

## Preface

There is a rich history of research in complex geometry and complex analysis of one and several variables at Johns Hopkins University (JHU; Baltimore, Maryland) and at the University of Maryland (UMD; College Park, Maryland). W.-L. Chow came to Hopkins in 1948, remaining there throughout his career and bringing K. Kodaira to Hopkins from 1962 to 1965. At College Park, an international conference in several complex variables convened in 1970, the proceedings of which are published in a two-part volume<sup>1</sup> edited by J. Horváth. Then in 1973, the University of Maryland held a Special Year in Complex Function Theory; some of the talks during that year are published in a volume<sup>2</sup> edited by W. E. Kirwan and L. Zalcman. As the editors of that volume wrote, the common denominator for the contributions was “a certain emphasis, in point of view or in method, on problems having concrete geometric content”. Subsequently, C. Berenstein and the second editor of the present proceedings organized a Hopkins–Maryland joint seminar in complex analysis, which ran through 1989. Seminars on complex geometry then continued at Hopkins through 2012, organized by the second editor of this proceedings together with V. V. Shokurov and S. Zucker during 1991–2004 and with R. Wentworth and S. Zelditch during 2004–10. The complex geometry seminars at Hopkins were also co-organized by J. Noguchi in 1998 and by the first editor of the present proceedings in 2008–09. Additional activity was provided by conferences involving complex geometry sponsored by the Japan–U.S. Mathematics Institute (JAMI)<sup>3</sup> at Johns Hopkins in 1991, 1998, 2004, and 2019.

In 2012, the editors of this proceedings revived the Hopkins–Maryland joint seminar by establishing the JHU-UMD Complex Geometry Seminar, with the assistance of R. Wentworth, S. Wolpert and Y. Yuan. Topics presented at the seminar include geometric flows, canonical metrics, geometric stability, pluripotential theory, the Monge–Ampère equation, zeros of random holomorphic sections,  $L^2$  extension, deformation theory, Bergman kernel, special Lagrangians, and Gromov–Witten theory, as well as topics on the interface of complex geometry with convex geometry, symplectic geometry, algebraic geometry, and topology.

This volume contains contributions from speakers at the seminar during three academic years from 2015 to 2018. The volume begins with a survey by T. Darvas of recent developments in pluripotential theory and its application to Kähler–Einstein metrics. The next article is a survey by S. Dinew of recent advances in the theory of local regularity of plurisubharmonic functions and the complex Monge–Ampère

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<sup>1</sup>*Several Complex Variables I, II*, Lecture Notes in Mathematics, Vols. 155, 185, Springer, 1970, 1971.

<sup>2</sup>*Advances in Complex Function Theory*, Lecture Notes in Mathematics, Vol. 505, Springer, 1976.

<sup>3</sup><https://mathematics.jhu.edu/events/jami/>.

equation. The article by F. R. Harvey and H. B. Lawson concerns properties of pluriharmonic functions arising in the generalized potential theories associated to subequations. Next, C. Li and G. Tian discuss orbifold regularity for weak Kähler–Einstein metrics of certain singular Fano varieties via resolution of singularities. The article by Z. Lu and H. Xu concerns the spectrum and self-adjointness properties of the Laplacian on the moduli space of polarized Calabi–Yau manifolds. L. Ni and F. Zheng review recent progress in the study of compact Kähler manifolds with positive orthogonal Ricci curvature. D. H. Phong, S. Picard, and X. Zhang describe the long-time behavior of the Anomaly flow on unimodular Lie groups. The volume concludes with an article by Z. Slodkowski on the pseudoconcave decomposition of the core of a complex manifold.

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