

pure and applied operator theory. Here is a list of the contributions:

*M.S. Livšic, A.S. Markus* Joint spectrum and discriminant varieties of commuting nonselfadjoint operators (20p) (On the edge of algebraic geometry. Investigates the spectrum of commuting operators with finite dimensional imaginary parts)

*D. Alpay, L. Baratchart, A. Gombani* On the differential structure of matrix-valued rational inner functions (37p) (Parametrizations are described for the submanifold of such functions. Related to linear control systems)

*J.A. Ball* Conservative dynamical systems and nonlinear Livšic-Brodskii nodes (29p) (Classical results from linear system theory are extended for nonlinear systems)

*A. Ben-Artzi, I. Gohberg* Orthogonal polynomials over Hilbert modules (31p) (The polynomials are obtained by orthogonalization of the powers of the shift matrix in the modules of  $C^*$ -algebra of block diagonal matrices in  $\ell_r^2$ )

*R. Bhatia, C. Davis* Relations of linking and duality between symmetric gauge functions (11p) (Mainly the introduction of linked s.g.f. and the quotient or 2 s.g.f.)

*G. Christner, K.Y. Li, J. Rovnyak* Julia operators and coefficient problems (44p) (Relates to contractive triangular operators and the Schur algorithm)

*H. Dym* Shifts, realizations and interpolation, redux (60p) (A study of vector valued meromorphic functions invariant with respect to a generalized backward shift)

*A. Feintuch* Arveson's distance formulae and robust stabilization for linear time-varying systems (12p)

*P. Fillmore, M. Khalkhali* Entire cyclic cohomology of Banach algebras (8p) (Report on recent results. Details appear elsewhere)

*P.A. Fuhrmann* The bounded real characteristic function and Nehari extension (52p) (Study of analytic functions in the right half plane with close links to  $H^\infty$  control)

*L. Hanin* On isometric isomorphism between the second dual to the small Lipschitz space and the big Lipschitz space (9p)

*J.W. Helton, J.J. Wavrik* Rules for computer simplification of the formulas in operator model theory and linear systems (30p) (computer algebra and operator theory)

bra and operator theory)

*V. Khatskevich* Some global properties of fractional-linear transformations (7p)

*E. Nordgren, P. Rosenthal* Boundary values of Berezin symbols (7p) (All Berezin symbols of an operator have continuous extensions to the boundary iff the operator is a translate of a compact operator)

*M. Rosenblum* Generalized Hermite polynomials and the Bose-like oscillator calculus (28p) (Study of these polynomials, relation to generalized Fourier transform and application in said calculus)

*N. Zobin, V. Zobina* A general theory of sufficient collections of norms with a prescribed semigroup of contractions (20p) (Review on the interpolation theory of such norms)

A. Bultheel

## Basic Algebraic Geometry

Igor R. Shafarevich

Second, Revised and Expanded Edition, Translated by Miles Reid, Springer-Verlag, 1994

Volume 1: Varieties in Projective Space  
ISBN 3-540-54812-2, Softcover, DM 68.

Volume 2: Schemes and Complex Manifolds  
ISBN 3-540-57554-5, Softcover, DM 68.

Algebraic geometry deals with the study of solution sets of polynomial systems. During the 19th century, it played a central role in mathematics. Towards the middle of our century, algebraic geometry has undergone a complete reconstruction, while the application of its ideas has grown tremendously.

The aim of the book is to provide an overall view of the many varied aspects of algebraic geometry. The prerequisites for reading the first volume are kept to a minimum. In addition to an undergraduate algebra course, the author assumes familiarity with finite and transcendental field extensions, and with ideals and quotient rings. For the second volume, the reader must be familiar with the definition of differential manifolds, with the basic theory of analytic functions of a complex variable and know about homology, cohomology and differential forms. For the last chapter, familiarity with the notion of fundamental group and the universal cover is needed.

Volume 1 contains Book 1 and corresponds to Part I of the first edition. The titles of the chapters are the following.

I. Basic Notions

II. Local Properties

III. Divisors and Differential Forms

IV. Intersection Numbers

Algebraic Appendix

Compared to the first edition, a lot of material of a rather concrete geometric nature has been added. Also more concrete algebraic varieties have been considered. This edition treats questions related to degenerate fibres in families. Finally, some applications to number theory have been added.

The second volume starts by considering algebraic varieties from a more general and invariant point of view. It is organized in two books, Book 2 deals with schemes and varieties, whereas complex algebraic varieties and complex manifolds are treated in Book 3. The chapter headings are the following.

