mization is equivalent to choosing z_δ to minimize the functional

$$M^\alpha[z, u_\delta] = \rho_U^2(Az, u_\delta) + \alpha\Omega[z].$$

(α is called the regularization parameter. It depends on δ and u_δ.)

Having thus developed the regularization method, the remainder of the book details its application to a wide variety of ill-posed problems. Problems discussed include:

1) Singular and ill-conditioned systems of linear algebraic equations;
2) Fredholm integral equations of the first kind (with emphasis on kernels of convolution type);
3) Stable methods (in the space of continuous functions) for summing Fourier series with approximate coefficients in l_2; and
4) Problems in optimal control and mathematical programming.

In each case, the authors construct the regularization operator for the problem in detail. Methods for determining the optimal regularization parameter α under assumptions on the distribution of noise are also discussed.

The book also has an unexpected but particularly welcome feature: an extensive bibliography of the Russian literature. The reference list will be extremely valuable both to the active researcher and the student surveying the ill-posed problems literature.

In conclusion, it should be noted that although the book presents results not commonly included in an applied mathematics education, the techniques are accessible to graduate students and the engineering community. Thus, the book will serve as an excellent reference to anyone whose research leads him into the realm of ill-posed problems.

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1. M. M. LAVRENTIEV, *Some Improperly Posed Problems of Mathematical Physics,* Springer-Verlag, New York, 1967.

2. M. M. LAVRENTIEV, V. G. ROMANOV & V. G. VASILIEV, *Multi-dimensional Inverse Problems for Differential Equations,* Lecture Notes in Math., vol. 167, Springer-Verlag, Berlin, 1967.

3. R. LATTES & J. L. LIONS, *Methods of Quasireversibility: Applications to Partial Differential Equations,* American Elsevier, New York, 1969.

4. L. E. PAYNE, *Improperly Posed Problems in Partial Differential Equations,* Regional Conference Series in Applied Mathematics, No. 22, SIAM, Philadelphia, 1975.

22 [4.00, 12.00].—G. HALL & J. M. WATT, Editors, *Modern Numerical Methods for Ordinary Differential Equations,* Clarendon Press, Oxford, 1976, ix + 336 pp, 24cm. Price $21.50.

This volume is intended as an up-to-date account of theoretical questions and practical questions and methods in the numerical solution of ordinary differential equations. It consists of twenty-one chapters (eight on general initial value problems, six on stiff problems, five on boundary value problems, and two on functional differential equations); these chapters are written by thirteen scholars from England, New Zealand, and Scotland.

The authors and editors succeed admirably in achieving the goal mentioned. Naturally, the theoretical discussion is mainly limited to results and glimpses of proofs, but adequate references are always given. Frequently, the discussion is very elucidating. Hints as to "best algorithms" are often given.

The different chapters are well integrated towards a whole (only occasionally are forward references found), but they can also be read independently by a reader with a modest background.

A good bibliography and a subject index add to the value of this book.

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23 [5.00].—W. E. FITZGIBBON & H. F. WALKER , Editors, *Nonlinear Diffusion,* Pitman Research Notes in Mathematics, Pitman Publishing Ltd., London, 1977. Price £7.50.

These notes constitute the lectures of the participants of the NSF–CBMS Regional Conference on Nonlinear Diffusion held at the University of Houston in June, 1976. The lectures of the principal speaker, D. G. Aronson, are to be published by SIAM in the CBMS Regional Conference Series in Applied Mathematics.

Over the last twenty years, there has been an ever increasing recognition on the part of physical scientists of the inadequacy of classical linear diffusion theory as a tool for predicting experimental observations.

Thus, it has become necessary to include previously neglected (or small) nonlinear terms in the mathematical modeling of many observed phenomena. As is usually the case, the physical problems have again provided mathematicians with a rich variety of research questions.

The present set of notes includes lectures of interest both to mathematicians and to applied scientists. For want of a better way to provide an overview of these notes, we have divided the articles into two rough classes: those of primarily a theoretical nature and those that would be of more interest to applied scientists. Naturally, this classification is based on the reviewer's own personal prejudices and he offers, in advance, his apologies to any of the authors who might feel that their work has been placed in the wrong class. Since this is a loose classification and since people have varying interests, some theoreticians will find the applied articles of interest and conversely, some experimentalists will find the theoretical articles relevant to their needs.

Among those articles of a theoretical nature are the following:

1. D. G. Aronson, The Asymptotic Speed of Propagation of a Simple Epidemic.
2. E. D. Conway and J. A. Smoller, Diffusion and Classical Ecological Interactions: Asymptotics.
3. P. C. Fife, Stationary Patterns for Reaction Diffusion Equations.
4. D. Henry, Gradient Flows Defined by Parabolic Equations.
5. R. M. Miura, A Nonlinear WKB Method and Slowly Modulated Oscillation in Nonlinear Diffusion Processes.
6. P. Nelson, Subcriticality for Submultiplying Steady State Neutron Diffusion.