occurs on pages 516 and 517. Here the factors pertinent to the question of cracking are not displayed well. One wonders about the role of grain size in this phenomenon.

Altogether the book represents the state of the work and knowledge on material systems based on and containing plutonium. One might have hoped for a better organization of our understandings of the relations between composition, structure, and behavior. More association of the subject of alloys, that is to say, the composition variable, with the question of impurities, which is only one end of the composition range, would have been useful. At least, plutonium as a substance is moving from the state of being a mysterious or sacred entity into the status of providing an objectively evaluated class of materials.

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Methods of Mathematical Physics, Volume II, Partial Differential Equations. By R. COURANT and D. HILBERT. Interscience Division of John Wiley and Sons, Inc., New York, 1962. 850 pp., $17.50.

Richard Courant's work and stature are widely and firmly planted in contemporary mathematical physics. We may expect that such a volume as this, with eight hundred pages of text and a bibliography of twenty pages, will be definitive and thorough in the topics taken up.

Since it has "only six chapters," a few remarks will be made regarding each of these. Chapter I sets forth general information and definitions on partial differential equations and their solutions: examples are given for several types of equations, the corresponding solutions, and solution techniques. These examples are presented clearly, without a burden of detail that would obscure their general features.

Some pervading characteristics of the book are noticeable in the first chapter. As stated in the preface, its purpose is to deal with the *theory* of partial differential equations: though originating sometimes in specific physical situations, the equations are discussed chiefly to display mathematical ideas. Nonetheless, Professor Courant does not ignore the nonmathematician. Following a purely analytic existence proof for power series solutions, obtainable only under highly restrictive circumstances, he mentions less idealized conditions which continually confront a physicist—or mathematician. The over-all style of writing is often that of a casual discourse, avoiding monotony which can accumulate in a mathematical treatise, and yet establishing rigorous statements.

In Chapter II, considerations are limited to first order equations (linear and nonlinear) and broadened to exhibit solutions under some of the less idealized conditions mentioned. Solutions are developed formally, with concrete examples, via methods involving characteristic curves and strips: these permit the application of simple integration techniques employed with ordinary differential equations. A few well-chosen figures here would add much to the description of characteristic curves, Monge cones, etc.—particularly since the text emphasizes the utility of geometric interpretations.

Leading into studies of higher order equations (about 80% of the volume), Chapter III contains, first, several major sections on elliptic, hyperbolic, and parabolic classifications. Under the inclusive title "Differential Equations of Higher Order" there are explorations into several topics such as wave propagation, and superposition solutions of homogeneous and inhomogeneous boundary value problems. An interesting final section on "typical problems" identifies origins of differential equations and discusses the role of initial or boundary conditions in usually (not always) establishing unambiguous descriptions of nature. Reaching the end of this chapter, one is quite aware of numerous forward and backward references. The stated aim of presenting problems at various levels of sophistication is definitely met.

The development of solutions of Laplace's and Poisson's equations, with appropriate boundary conditions, appears in Chapter IV on elliptic equations. Ample space is given to average value theorems for these solutions and for functions which satisfy more general elliptic equations.

In two final and long chapters on hyperbolic equations, an outstandingly complete treatment is provided for the solution of initial value problems involving two independent variables. Wave propagation, especially in hydrodynamics and electromagnetic theory, is examined very thoroughly for two or more space-time coordinates. An appendix on transient analysis with integral representations and Heaviside calculus will have special appeal for applied scientists.

This review does not adequately show the extent to which theoretical developments of the last few decades (in some cases, few years) have been included or referenced. The book will doubtlessly become a standard: I believe that many professionals, including those with no more than a reasonably thorough undergraduate course in ordinary differential equations, will use it for reference or in systemized study. Its price precludes wide private ownership, however. Interscience Publishers should consider a paperback edition, perhaps in two volumes. Running heads including section numbers would facilitate use of the extensive internal referencing. Consistency of notation and scarcity of errors are both gratifying in such a long volume.

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