R. S. VARGA, *Scientific Computation on Mathematical Problems and Conjectures*, CBMS 60, SIAM, 1990, 122 pp.

These notes comprise six lectures on diverse problems in approximation theory. The glue that binds the topics together is the rich interplay between classical analysis and extensive symbolic and numerical calculation. Included are discussions of the Bernstein Conjecture on rate of approximation to $|x|$, the "1/9" conjecture, location of zeros of sections of $\exp(x)$, and real versus complex rational approximations. There is a discussion of the resolution of a problem of Pólya's that relates to the Riemann hypothesis and various other aspects of this possible approach to this most famous of problems. The final lecture concerns polynomials with concentration at low degrees. Varga successfully mixes hard analysis and non-trivial computation in his attack on these six interesting problems. The computations provide a level of insight that one would be unlikely to garner from a purely analytic approach, without concealing the primarily mathematical nature of the problems. This style of mathematics is very much to the taste of the reviewer, who enjoyed the collection immensely.

PETER B. BORWEIN

G. WAHBA, *Spline Models for Observational Data*, CBMS 59, SIAM, 1990, 169 pp.

This monograph is a compilation of a series of 10 lectures given at a Regional Conference on March 23–27, 1987. "The selection of topics is quite personal... and the lectures represent a story, as" the author "saw it in March 1987, of many of the interesting things that satisticians can do with splines." "It is smoothing problems like"

$$\min \frac{1}{n} \sum_{i=1}^{n} (y_i - f(x_i))^2 + \lambda \int_a^b (f^{(m)}(x))^2 \, dx \qquad (*)$$

over $f \in L_2^{(m)}$ for given data $((x_i, y_i))_{i=1}^n$ and given positive λ "and their myriad variations that we will be interested in in this monograph." The book addresses the statistician who wants to find out how splines can be used in statistics. This makes the book also interesting to non-statisticians, but they had better know some statistics. A first chapter on "Background" covers reproducing kernel Hilbert spaces and their relation to stochastic processes, and also the interpretation of the smoothing spline as a Bayes estimate. Chapter 2, entitled "More Splines," brings splines on spheres and thin plate splines, while Chapter 3 has the intriguing title "Equivalence and Perpendicularity, or, What's So Special About Splines?" There follow chapters on "Estimating the Smoothing Parameter," "Confidence Intervals," and "Partial Spline Models." Chapter 7, "Finite Dimensional Approximating Subspaces," discusses the practically important issue of minimizing $(*)$ over a computationally convenient subspace of $L_2^{(m)}$. The next chapter, "Fredholm Integral Equations of the First Kind," explores the related issue of regularization of ill-posed problems. Chapter 9 contains "Further Nonlinear Generalizations." After a short chapter on "Additive and Interaction Splines," there comes a helpful chapter on "Numerical Methods," followed by a final chapter on two "Special Topics," viz. the notion of "high frequency" in different spaces, and the connection between optimal quadrature and experimental design. The book has an extensive bibliography and an author index.

CARL DE BOOR