实验室年会特邀报告——Uniformization of Certain Subvarieties of Finite-Volume Quotient Spaces of Bounded Symmetric Domains

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嘉宾介绍：

莫毅明，1956 年 5 月生于香港，籍贯广东东莞。1978 年在美国耶鲁大学获硕士学位。1980 年在美国斯坦福大学获博士学位。2015 年当选中国科学院院士。2017 年当选港科院院士。香港大学讲座教授和明德教授、数学研究所所长。

莫毅明教授先后在美国获 Sloan 奖与美国总统年青研究人员奖，并在香港获颁 1998/99 年度裘槎奖。1988 创新地结合了 Ricci 流与代数几何方法，解决了广义 Frankel 猜想。1992 年运用调和映照证明了紧致 Kahler 流形的基本群的因子分解定理。此工作与其推广为 1994 年莫毅明在苏黎世的 ICM 上所作 45 分钟报告的主题。2002 年莫毅明获选《Inventiones Mathematicae》，现任《Mathematische Annalen》、《, Science China Mathematics 》、《 Chinese Annals of Mathematics》

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摘要： By the Uniformization Theorem a compact Riemann surface other than the Riemann Sphere or an elliptic curve is uniformized by the unit disk and equivalently by the upper half plane. The upper half plane is also the universal covering space of the moduli space of elliptic curves equipped with an appropriate level structure. In Several Complex Variables, the Siegel upper half plane is an analogue of the upper half plane, and it is the universal covering space of moduli spaces of polarized Abelian varieties with appropriate level structures. The Siegel upper half plane belongs, up to biholomorphic equivalence, to the set of bounded symmetric domains, on which a great deal of mathematical research is taking place. Especially, finite-volume quotients of bounded symmetric domains, which are naturally quasi-projective varieties, are objects of immense interest to Several Complex Variables, Algebraic Geometry, Arithmetic Geomtry and Number Theory, and an important topic is the study of uniformizations of algebraic subsets of such quasi-projective varieties. While a lot has already been achieved from methods of Diophantine Geometry, Model Theory, Hodge Theory and Algebraic Geometry for Shimura varieties, techniques for the general case of not necessarily arithmetic

quotients have just begun to be developed. We will explain a differential-geometric approach to the study of such algebraic subsets revolving around the notion of asymptotic curvature behavior and the use of rescaling arguments, and illustrate how this approach using transcendental techniques leads to various characterization results for totally geodesic subvarieties of finite-volume quotients without the assumption of arithmeticity. Especially, we will explain how the study of holomorphic isometric embeddings of the Poincar\'e disk and more generally complex unit balls into bounded symmetric domains can be further developed to derive uniformization theorems for bi-algebraic varieties and more generally for the Zariski closure of images of algebraic sets under the universal covering map.