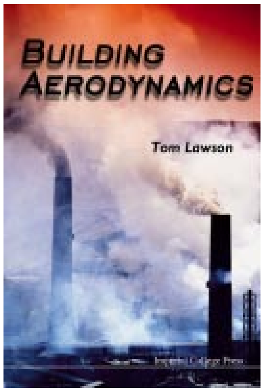
that experimental discipline. The author notes that he is not an advocate of this application of Computational Fluid Dynamics (CFD), particularly since CFD is still in the early stages of development. This reviewer shares the author's lack of enthusiasm for this application for technical reasons, namely unsteady, separated flow remains one of the most challenging phenomena to be simulated by CFD. Chapter 11 is important since the natural winds are not steady and thus knowledge of statistics is essential.



This reviewer feels the author has satisfied his goal. An interested reader should keep in mind the book is written in the UK for practitioners in the UK. So, the author explains the climate in terms of an Icelandic low, a Siberian high, and a subtropical high-pressure cell over the Azores. Further, there are references to standards and data sources that may not be generally available in the US. Other sources like the ESDU information may only be available at specialized libraries. Readers in the US may wish to supplement this book with ASCE Memoranda and Reports on Engineering Practice #67, ''Windtunnel Studies on Buildings and Structures.''

This reviewer notes the author's familiarity with the subject occasionally leads to overlooked details. For example Figure 1.02 on p 11 refers to ''Southwest'' Trade Winds when he should have used ''Southeast'' Trade Winds. On p 18 the legend below Figure 1.07 refers to frequency (Hz in wind tunnel time without defining wind tunnel time any where in the book. On p 29 the author states, ''The opposite to a bluff body is a plate,'' which is true if the plate is lined up with the relative wind, not normal to it. The pictures of surface streamline on pages 50, 51, and 53 could use a little more explanation.

While it may be a matter of local usage, this reviewer found the implied definition of dynamic pressure (pp 34 and 35) as ''1/2rhoVsquared'' to be ambiguous. The definition would be clearer if the author had written ''(1/2)rhoVsquared.'' This issue appears from time to time throughout the book in different forms (see the middle of p 63 for example). This reviewer feels this ambiguity is unfortunate since one purpose of the book is the education of architects and students. This reviewer is an engineer who feels the ability to do ''back of the envelope calculations'' to obtain a rough idea of the size of effects is often a useful skill during team interactions. As such, the ambiguity detracts from learning to estimate accurately.

Building Aerodynamics fills a need, but its general applicability is reduced somewhat by its understandable focus on the weather and standards used in Great Britain. A Professor of Wind Engineering or librarian at a British Institution of higher education may well want to acquire this book either as a text or for reference purposes. Serious research Wind Engineers in the US may want to purchase the book, if they are not already with Lawson's work.

1R36. Capillary Surfaces: Shape, Stability, Dynamics, in Particular Under Weightlessness. Tracts in Modern Physics, Vol 178**. -** D Langbein *(Univ Bremen, Am Fallturm, Bremen, 28359, Germany).* Springer-Verlag, Berlin. 2002. 364 pp. ISBN 3-540-41815-6. $219.00.

Reviewed by KJ Ruschak (Manuf Res and Eng Organization, Eastman Kodak, 2/35 Kodak Park, Rochester NY 14652-3701).

This book is a monograph on capillary hydrostatics and hydrodynamics treating liquid/air or liquid/liquid interfaces at small Bond number: a condition of near weightlessness, of nearly identical liquid densities, or of such small extent that surface energy effects dominate. Consideration is limited to pure liquids with constant and uniform surface tension. The book is predominantly theoretical and mathematical, but presents results for several experiments performed in spacecraft such as European Spacelab, in aircraft in parabolic flight, or in drop towers. Applications such as the design of liquid containers for spacecraft or the growth of large, high-quality crystals are mentioned, but not considered in detail. A solid background in the physics of capillary phenomena and in applied mathematics, including the calculus of variations, are requisites for the reader. The typically concise development at a high level makes the book unsuitable as a textbook or as an introduction to the subject matter.

