of the shapes a pair of names—the first name would indicate the top contour; the last name, the bottom. Even if the subject is not told of the similarities of the shapes, the names will now cue him to recognize these similarities. If he does notice the similarities, the jigsaw problem becomes trivial once the names have been memorized. The subject merely fits the names together as simply as he would fit the actual shapes together.

Of course, the preceding experiment