

# Several Complex Variables

**Volume 30 - Part 2**

**PROCEEDINGS OF  
SYMPOSIA IN  
PURE MATHEMATICS**

**AMERICAN MATHEMATICAL SOCIETY**

## **SEVERAL COMPLEX VARIABLES**

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IN PURE MATHEMATICS  
Volume XXX, Part 2**

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**AMERICAN MATHEMATICAL SOCIETY  
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These proceedings are dedicated to

Lillian Casey

who was the guiding force  
behind six years of AMS meetings



## PREFACE

The American Mathematical Society held its twenty-third Summer Research Institute at Williams College, Williamstown, Massachusetts, from July 28 to August 15, 1975. Several Complex Variables was selected as the topic for the institute. Members of the Committee on Summer Institutes at the time were Louis Auslander (chairman), Richard E. Bellman, S. S. Chern, Richard K. Lashof, Walter Rudin, and John T. Tate. The institute was supported by a grant from the National Science Foundation.

**ORGANIZATION.** The Organizing Committee for the institute consisted of Ian Craw, Hans Grauert, Robert C. Gunning (cochairman), David Lieberman, James Morrow, R. Narasimhan, Hugo Rossi (cochairman), Yum-Tong Siu, and R. O. Wells, Jr. (Editor of these PROCEEDINGS).

**PROGRAM.** The topic of the 1975 summer institute was the theory of functions of several complex variables. The emphasis in arranging the program was on the more analytical aspects of that subject, with particular attention to the relations between complex analysis and partial differential equations, to the properties of pseudoconvexity and of Stein manifolds, and the relations between currents and analytic varieties. However, there were also lectures and seminars on other aspects of that broad and active field of investigation, such as deformation theory, singularities of analytic spaces, value distribution theory, compact complex manifolds, and approximation theory.

There were six series of invited expository lectures, as well as twenty-two hour lectures of a general or survey nature; there were also eight series of seminars on current developments in the subject, six of which were planned and partially arranged in advance.

**PRINCIPAL LECTURE SERIES.**

*Chern-Moser invariants* by Daniel M. Burns, Jr. and Steven Shnider (2 lectures);  
*Power series methods in deformation theorems* by Otto Forster (5 lectures);  
*Holomorphic chains and their boundaries* by Reese Harvey (4 lectures);

*Methods of PDE in complex analysis* by Joseph J. Kohn (5 lectures);  
*Tangential Cauchy-Riemann equations* by Masatake Kuranishi (3 lectures);  
*Analysis on noncompact Kähler manifolds* by Hung-Hsi Wu and Robert E. Greene (4 lectures).

HOURLY LECTURES.

*Theta functions with characteristic and distinguished subspaces of the Heisenberg manifold* by Louis Auslander;  
*Hardy spaces and local estimates on boundaries of strongly pseudo-convex domains. I* by Ronald Coifman;  
*Some recent developments in the theory of the Bergman kernel function. A survey* by Klas Diederich;  
*Fibering of residual currents* by Miguel Herrera;  
*The Monge-Ampere equation and complex analysis* by Norbert Kerzman;  
*Stable homology and positive currents on abelian varieties* by H. Blaine Lawson, Jr.;  
*A method of inverse functions for plurisubharmonic functions; applications to positive and closed currents* by Pierre Lelong;  
*Holomorphic vector fields on projective varieties* by David Lieberman;  
*Diffusion estimates in complex analysis* by Paul Malliavin;  
*Rational singularities, Moishezon spaces, and compactifications of  $C^3$*  by James A. Morrow;  
*Rankin-Selberg method in the theory of automorphic forms* by Mark Novodvorsky;  
*Hardy spaces and local estimates on boundaries of strongly pseudo-convex domains. II* by Richard Rochberg;  
*Analysis of the boundary Laplacian and related hypoelliptic differential operators* by Linda Rothschild;  
*Classification of quasi-symmetric domains* by Ichiro Satake;  
*The Levi problem* by Yum-Tong Siu;  
*Boundary values of the solutions of the  $\bar{\partial}$  equation and characterization of zeros of functions in the Nevanlinna class* by Henri Skoda;  
*Value distribution on parabolic spaces* by Wilhelm Stoll;  
*Extending functions from submanifolds of the boundary* by Edgar L. Stout;  
*Equisingularity and local analytic geometry* by J. Stutz;  
*Constructability* by Jean-Louis Verdier;  
*Boundary values of holomorphic functions on a Siegel domain and Cauchy-Riemann tangential equations* by Michelle Vergne;  
*Deformations of strongly pseudoconvex domains in  $C^2$*  by R. O. Wells, Jr.