The book primarily treats, usually from the perspective of minimization of free energy, equilibrium meniscus shapes and their stability according to the Gauss-Laplace (or Young-Laplace) differential equation of capillary hydrostatics. Stability is determined by variation of energy to verify a minimum or by the sufficient, but nonessential condition for instability of a minimum in volume as an independent parameter such as pressure is varied. The specific problems treated include liquid bridges between parallel plates that may be rotating; two liquid bridges between three colinear plates where the center plate floats between fixed-end plates; liquid shapes determined by wetting barriers arising from sharp edges or abrupt changes in the surface energy of the solid surface (canthotaxis or contact line pinning); partially filled containers of cylindrical and polygonal cross section; and menisci in wedges and corners. Some problems in capillary hydrodynamics, where pressure is modified by flow, are treated as well. These include flow into tubes and wedges driven by capillarity and the forced oscillation of liquid columns. Topics that are not covered in any depth include surfactants, non-ideal surfaces, dynamic contact angles, gradients in surface tension, and numerical methods of solution (although some results of numerical computations are presented).

The many photographs of static and dynamic menici from ingenious experiments conducted in spacecraft, aircraft, and drop towers are effective at stimulating interest. Nonetheless, the solid geometry, advanced mathematics, and typically concise development make for challenging reading.

The book has an extensive table of contents and four-page subject index. The last chapter is a listing of experiments, including those not directly related to the subject matter of the book, that have been conducted in sounding rockets, Spacelab, and satellites. The graphics are generally clear and effective, although some photographs are so small that interpretation is difficult, and some plots are so busy that individual curves are difficult to identify and track.

The author has produced an in-depth review and synthesis of results on the mathematical modeling of the equilibrium and dynamic shapes of menisci of pure liquids that have been observed experimentally under conditions of weightlessness. Readers interested in applications of this modeling or in physicochemical hydrodynamics will find the material limited. *Capillary Surfaces: Shape, Stability, Dynamics, in Particular Under Weightlessness* will be valuable to those working or having applications in this specialized area and useful as a reference to those with broader interests in capillary phenomena. The book is not recommended to those lacking significant background in fluid physics and applied mathematics.

1R37. Hydraulics of Stepped Chutes and Spillways. - H Chanson *(Dept of Civil Eng, Univ of Queensland, Brisbane, Australia).* Balkema Publ, Rotterdam, Netherlands. 2002. 384 pp. ISBN 90-5809-352-2. $105.00.

Reviewed by AS Paintal (Eng Dept, Metropolitan Water Reclamation District, 100 E Erie St, Chicago IL 60611).

This book provides a comprehensive coverage of most of the engineering topics in the hydraulic design of stepped chutes and spillways. The stepped channels and chutes have been in use for more than 3500 years, but there is no publication on the hydraulic design of these structures. Since 1980s, there has been a renewed interest in these structures for water and wastewater treatment plants and flood control facilities due to development of new construction techniques and materials. This book fulfills the need for presenting the state of the art in the stepped chute hydraulics. It helps students as well as practicing engineers and researchers get a *feel* for various aspects of the stepped chute hydraulics.

The book is organized in ten chapters and nine appendices. The chapters provide an orderly development of the subject. Chapter 1 gives a brief introduction of the subject and discusses the organization of the book. A stepped chute is defined as a channel with a series of drops in the channel bed. The flow in this channel is classified based upon the geometry of steps and flow rate. Three regimes of flow are defined, they are: nappe flow regime at low flow rates, transition flow regime at intermediate flow rate, and skimming flow regime at large flow rates. Chapter 2 provides a brief history on the development of the design and construction methods and materials for stepped chutes and spillways. The stepped cascades have been in use for aqueducts and fountains since historic times.

Chapter 3 deals with the hydraulics of nappe flow regime. The nappe flow is defined as a succession of free falling sheets of water with the jet impinging on the next lower step. On the lower step, either the flow is supercritical, or a full or partial hydraulic jump is formed. The energy is lost in impact and in hydraulic jump. Chapter 4 is concerned with transition flow regime that is defined as transition from nappe flow regime to skimming flow regime. This regime is associated with the severe hydrodynamic fluctuations and is, therefore, avoided in the design. Chapter 5 discusses the skimming flow regime, in which the flow skims over the steps with the external edges of the steps forming a virtual-channel bed. The energy is dissipated due to vortices that are formed in each corner.

As the dissolved oxygen concentration is a prime indicator of the quality of water, Chapter 6 discusses the aeration and deaeration characteristics of cascading water. The cascades are very efficient means of aeration due to turbulent mixing and air entrainment.

In Chapter 7, new design methods and guidelines are presented for various applications of stepped chutes. The design procedures for stepped spillways, stepped channels at the toe of the chute, stepped fountains, and water staircases are discussed in detail with a number of examples.

Historic accidents and failures of hydraulic structures with stepped chutes and channels are discussed in Chapter 8. Recommendations are formulated for safe and efficient design. The author recommends avoiding transition flow regime as hydrodynamic fluctuations are inherent in this flow regime. Quality of construction methods and materials, and good maintenance practices are also emphasized.