V. Schemes

VI. Varieties

VII. The topology of Algebraic Varieties

VIII. Complex Manifolds

IX. Uniformisation

Historical Sketch

There are two main additions compared to the first edition. The first one is the notion of the algebraic variety classifying algebraic or geometric objects. The second addition concerns Kähler metrics and a description of Hodge's theorem.

The first volume goes 'from the particular to the general'. This style is dropped in the second volume. Though, throughout the whole work, the motivation of the ideas is stated in a human-oriented way. Furthermore, many meaningful examples illustrate the theory. This makes the book excellent for teaching purposes. Each paragraph contains a list of exercises. There are guidelines for further reading in the preface to the second volume. The index is the same for both volumes, hereby it is indicated which topic occurs in what volume.

According to the translator's experience it is impossible for many students to do both the research for a Ph.D. thesis and to master all the theoretical foundations of algebraic geometry at

the same time. Therefore, Shafarevich's book is a must for anyone looking for a liberal education in algebraic geometry.

More than once, I have had the experience that, whenever in need of concepts and results from algebraic geometry, it is very hard to find an accessible reference in the literature. To my best knowledge, only this book manages to describe so many advanced constructions while still being accessible for researchers outside the field of algebraic geometry. This book is indeed a tremendous achievement.

J. Verschelde

### A Survey of Preconditioned Iterative Methods

Are Magnus Bruaset

Research Notes in Mathematics, 328, Longman, 1995, ISBN 0-582-27654-3.

This book presents an overview of iterative methods and preconditioners for the solution of linear systems. The emphasis lies on problems arising from differential equations, but the discussion is quite general and useful for anybody. The monograph is aimed at a wide audience, specifically to those who want to enter the world of iterative linear system solvers.

The theory is restricted to a minimum. The study is almost complete. It consists of three parts : an overview of methods based on matrix splittings including Gauss-Seidel and SOR ; a detailed survey on Krylov iterative methods including Conjugate Gradients, GMRES and QMR ; and a good introduction to various types of preconditioners including incomplete factorisations, multi-level and domain-decomposition approaches. Especially the latter part is very interesting. The author pays a lot of attention to implementation issues for vector and parallel computers. The list of 431 references is impressive. The epilogue gives an excellent summary of the main ideas. The style is talkative. The explanation is brief : sometimes I had the impression of a bibliographical study with notes that link the references together. Often I liked the author to give more chapter and verse. The message is not always very clear and the reader often needs a lot of prescience to understand the details. The details are hard to dis-

The prominent Russian mathematician Igor Rostislavovich Shafarevich passed away on February 19, 2017. In this article we supply his biography, discuss his many important contributions to number theory, algebra and algebraic geometry, and also discuss his political activity and some of his numerous publications on social issues. Discover the world's research. 19+ million members. I. R. Shafarevich, *The Socialist Phenomenon*, translated by W. Tjalsma, with a foreword by A. Solzhenitsyn. HarperCollins Publishers. 1980. Progress from the first edition starts by characterizing the finite-field like  $P(\text{pseudo})A(\text{lgebraically})C(\text{losed})$  fields. We once believed PAC fields were rare. Varieties in projective space; Translated from the 1988 Russian edition and with notes by Miles Reid. MR 1328833. 33. Saharon Shelah, Classification theory and the number of nonisomorphic models, *Studies in Logic and the Foundations of Mathematics*, vol. 92, North-Holland Publishing Co., Amsterdam-New York, 1978. M. Rosen, Abelian varieties over  $k$ , in: *Arithmetic Geometry*, G. Cornell and J. H. Silverman ed., Springer-Verlag 1986. MR 0861969. 30. J. -P. Serre, Local fields, Springer-Verlag 1979. MR 0554237. 31. Igor R. Shafarevich *Basic Algebraic Geometry 1 Second, Revised and Expanded Edition* Springer-Verlag APOE the gd AGH + OH + EME Wise Igor R. Shafarevich Steklov Mathematical Institute Ul. Vavilova 42, 117966 Moscow, Russia Translator: Seyprye & Miles Reid AAG oO Mathematics Institute, University of Warwick no Coventry CV4 7AL, England; ey 3 e-mail: Miles@Maths. Warwick:Ac.UK, ? With 21 Figures The title of the original Russian edition: *Osnovy algebraicheskoy geometrii*, tom 1 © Nauka, Moscow 1988 ISBN 3-540-54812-2 Springer-Verlag Berlin Heidelberg New York ISBN 0-387-54812-2