BOOK REVIEWS

Vector and tensor analysis. By Nathaniel Coburn. New York, Macmillan, 1955. 12+341 pp.

While unified under a single title and forming a coherent sequence, the material covered in this book could well be taught in three separate courses: an undergraduate course in vector analysis, and two graduate courses, one on tensor analysis and the other on elasticity and fluid dynamics.

The first four chapters of the book are devoted to vector analysis. The treatment is distinguished by a strong tensor flavor and by the fact that it is not confined to a single coordinate system. Throughout the book ample problems are provided at the end of nearly every section. As with most treatments of vector analysis, the sequence is from algebra to differentiation, integration and applications. A number of excellent applications to differential geometry are incorporated into the original exposition of vectors. The author's background in physics is evidently focused on mechanical problems and all other fields of physics are almost entirely ignored. When thermal problems are analyzed, they are viewed from a mechanical point of view, as on p. 79 where the author reasons, "If we assume that *heat behaves like a fluid mass and satisfies the continuity principle* . . . ." The modern physicist would reason simply, "If we assume that thermal energy is conserved. . . ."

Many topics are marked by their absence. No physical picture of the meaning of the divergence and curl of a vector is developed. Integral definitions of these concepts are not employed, resulting in a loss of physical clarity and in an unnecessarily lengthy development of the theorems of Stokes and Gauss. Other topics which are untouched are the scalar quasi-potential, the vector potential, classification of vector fields, and the entire range of fruitful applications to electromagnetic theory. The study of vectors concludes with a rather sketchy treatment of rigid-body motion and a rather beautiful and fairly detailed exposition of the flow of perfect fluids.

Tensors, on the other hand, are presented with a strong vector flavor. The approach is cautious. Vector notions are retained as long as possible and unnecessarily frequent use is made of unit vectors. First, tensors in orthogonal cartesian coordinates are treated. Thus, index notation is introduced without regard for the distinction between contravariance and covariance, and the coordinates of tensors