Chapter 9 deals with the flow instabilities and unsteady wave phenomena that occur in the stepped channels and spillways. Basic theory is provided for the wave phenomena, and the documented experiences are reviewed.

Chapter 10 provides a summary and makes recommendations for future research on the air-water gas transfer process in nappe and skimming flow regimes, hydraulic characteristics of transition and skimming flow regimes, and hydrodynamic loads on the steps.

There are nine appendices. Appendix 1 gives a list of physical and chemical properties of fluid in SI units, while Appendix 2 provides a table for unit conversions. A method for computing nappe trajectory is given in Appendix 3, and Appendix 4 explains a procedure for computing bubble rise velocity. A method for modeling form drag and resistance to flow is given in Appendix 5, and void fraction distribution in chute flow is discussed in Appendix 6. A method of computing the flow in stepped chute for skimming flow regime is given in Appendix 7, and a procedure for modeling air-water gas transfer in skimming flow regime is presented in Appendix 8. Appendix 9 provides a procedure for reporting errors and omissions in the book.

A list of symbols, a comprehensive glossary of technical terms, and a list of references are also included in the book.

The hydraulics of stepped chutes differs from the classical hydraulics of smooth channels and is not usually taught in schools. The books on classical hydraulics do not cover this topic either. The purpose of the book has been to provide basic hydraulic theory related to designing stepped chutes and spillways. The book is based on a state-of-the-art-review of literature and research reports. The book is very well illustrated with a large number of charts and photographs. The photographs show hydraulic structures built over the years that incorporate stepped chutes for energy dissipation, flood control, and aesthetics (landscaping).

Hydraulics of Stepped Chutes and Spillways is a useful contribution to the field of hydraulics. The book may be used as a text for an undergraduate (elective) or a graduate course in the hydraulics of stepped chutes. The book will be useful for engineers working in the area of design and research.

1R38. Mechanics of Turbulence of Multicomponent Gases. Astrophysics and Space Science Library, Vol 269. - Edited by MYA Marov and AV Kolesnichenko *(MV Keldysh Inst of Appl Math, Russian Acad of Sci, Moscow, Russia)*. Kluwer Acad Publ, Dordrecht, Netherlands. 2001. 375 pp. ISBN 1-4020-0103-7. $134.00.

Reviewed by AC Buckingham (Center for Adv Fluid Dyn Appl, LLNL, Mail Code L-23, PO Box 808, Livermore CA 94551).

This book provides both a valuable historical perspective and a comprehensive review of the theoretical considerations, model and procedural refinements, and illustrative computational results developed in Russia for analysis of terrestrial upper atmospheric physics and that of the atmospheric mantles surrounding the outer Solar System planetary giants. These planetary atmospheres are described as subject to nearly continuous molecular compositional, thermodynamic state and thermophysical phase changes as the result of, at least, the driving influences of: multi-spatial scale, compressible turbulent mixing; molecular mass, momentum, and energy transport processes; solar radiation absorption and transfer; buoyancy driven convective heating, ionosphere level electromagnetically driven charged particle accelerations; planetary atmospheric rotation, coupled global scale and local scale wind shear; and chemical reactions. The book is a monograph emphasizing nearly 30 years of the authors' theoretical research and computational procedural development systematically combining these influences. Research was conducted by the authors, senior scientists and numerical procedure innovators, while at the MV Keldysh Institute of Applied Mathematics, Russian Academy of Sciences in Moscow.

The substantial reference list (over 350 sources) is usefully comprehensive particularly with respect to current published Russian work. Inadvertently, a few key non-Russian references outlining some important advances over the last 20 years in turbulence theory and simulation in the presence of reactive multicomponent species together with some information on high energy density experiments for astrophysical research applications are missing. Without implied criticism for the authors' admirable and remarkable efforts in preparing this otherwise comprehensive book, but in the spirit of providing completeness for the reader, this reviewer has added some representative references to this later work in this review, specifically identifing the references, when added, with the reader's attention drawn to a list of publications appearing at the end of this review. The cross index is useful, but somewhat sparse for the abundant topics and material developed. In particular, the reader may miss the inclusion of a combined topic and individual author cross-reference index with multiple entries.

The book is non-pedagogical in content, style, and organization. Consequently, it appears to have little use or appeal for student instruction. Its most probable appeal would be to specialists with interests in numerical modeling for analysis and evaluation of upper planetary atmospheric composition variation and dynamic structure. Another category of interested reader might be found in the non-specialist in atmospheric physics and fluid dynamics. This individual