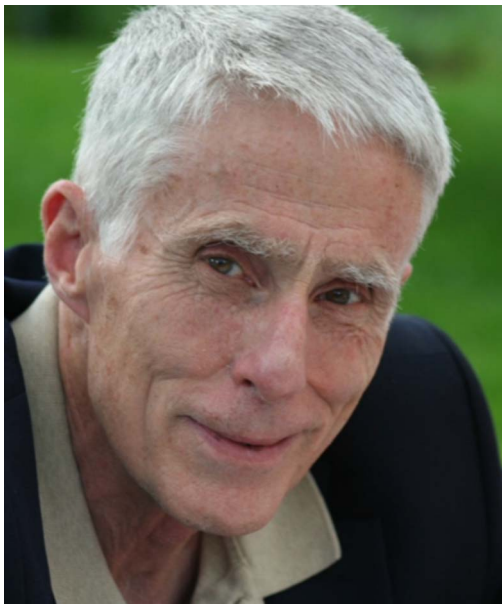


Preface



This volume celebrates the work of Herb Clemens in algebraic geometry and string theory and his broad influence on these fields and on their practitioners.

Herb has had a profound influence on the development of algebraic geometry in the past half century. His early work was focused on Hodge theory, starting with his 1969 paper on the Picard-Lefschetz theorem for families of algebraic varieties acquiring ordinary singularities. His theory of the intermediate Jacobian, developed with P. Griffiths, revolutionized Hodge theory and led in 1972 to their proof of the longstanding conjecture about the irrationality of the cubic threefold. His ideas in the 1977 work on degeneration of Kahler manifolds and the Clemens-Schmid sequence have become basic tools of the trade, applied masterfully in the 1983 paper on double solids.

In parallel, Herb made a major impact on the theory of Prym varieties. These appeared already in his work on the cubic threefold, and their importance was emphasized in his 1974 ICM talk, which influenced generations of algebraic geometers. Prym varieties recurred in Herb's double solid papers and in many of his subsequent works.

The early eighties saw Herb's work on Néron models for families of intermediate Jacobians, and his proof that the Griffiths group (homological equivalence modulo algebraic equivalence) can fail to be finitely generated. His influential book on higher dimensional complex geometry (with J. Kollár and S. Mori) appeared in 1987, several years after the beautifully impressionistic *Scrapbook of Complex Curve Theory*.

Herb's work in algebraic geometry, especially his investigation of the infinitesimal Abel-Jacobi mapping and deformation theory, led to some spectacular progress in the overlap of string theory and mathematics. The Clemens Conjecture on finiteness of the number of rational curves of every positive degree on general quintic threefolds was studied in his 1986 papers on curves on generic hypersurfaces and on curves on higher-dimensional complex projective manifolds. This conjecture laid the foundations for all subsequent works, in math and in physics, on counting such curves, and provided a major impetus for the enumerative predictions of mirror symmetry and the development of Gromov-Witten and related invariants.

Herb's next set of works included other major contributions to mathematical physics. For one example, the 2002 paper describing moduli schemes associated to K-trivial threefolds as gradient schemes presaged a lot of deep current work in derived algebraic geometry and its physics interactions.

In his six most recent papers, Herb has been working with physicists on F-theory phenomenology. F-theory is a non-perturbative variant of string theory and is closely related to the study of elliptic fibrations in algebraic geometry. Herb's ongoing works aim at discovering particular F-theory compactifications that lead to low-energy behavior that is as close as possible to the particle physics we know from accelerators and the Standard Model.

In addition to the research work, Herb has made broad contributions to the mathematical community. In the sixties and again in the seventies, he spent several years in South America, initially with the Peace Corps, helping develop Chilean mathematics. Throughout his career he advised twenty PhD students, many of them now working at leading institutions. Herb has also devoted tremendous amounts of time and effort to furthering math education at all levels. This is documented in several books on secondary and undergraduate mathematics and a dozen math education articles. At various times he taught at elementary, intermediate and high schools, and directed the Utah site of the IAS/Park City Mathematics Institute as well as a long list of educational and research institutes. His contributions have been recognized with two ICM invitations, a Fullbright and a Sloan, the American Mathematical Society Distinguished Service Award, and several high honors in Italy and South America.

Herb's students, friends and colleagues dedicate this volume in gratitude and in celebration of his kindness, his tireless devotion to mathematics and its practitioners, his spectacular results and his profound influence on all he works with.

Ron Donagi
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