Lively tales of river bores, bombs and bouncing balls

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Title: Physics of Continuous Matter: Exotic and Everyday Phenomena in the Macroscopic World. First edition
Author: B. Lautrup
Reviewer: Trevor Bacon
Publisher: CRC Presss
ISBN: 0 7503 0752 8
Pages: 608
Price: £29.99

Given recent natural disasters around the world, it is a welcome surprise to find a physics textbook, written before these events, with succinct, quantitative accounts of earthquakes, tsunamis and tornadoes.

B. Lautrup's text is an introduction to the fundamentals and the equations of continuum mechanics derived from Newtonian particle mechanics. It offers a compendious, but not encyclopaedic, classical account of fluids and solids, including hydrostatics, deformable solids, basic fluid mechanics and more advanced fluid mechanics. Presented in this way, it may not sound enticing, but it covers a range of interesting topics: the development of the theory of tides; Newtonian cosmology and the cosmological constant; the drag crisis (the first account of which was published by Alexandre Gustave Eiffel, constructor of the eponymous tower) as applied to golf and tennis balls; estimation of the yield of a nuclear bomb from time-lapse photographs; river bores; subsonic flight; and the wind-chill factor. Continuum physics is presented as, in the author's words, "a huge collection of interconnected topics".

Lautrup is a professor in theoretical physics at the Niels Bohr Institute in Copenhagen University. Originally a researcher in high-energy physics, he has recently been interested in physics on a macroscopic scale, including neural nets and spin glasses, medical imaging and fluid mechanics. His interests make him well qualified to write on continuum physics.

As an innovation, the field concept is introduced from the start. The treatments of the selected topics are given with a light touch and no loss of rigour, as a measure of which there are more than 1,200 equations in the book together with 278 problems and sketch solutions. Lautrup's intention is that students should learn, via a set of interesting problems, to reason about macroscopic physics qualitatively and quantitatively.

Lautrup believes that his book will be useful at several levels of teaching, starting as an introductory second-year text based on most of the first 20 chapters; later and more

advanced courses might include the remaining 12 chapters. The text should suit physics, geophysics and astrophysics courses and be of interest to students of aeronautics and civil and mechanical engineering.

The book has been well produced and edited, although the publishers have not insisted on British (as opposed to American) spellings. Curiously, Lautrup quotes a 1998 source for the value of the gravitational constant, *G*, with the comment that the uncertainty of more than one part in a thousand is embarrassingly large. The 2004 value, he will be pleased to learn, has an uncertainty ten times less.

This text succeeds in being both introductory and advanced and in covering a wide range of topics. The preface tells us that it "is written for adults with a serious intention to learn physics". It can be recommended not only as a textbook but also as a reference. Perhaps one of its readers will go on to claim the million-dollar prize, mentioned in the text, for a proof on the existence of smooth, non-singular solutions to the Navier-Stokes equations - one of the seven Millennium Prize problems.

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