journal of applied mechanics

book reviews

Modeling Hydroelastic Vibrations. By Ottó Haszpra. Akadémiai Kiadb, Budapest, Hungary. 1978. Pages 136. Cost $12.

REVIEWED BY R. D. BLEVINS[1]

Dr. Ottó Haszpra, who is scientific deputy director of the research center for water resources development at Budapest, has written this slender (136-page) volume to establish the scaling laws for model testing of the vibrations of hydraulic structures induced by a water flow. At the author's laboratory in Hungary, investigations have been carried out of the vibrations of locks, gates, and barriers which arise during the emptying and filling of navigational locks in large canals. This book is largely based on experiences from these investigations. As such, it is a guide to model testing of similar hydraulic structures.

The chapters are as follows: Introduction, which sets the limit of model scaling of vibrations in structures exposed to an incompressible (water) flow. Chapter 2 reviews associated experience in hydroelasticity which is meager indeed for the locks and navigational structures to which this book is primarily devoted. The heart of the book is contained in Chapter 3 which developes scaling laws for modeling hydroelastic vibrations. In it, scale ratios are developed for forces associated with inertia, gravity, elasticity, turbulent friction, pressure, and structural friction. Chapter 4 discusses experimental verification, mostly in tests on cantilevers. Chapter 5 is devoted to model techniques and instrumentation while Chapter 6 gives two examples of modeling large hydraulic in open channel flows.

This book fulfills its stated purpose and does not reach for higher goals. No discussion of flow-induced vibration mechanisms is given nor is there detailed analytical exploration of phenomena. The modeling itself is accomplished in a personal style. For example, the concept of elasticity and interia are introduced and scaled but no mention of natural frequency or damping is made until Chapter 4 in a discussion of measurement. Reynolds number is only briefly discussed. While the author's scale parameters are doubtlessly equivalent to more conventional scales such as, Reynolds, Froude, and Strouhal numbers with mass ratio and damping ratio, the author does not choose to present them in this form. Rather the scale laws are represented by the symbol "c" with one of approximately 12 subscripts. This makes for somewhat difficult reading and interpretation.

The book is a worthwhile source for the modeling of the vibrations of hydraulic structures in open channel flow. The concepts and overall logic is clear and the 218 references will provide a broad background of material.

Catastrophe Theory: Selected Papers 1972–77. By E. C. Zeeman. Addison-Wesley Publishing Company, Inc., Reading, Mass. 1977. Pages x-675. Price $26.50 hard binding, $14.50 paper binding.

REVIEWED BY G. W. HUNT[2]

The two years of 1977 and 1978 have proved particularly stimulating for those with an interest in the development and applications of catastrophe theory. Not only has the theory received one of the most vehement, and startling, attacks on any field of scientific endeavor within recent years, but we have also seen the most complete answer to these criticisms to date, in the publication of two highly significant texts. The first of these is of course the book under review, Zeeman's *Catastrophe Theory, Selected Papers 1972–1977*, the second being Poston and Stewart's *Catastrophe Theory and Its Applications*, Pitman, 1978. A review of one of these would be incomplete without at least passing reference to the other.

For readers of this Journal it is perhaps the second that would immediately catch the eye, since it seems to be written with the Applied Mechanics community largely in mind, from a classical viewpoint and concentrating mainly on applications in the "hard" sciences. With Zeeman's book this is conspicuously not the case. As the title suggests the volume is a collection of papers, presented in most cases unchanged from the original format. The majority are written for specialist audiences, and the range of disciplines which the book embraces is indicative of the author's divergent and stimulating approach to research.

Zeeman is uncompromisingly a topologist, and this fact resonates through the book. Thus the applied mechanician will find modern topological techniques applied to familiar problems column and arch buckling, and the stability of ships for example—as well as perhaps less familiar applications in the biological and social sciences. Well over half the papers are devoted to the "soft" sciences, the area that has come in for the most criticism, and this seems to reflect the author's own interests. It is worth noting, however, that here mechanical analogs often play a vital role, as in the oscillator models of brain activity employing Duffing's equation, for example. Mathematical contributions include a complete proof from first principles of the classification theorem, difficult reading but important in that it encompasses the essence of catastrophe theory, as opposed to applications of the theory.

The book is compelling reading for many reasons, especially in the light of the recent controversy. All the relevant papers are here and, as the whole is often more that the sum of the parts, we are left with a much clearer picture of the philosophical base of catastrophe theory, and the author's highly characteristic approach to mathematical modeling, than could possibly be obtained from any individual contribution. For the present reviewer the exciting synthesis of ideas and interdisciplinary nature of the book more than outweigh the, at times, somewhat cavalier attitude to modeling in the social sciences: ultimately the reader must judge for himself.

Zeeman's book has one other significant advantage over the Poston and Stewart contribution in this money-conscious age. It costs about one-third the price.

Handbook of Turbulence. Volume 1. Walter Frost and Trevor H. Moulden (Eds.) 1977. Plenum Press, (a Division of Plenum Publishing Corporation), 227 West 17th Street, New York, N. Y. 10011. Pages 498. Price $49.50.

REVIEWED BY P. A. LIBBY[3]

Reflective of the increasing interest in, and importance of, turbulence in a wide variety of engineering fields is the number of recent

[1] General Atomic Company, P.O. Box 81608, San Diego, Calif. 92138

[2] Lecturer, Department of Civil Engineering, Imperial College, London, SW7 2AZ, England.

[3] Professor of Fluid Mechanics, Department of Applied Mechanics and Engineering Sciences, University of California, San Diego, La Jolla, Calif. 92093.

Turbulence takes place in practically all flow situations that occur naturally or in modern technological systems. Therefore, considerable effort is being expended in an attempt to understand this very complex physical phenomeÂ non and to develop both empirical and mathematical models for its.Â Such numerical and analytical computational schemes would allow the reliable prediction and design of turbulent flow processes to be carried out. The purpose of this book is to bring together, in a usable form, some of the fundamental concepts of turbulence along with turbulence models and experimental techniques. It is hoped that these have "general applicability" in current engineering design. Volume 92 Issue 4. Handbook of Turbulence. Volume 1. Fundamentals and English FranÃ§ais. Journal of Fluid Mechanics. Article contents. Abstract. Handbook of Turbulence. Volume 1. Fundamentals and Applications. Edited by W. FROST and T. H. MOULDEN. Plenum, 1977. Handbook of Environmental Fluid Dynamics, Volume One. DOI link for Handbook of Environmental Fluid Dynamics, Volume One. Handbook of Environmental Fluid Dynamics, Volume One book.Â Canopy Turbulence. WithE.G. Patton and J.J. Finnigan. Vegetation covers nearly 30% of the Earthâ€™s land surface and inÅ¾uencesclimatethroughtheexchangesofenergy,water,carbondioxide