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BOOK REVIEWS

André Weil, Number theory — An approach through history from Hammurapi to Legendre, xxi+375 pages, Birkhäuser, Boston, 1984.

A very unusual book combining thorough philological exactness, keen observation, apt comments of the essential points, picturesque phantasy, enthusiastic loving of the subject and brilliant literary style: a romantic novel of documents.

It is both number theory and its history in an inseparable oneness, helping us understand the very roots and the first big stage of progress of this discipline. The author, one of the most prominent number theorists in our century, chose to give us a broad perspective of the birth of modern number theory. This is basicly the period from Fermat through Euler enriched by Lagrange and Legendre stopping just before the appearance of Gauss. Most of the mathematical results appearing in the book could be discussed in a clear-cut and well-constructed course of number theory, and in general we are accustomed to have this topic treated in such a straightforward manner. This systematic treatment is really present since Gauss. But the birth (Fermat) and the rebirth (Euler) were much harder, more mystical, and full of doubts, questions and missing links. And Weil shows us the story of the creation with its inevitable side-tracks, right and wrong guesses, and more and more shining theorems on the horizon.

The book starts with a short exposition of the most important works of the antiquity, closing the "protohistory" with Diophantus and his resurgence by Viète and Bachet. This is the point, when "the curtain could rise; the stage was set. Fermat could make his entrance."

As Fermat barely ever gave proofs, and the basic source for judging his results is his large correspondence with other mathematicians of the era, it is quite a venture as Weil tries to establish a consistent system sketching what Fermat really could have proved and how he might have done this. The best help in this (fictious) reconstruction is the way as Euler did it in some cases, since also Euler had to give (again?) the proofs of Fermat's results. In some other cases, however, Weil finds quite uncommon, non-standard methods, which are conceivably within Fermat's reach. You may agree or not with this science fiction, but it is an exciting adventure by all means.

The chapter dealing with Euler gives a vivid description of the untiring super-genius, who renewedly attacked the hardest problems, used the evidences of his own large numerical experiments, gave hair-raising heuristic arguments, which still worked nearly always. One gets a very good impression how Euler explores new areas, connects them to old ones, how he reacts promptly to results achieved by his contemporaries (several nice examples are given in connection with Lagrange).

The concluding chapter about Lagrange and Legendre ("the age of transition") together with the "protohistory" set the work of the two big, Fermat and Euler, in a nice frame.

Weil always goes back to the very sources, the book is packed with fine quotations from the original works in the original languages (Latin, French and German), and still evades to be encyclopedic. He makes his selection boldly, picks, omits and emphasizes in an individual way. Also, the appendices at the end of each chapter have a special role, they help you to get orientated in the matematical material touched in the book, in those cases, when some essential, global view is possible only by more modern methods, or when the detailed proof would spoil the structure of the historic parts.

The many suppositions, references, the (sometimes too) versatile elaboration of

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the topic render the book now and then a little intricate and harder digestible. But one must not forget that also the transparent theories of today in their simplified and crystal-clear mathematical perfection are based on the troubled struggles and partial triumphs of the yesterdays, and Weil draws us a real beautiful and truish picture of these yesterdays.

R. Freud (Budapest)

István Vincze, Mathematische Statistik mit industriellen Anwendungen, I—II (zweite, erweiterte deutsche Auflage), 252+250 pages (the pages of the two volumes are numbered consecutively from 1 to 502), Akadémiai Kiadó, Budapest, 1984.

This is a revised version of a book [1] published originally in 1968, and, translated by Mrs. Éva Vas, in 1971 [1a].

The main chapters are the following: 1. Introduction, 2. Probability theory, 3. Sampling theory, 4. Estimation theory, 5. Testing statistical hypotheses, 6. Sequential sampling, 7. Decision theory, 8. Analysis of variance, 9. Regression analysis, 10. Statistical methods of quality control.

The book ends with a collection of tables: uniform and normal random numbers, normal, Poisson, binomial distribution, the critical values of t, F, χ^2, Kolmogorov and Wilcoxon test. The author presents a sound introduction to statistical practice. The theory is based on clear probability concepts and analytical formulas. The motivations arise from a deep understanding of statistical theory. The methods are enlightened by examples coming from the practice of a long life.

The book may be used first of all as it was actually used in its long history in university teaching. The students are introduced in the statistical literature of our days just by showing them the first steps where to start. Yet it is not merely a theoretical introduction, it is a real partner for anybody working with statistics even without any mathematical background.

REFERENCES

[1] I. Vincze, *Matematikai statisztika ipari alkalmazásokkal* (Mathematical statistics with industrial applications), Műszaki Könyvkiadó, Budapest, 1968. (In Hungarian)

[1a] I. Vincze, *Mathematische Statistik mit industriellen Anwendungen*, Akadémiai Kiadó. Budapest, 1971. *MR* **50**: 5995

G. Tusnády (Budapest)

S. G. Krein (Kreĭn), Linear equations in Banach spaces, 102 pages, Birkhäuser, Boston, 1982.

Let E be a Banach space and assume that a linear operator A is defined on a linear manifold $\mathfrak{D} \subset E$ and takes $\mathfrak{D}$ into another Banach space F. The book considers the equation $Ax = y$ where y is a given element of F and x is an unknown element in $\mathfrak{D}$. Very concise (3—5-page-long) paragraphs deal with different aspects of the linear equation above as adjoint equation, equations with closed operators, linear changes of the variables, stability of the properties etc. The more substantial last two paragraphs are devoted to integral and differential equations.

To enjoy the book very few knowledge on functional analysis is required and even this is collected in an appendix. The nicely arranged material "is of interest to anybody dealing with linear equations", as I. Gohberg writes in the editorial introduction.

D. Petz (Budapest)

A. Bedford, Hamilton principle in continuum mechanics (Research Notes in Mathematics, 139), 106 pages, Pitman, Boston, 1985.

The objective of this monograph is to give a comprehensive account of the use of Hamilton's principle to derive the equations which govern the mathematical behaviour of continuous media. Persons interested in fluid and solid mechanics will gain a broadened