BOOK REVIEWS

T. Damour, B. Duplantier, V. Rivasseau, eds.: GRAVITATION AND EXPERIMENT. POINCARÉ SEMINAR 2006. Birkhäuser-Verlag AG, Basel, 2007. ISBN 978-3-7643-8523-1, 145 pages, 35 figs., hard cover, price EUR 79,90.

The Poincaré Seminar is held at the Institute Henri Poincaré in Paris twice a year. This volume contains lectures presented at the Poincaré Seminar focused on Gravitation and Experiment which took place in October 2006.

The editors made particular effort to present the chosen topics in a pedagogical form accessible to mathematicians and physicists not only at the professional level but also at graduate student level. The first contribution by T. Damour is an excellent introductory overview "General Relativity Today" explaining basic principles, properties and results of general relativity, including applications in other fields of research (e.g. astronomy), commercial applications (GPS) and various contemporary and future experiments designed to further test the validity of this theory. The last section of this contribution focuses on possible extensions of general relativity, such as supergravity and string theory.

The second contribution "Beyond Einstein's Gravity" by I. Antoniadis, where main properties of the large extra dimension scenario are reviewed, is the natural continuation of the first article. In the following three sections various experimental topics are reviewed—M. Kramer discusses tests of general relativity in the strong field regime using binary pulsar data and in particular recent results of his team confirming validity of general relativity at the 0.05% level. J. Mester reviews the status of the Gravity Probe B experiment and J. Y. Vinet summarizes the status of ongoing and future experiments attempting to detect gravitational waves.

Vojtěch Pravda

J. M. McNamee: NUMERICAL METHODS FOR ROOTS OF POLYNOMIALS. PART I. Elsevier Science, Amsterdam, 2007. ISBN 978-0-444-52729-5, 333+xx pages, hard cover, price USD 160,–.

This book surveys the most important literature on numerical methods for polynomial root-finding. The author describes the contents of each bibliography item. Some papers are just mentioned and summarized in a few lines, while the summaries of papers considered more important are several pages long.

The presented papers are carefully selected and the order in which they appear in the book is well thought of. The author proceeds pedagogically from the simplest and mostly also the oldest methods to the more elaborate and modern ones. The methods are grouped into chapters and sections. In each section, the abstracts distilled from individual papers are preceded by a brief introduction and, sometimes, by historical remarks. The mathematical background and properties of the methods are often presented in the form of definitions, theorems, and proofs.

The book is split into six chapters and an introduction that contains a few historical remarks, some examples of applications of polynomial root-finding, and a short mention of several well-known methods. Chapter 1 treats the problem of the evaluation of a polynomial and, possibly, of its derivatives at one or more points. It also deals with the issues of convergence and a priori bounds on roots; the appendix to this chapter lists 45 bound formulas. Chapter 2 is devoted to Sturm sequences and to greatest common divisors. The connection between continued fractions and real root-finding is analyzed in Chapter 3, whereas Chapter 4 presents methods for simultaneous and possibly parallel computing of all the roots of a given polynomial. Chapter 5 explains Newton's and the related methods. Finally, the long Chapter 6 deals with matrix methods, where the detailed treatment of Zheng's method designed for finding roots of possibly high multiplicity deserves emphasis. At some places, available computer codes are mentioned and briefly described.

As the author mentions in the introduction, the book may serve as a handbook containing a large variety of methods for polynomial root-finding. It is a rich source of the relevant literature. The author refers to more than 370 items. For this reason, it may also be used to study the history of root-finding methods. However, I would not recommend this book to students as the prime source on the subject, because the book just describes a variety of results and does not provide a sufficiently detailed mathematical background. Moreover, the quality of its content is lowered by poor typography, which makes the book rather difficult to read.

Tomáš Vejchodský