Filippov; see FATOC, pp. 107 and 109.) The skilled and sophisticated reader will eventually light upon theorem 4 on p. 259 in FOCT, of which the author's theorem 1 is an almost verbatim restatement. Unfortunately, a change from f to capital F and the insertion of a comma render part (d) of the author's hypothesis almost incomprehensible.

It is one thing to briefly recapitulate an argument orally in a classroom, and quite another to commit an argument to print where it remains frozen in time and in place, permanent testimonial to an author's follies. How can we expect our students to ever attain a modicum of literacy if we do not set an example? On p. 15, line 6, we read: "... that the control is either $u^* = +1$ (then $u^* = -1$), or ...". One stops and wonders for an instant: does the "then" stand for "afterwards", or "accordingly", or "besides", or what? Here is how it should read: "... either $u^* = +1$, to be followed by $u^* = -1$, or ...". On p. 41, we read that "... is known *classically* as the Euler–Lagrange equation." Does this mean that the Romans, ancient Greeks, and Hebrews knew it as such? "A better method is to make the following transformation" is to be found on p. 32, line 2. The method entails *more* than the transformation. What should be said at this point is that "a better method is to remove the inequality constraints by means of the following transformation...". On p. 64, line 17, we find that "it is necessary to consider measurable controllers, not just piecewise continuous." Either "controllers" has to go to the end of the sentence, or it must be repeated or replaced by "ones" at the end of the sentence. Doesn't anybody, except for a few troglodytic curmudgeons such as this reviewer, care about style and the proper use of our language anymore? A recent observation by David W. Hughes that "the ghost of the illiterate scientist walks through every paragraph" (in a review of Peter H. Cadogan's *The Moon—Our Sister Planet*, Nature, 296, 5853, p. 182) comes readily to mind.

This treatment is not particularly original. The author's claim (Preface, p. ix, line 11) that "This text differs ... in that we have not attempted to prove the maximum principle ..." cannot seriously be viewed as a claim to originality. We cannot recommend the book for self-study. The reader with just a junior-level differential equations background will soon find himself snowed under (by lemmas such as "$\int_0^T X^{-1}(t)\mathbf{b}(t)u(t)\,dt$ is a continuous linear mapping between $U \subset L^\infty([O, T])$ with the weak-star topology and R^n with the usual topology"—p. 170), while the reader with some background in linear functional analysis can do better by looking elsewhere. As a text, it may have its use as a skeleton to the very competent instructor who can flesh it out according to his tastes and students' needs.

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The Symmetric Eigenvalue Problem. By BERESFORD N. PARLETT. Prentice Hall, Englewood Cliffs, NJ, 1980, xix + 348 pp.

The computation of eigenvalues and eigenvectors of a matrix is extremely important in many areas of engineering and applied sciences. In most important applications, such as structural engineering, the matrices encountered are usually symmetric. This book deals with the numerical methods for computing eigenvalues and eigenvectors of symmetric matrices.

Since Wilkinson's excellent treatise *The Algebraic Eigenvalue Problem,* published in 1965, no other exhaustive book has been written on the subject. An update of Wilkinson's volume has become critically needed as numerical methods have very much evolved since 1965. Parlett's book fills this gap.

The book can roughly be divided into three parts. The first four chapters include an introduction (Chapter 1), an interesting chapter on roundoff error analysis and available software (Chapter 2), a chapter on the use of Sylvester's theorem (Chapter 3), and a chapter on basic single vector iteration algorithms (Chapter 4). The important Chapter 4 contains unpublished material and an excellent treatment of the Rayleigh quotient iteration.

In the second part, the author treats the classical algorithms for dense matrices, such as reductions to tridiagonal form (Chapter 7), the $\mathcal{QR}$ and $\mathcal{QL}$ algorithms (Chapter 8), and the Jacobi methods (Chapter 9). This part contains a large number of relatively recent results, and new viewpoints. For example, the square root free plane rotations both for reducing to tridiagonal form and in the $\mathcal{QL}$ algorithm are described, as are new shifts of origins for the $\mathcal{QL}$ algorithm. The author succeeds in his efforts to write a part on eigenvalue algorithms which is usually difficult to present. There are many valuable comments emphasizing the advantages and disadvantages of each technique.

The culminating part of the book lies in the last six chapters, which deal with eigenvalue algorithms for large sparse matrices. The Lanczos algorithm is the most powerful tool for computing eigenvalues of large matrices and, as expected, occupies an important portion of the last chapters. This part reflects somewhat the author's research interests, and indeed still constitutes an important research area. Other important algorithms, such as the subspace iteration method, the block Lanczos algorithm, and methods for the generalized eigenvalue problem are also fully described. The book is written in an excellent style. The material is clearly presented and self contained. Geometrical interpretations are given a particular importance and are undeniably helpful in many instances.

This book is a valuable reference on numerical methods for computing eigenvalues and eigenvectors of symmetric matrices and constitues an excellent companion volume to Wilkinson's masterpiece. I strongly recommend it to anyone interested in eigenvalue computations or, more generally, in numerical linear algebra.

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Controlled Diffusion Processes. By N. V. KRYLOV. Springer-Verlag, New York, 1980. xi + 308 pp.

The mathematical problems treated in this book concern the optimal control of processes governed by stochastic differential equations of the form

$$dx_t = b(\alpha_t, x_t)\,dt + \sigma(\alpha_t, x_t)\,dw_t.$$

Here x_t is a vector of some finite dimension d, representing the state at time t of the system being controlled; α_t represents the control applied to the system at time t, and w_t is a Wiener process of some finite dimension d_1. The problem is to find a control minimizing the expected cost of running the process x_t, on a finite or infinite time interval, cost being measured according to some suitable criterion. For example, the controller may seek to minimize an expected discounted cost $E\int_0^\infty e^{-\rho t} f(\alpha_t, x_t)\,dt$, $\rho > 0$. The information available to the controller must also be specified. This book is concerned with the so-called "complete information" case, in which at time t the controller can base his choice of α_t on past values x_s, α_s, w_s for times $s \leqq t$. Actually, under reasonable technical assumptions, it turns out that the problem is Markovian in the sense that the controller needs only controls which are feedback functions of time and the current state: $\alpha_t = \alpha(t, x_t)$. Optimal stochastic control problems with complete information can be treated by the method of dynamic programming, which reduces the problem to studying the Bellman equation. For controlled diffusions on a finite time interval, the Bellman equation is a nonlinear,