Perspectives of Modern Complex Analysis

Introduction. A conference on the theme *Perspectives of Modern Complex Analysis* will occur at the Będlewo Conference Center (Stefan Banach International Mathematical Center, Poland), July 21–25, 2014. The web site is

$$\texttt{http://bcc.impan.pl/14Perspectives}$$

The goal is to keep in contact active and developing researchers working in complex analysis and its most important applications with some of the international leaders of in the discipline. The main topics of the conference reflect the impact of Prof. Alexandre Eremenko (Purdue University) on modern complex analysis. To gauge the scope of his interests and contributions, consult his web page `www.math.purdue.edu/~eremenko`. Complex analysis has its own rich tradition, whose connections to potential theory and dynamical system are in the forefront of contemporary mathematics. However, there are also long-standing deep connections to other sciences and engineering from its viewpoint of differential equations. Experience has shown that the most significant properties of solutions of many ordinary and partial differential equations reveal themselves only by being viewed in the complex domain.

Main themes. The principal themes of this meeting are the following:

    I. *Classical complex analysis and its associated potential theory*

    II. *Iteration of real, rational and entire mappings*

    III. *Real algebraic geometry*

    IV. *Spectral theory and mathematical physics*

    V. *Diverse, but centered on analysis*

Main speakers (preliminary list). Because of the wide scope of research encompassed by this conference, the number of main speakers will be limited. In return, the conference facilities have been shown as excellent for informal discussions and exchanges of research. The participants are encouraged to announce results, which will be available on the conference web site. There will be poster and discussion sessions with the aim of maximal dissemination and contact among the participants. *The organizers consider arranging opportunities for exposure of graduate students and junior researchers among the highest priority.*

(I.) Katsutoshi Yamanoi (Tokyo Institute of Technology)

(II.) Walter Bergweiler (Christian-Albrechts-Universität zu Kiel), Mikhail Lyubich (Stony Brook University), Anna Zdunik (University of Warsaw)

(III.) Frank Sottile (Texas A&M University)

(IV.) Carl Bender (Washington University in St. Louis)

(V.) Mario Bonk (University of California, Los Angeles), Mikhail Sodin (Tel Aviv University), Alexander Volberg (Michigan State University)

Brief scientific summary.

(I.) Nevanlinna theory has played a central role in contemporary complex analysis not only because of its own directions and circle of problems, but because of its deep connections to potential theory, approximation theory, and the theory of differential equations in the complex plane, among other features. Yamanoi's successful resolution of the Mues conjecture (a special case of the Gol'dberg conjecture) suggests the possibility of significant applications in coming years.

(II.) The dynamics associated to the iteration of real, complex and, now, quasiregular mappings remains one of the most vigorous topics, and its successes have been acknowledged even by Fields Medals. Eremenko has introduced the escaping set (originally for entire functions) $I(f) = \{z; \ f^n(z) \to \infty\}$, and this has in more recent times been the subject of intense investigation. The Eremenko–Lyubich class of entire functions with bounded singular set, introduced by them in 1992, also plays a fundamental role in transcendental dynamics.

(III.) That algebraic properties in the real domain have a topological interpretation in $\mathbb{C}$ via complexification, has been a powerful tool, using the associated finite coverings. The history of real Schubert Calculus provides one example of this phenomenon. Schubert's work on enumerative geometry at the end of the nineteenth century became an essential ingredient for Hilbert's fifteenth problem, formulated as "Rigorous foundations of Schubert's enumerative calculus." Of course, Schubert's original focus concerning the geometry of the Grassmann and flag varieties has played a foundational role in the theory of characteristic classes in algebraic topology, with deep connections to representations of Lie groups, and to the combinatorics of Young tableaux. In recent years it has had significant applications to control theory.

(IV.) Theoretical and mathematical physics has traditionally served as both inspiration for research in complex analysis and one of its key applications. The role of considering differential equations in the complex domain in the study of Schrödinger operators provides a link between this important area and the focus of this conference.

Bender's paper "Anharmonic oscillator" (1969, joint with Wu) opened a new (and still active and significant) field of research in complex analysis and mathematical physics. This work explained the divergence of the perturbation series of the quantum anharmonic oscillator (which has a quartic polynomial potential) through the behavior of ramification points in the analytic extension of the spectrum into the complex domain. Many of the associated conjectures have been confirmed in more recent times by Eremenko and Gabrielov, while some still remain open, confirmed only on the basis of numerical computation.

Organizing Committee

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