SEMINAR SERIES.

- (1) Singularities of analytic spaces (Egbert Brieskorn, chairman);
- (2) Function theory and real analysis (Stephen Greenfield, chairman);
- (3)  $q$ -convexity and noncompact manifolds (Yum-Tong Siu, chairman);
- (4) Value distribution theory in several variables (Wilhelm Stoll, chairman);
- (5) Compact complex manifolds (A. Van de Ven, chairman);
- (6) Problems in approximation (John Wermer, chairman);
- (7) Group representations and harmonic analysis (Kenneth I. Gross, chairman);
- (8) Differential geometry and complex variables (Peter Gilkey, chairman).

**SUMMARY.** The broad areas emphasized by this summer institute can be summarized as follows:

*The  $\bar{\partial}$ -equation.* The relation between complex analysis and partial differential equations centers about the Cauchy-Riemann or  $\bar{\partial}$ -equations. Kohn gave a series of lectures which provided a survey of the role of the  $\bar{\partial}$ -equations. Several lectures and seminar talks were devoted to the regularity up to the boundary of solutions of the  $\bar{\partial}$ -equation, with applications to complex analysis. The structure imposed by the  $\bar{\partial}$ -equation on the smooth boundary of a region in  $\mathbb{C}^n$  was discussed in several seminars as well. Most lectures on these topics were in the seminars led by S. Greenfield and Y.-T. Siu.

*Holomorphic chains.* Reese Harvey gave a survey of the characterization of holomorphic chains and their boundaries among other currents, with a number of applications to classical problems in complex analysis; other lectures discussed recent research on holomorphic chains, which includes, for instance, value distribution theory.

*Differential geometry.* R. E. Greene and H. Wu gave a survey of the characterization of Stein manifolds by curvature conditions on an underlying Kähler metric. A seminar was organized by P. Gilkey on differential geometry and complex analysis in an extension of this. The survey lectures by D. M. Burns, and S. Shnider discussed recent developments in the theory of higher order invariants associated to real hypersurfaces in  $\mathbb{C}^n$ .

*Singularities.* A seminar led by E. Brieskorn was devoted to the singularities of analytic spaces, with an emphasis on the complex analytic properties rather than the algebraic properties treated in the preceding summer institute on algebraic geometry.

*Value distribution theory.* Wilhelm Stoll lectured on general value distribution theory and led a seminar in which a number of recent developments in this area were discussed.

*Compact complex manifolds.* A number of analytic results on compact manifolds were discussed in a seminar led by A. Van de Ven.

*Approximation theory.* While no attempt was made to cover recent developments in complex analysis and function algebras, there was some discussion of approximation theory in a seminar led by J. Wermer.

*Harmonic analysis.* Symmetric spaces and boundaries of homogeneous domains have been much investigated in complex analysis and lead quite naturally to recent work on group representation and harmonic analysis, some of which was discussed in a seminar led by K. Gross.

**PROCEEDINGS.** The proceedings of the 1975 summer institute are published here in two volumes. The hour lectures and seminar papers accepted for publication appear in the seminar series most appropriate to the subject matter of the given paper. These are principally research reports describing current research of the authors, while some are of a general expository nature in a given area. The principal lecture series are represented by six survey articles which have been interlaced in these volumes with the seminar series, with an attempt being made for some relationship between the seminar series and the survey articles they juxtapose.

Volume 1: *Seminar Series: Singularities of Analytic Spaces*

*Principal Lecture 1: M. Kuranishi*

- Seminar Series: Function Theory and Real Analysis*  
*Principal Lecture 2: J. J. Kohn*
- Seminar Series: Compact Complex Manifolds*  
*Principal Lecture 3: Reese Harvey*
- Volume 2: *Seminar Series: Noncompact Complex Manifolds*  
*Principal Lecture 4: R. Greene and H. Wu*  
*Seminar Series: Differential Geometry and Complex Analysis*  
*Principal Lecture 5: D. Burns, Jr., and S. Shnider*  
*Seminar Series: Problems in Approximation*  
*Principal Lecture 6: O. Forster*  
*Seminar Series: Value Distribution Theory*  
*Seminar Series: Group Representation and Harmonic Analysis*

The detailed list of authors and titles of papers is given in the table of contents for each volume. At the conclusion of each volume is an author index for authors of articles, as well as authors of papers cited in the bibliographies for each particular part.

R. O. WELLS, JR.  
Houston, Texas  
May 1976

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I or II indicates in which part of this volume the pages occur.

Roman numbers refer to pages on which a complete reference to a work by the author is given.

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