

questions on stock material, and antiquated methods of teaching that promote memorization rather than discovery and problem solving.

A qualitative issue raised in all three volumes is the desirable relationship, at various educational levels, between general education and technical and vocational training. Should the formal school system train youngsters for specific jobs in industry, or should the schools produce trainable people, with specific training made the responsibility, wherever possible, of employing organizations? What should be the content of education in rural areas? Should it be basically the same as in urban areas, or strongly aimed towards agriculture as a vocation and towards distinctively rural problems?

In discussion at the conference sponsored by the International Economic Association, J. Miner of UNESCO

warned against overemphasizing the manpower element when considering the effects of education on economic growth. There are other ways by which education influences economic growth besides its contribution to the output of a more highly skilled labor force. Education promotes technological change and the shift of people into more productive economic sectors; it has effects on aggregate demand; there are social-cultural effects, including the creation of modern literate societies in which economies of scale become significant; and education has important effects on political stability. The most significant aspect of education's relation to economic growth in the developing countries, he concluded, is not its production of qualified manpower but rather its role in transforming the character of society. Vital, though hard to pin down and measure!

tive reasoning may be appropriate for a *first* in-service course for elementary teachers. However, in view of the continual improvement in our public school mathematics curriculum, today's elementary education majors may find this text somewhat elementary.

CHARLES W. NELSON
Department of Mathematics,
Purdue University

Teachers' Mathematics Reference Series

In this book, **Explorations in Elementary Mathematics** (Prentice-Hall, Englewood Cliffs, N.J., 1966. 288 pp., \$5.95), Seaton E. Smith, Jr., presents an intuitive discussion of the real number system, beginning with the natural numbers and working up to a brief discussion of the irrationals. Sets, systems of numeration, and some nonmetric geometry are also included. As stated in the preface, the text is designed primarily as an introductory course in modern mathematics for elementary teachers (preservice and in-service).

In general, the exposition is clear, and there is an adequate number of examples and exercises. Concepts are developed intuitively through specific examples, number lines and tables, and no formal deductive reasoning is required (only one proof—that $\sqrt{2}$ is irrational—appears in the book). This approach makes it palatable reading for the mathematically unsophisticated; whether it is sufficient for the elementary teacher (especially the preservice teacher) is another question.

In my opinion, some effort should have been made to at least occasionally *supplement* the intuitive approach with a small taste of formal deductive reasoning. For example, the reader is led to the product $-2 \cdot 3 = -6$ by observing a pattern in a table and assuming that the "patterns are reliable" (p. 107). It would seem equally reasonable to assume distributivity for integers (as

on p. 108), along with the additive inverse property (p. 70) to present the following argument:

$$\begin{aligned} 0 &= 0 \cdot 3 \\ &= (2 + -2) \cdot 3 \\ &= 2 \cdot 3 + -2 \cdot 3 \\ &= 6 + -2 \cdot 3 \\ &= 6 + -6 \end{aligned}$$

Similarly, the author sidesteps distributivity of division over addition, when this could have been easily demonstrated in chapter 6, using the definition of addition for rational numbers and $a/b = a \div b$.

In general, the author's attempt to communicate with the unsophisticated reader without a loss of mathematical precision is commendable. I noted only a few exceptions. In defining an infinite set, some confusion exists as to what is really meant by a one-to-one correspondence (p. 12). On pages 76 and 108 needless restrictions are placed on a , b , and c . Why should $a \neq b$ and $b \neq c$? The phrase "numbers represented by the denominators" (p. 123) implies denominators are numerals. In discussing separations, for example, one says that a line separates a plane into *three* sets: two half-planes and the boundary line. If the plane is divided into two sets, where does the line belong? Irrational number is incorrectly defined in the glossary.

These errors can be easily corrected and should not deter those who wish to use the book. The omission of deduc-

Regeneration in Animals

More than three dozen distinguished investigators gathered in Athens, Greece, in the spring of 1964 to assess progress in the study of regeneration and to present, often in a historical fashion, progress made in their individual laboratories. Their presentations, creditably edited and indexed by V. Kiortsis and H. A. L. Trampusch, appear in this lengthy volume, **Regeneration in Animals and Related Problems** (North-Holland, Amsterdam, 1965. 592 pp.).

This publication will be valuable because of its comparative approach. After a discussion of some general problems in the field, the reader systematically embarks on a phylogenetic trek through the major invertebrate phyla and then enters the vertebrate kingdom, related in a less systematic but engaging fashion. First, there is a discussion of regeneration in vertebrates (mainly amphibian), followed by a section entitled "Related problems" in which regeneration is discussed in light of tumors, hyperplasia, cell migrations, and the like.

What impressed me most, after the initial reading, was the enormous lack of progress during this century in this vital area of development. The questions asked by T. H. Morgan more than 50 years ago are the questions being asked today. This is not in itself detrimental except that, in general, the approach to the problems has not significantly altered either.

Repeatedly, the reader finds himself presented with an idea, implied by its author to be catastrophically original, when it is nothing more than a restatement of a concept that was in vogue several decades ago. The importance of the nervous system in regeneration, for example, is timeworn. Still no one has concentrated or characterized the topic material, nor has anyone developed a hypothesis concerning the mechanism of action of such a mate-