The 25th International Conference on Finite or Infinite Dimensional Complex Analysis and Applications

June 26 - 30, 2017

June 26 - 30, 2017

T4, T5 & T7 Meng Wah Complex, HKU

Program and Abstracts

Institute of Mathematical Research
Department of Mathematics

Date / Time	June 26 (Mon)	Date / Time	June 27 (Tue)	June 28 (Wed)	June 29 (Thu)	June 30 (Fri)
9:00 – 9:50	*Registration*	9:00 – 10:00	Armen Sergeev	Walter Bergweiler	Weixiao Shen	Cho Ho Chu
9:50 – 10:00	Tuen Wai Ng *Opening Remarks*	10:00 – 10:45	Tatsuhiro Honda	Toshiyuki Sugawa	Jian-Hua Zheng	Jinsong Liu
10:00 – 11:00	Yum-Tong Siu	10:45 – 11:10	*Tea Break*			
11:00 – 11:30	*Tea Break*	11:10 – 11:55	Ikkei Hotta	Chung Chun Yang	William Cherry	Feng Rong
11:30 – 12:15	Yik-Man Chiang	11:55 – 12:40	Hirokazu Shimauchi	***Lunch at Jumbo Kingdom Floating Restaurant***	Qi Han	Avery Ching
12:15 – 2:00	*Lunch*	12:40 - 2:00	*Lunch*		*Lunch*	
2:00 – 3:00	Rod Halburd	2:00 – 3:00	Yuefei Wang	***Excursion & Conference Dinner***	Sai-Kee Yeung	Xiangyu Zhou
3:00 – 3:45	Yang Chen	3:00 – 3:45	Liangwen Liao		Makoto Abe	Ngaiming Mok *Closing Remarks*
3: 45 – 4:05	*Tea Break*				*Tea Break*	
4:05 – 4:30	Zhi-Tao Wen	4:05 – 4:30	Luis Manuel Tovar		Chengfa Wu	
	Ji Eun Kim		Fan-ning Meng		Rakesh Kumar Parmar	
	Junesang Choi					
4:35 – 5:00	Limei Wang	4:35 – 5:00	Jianjun Zhang		Weihong Yao	
	Han Ul Kang		Ming Li		Purnima Chopra	
	Veerapazham Murugan					

Note: The schedule and details are subject to change.

***Organizing Committee*:**

Professor Ngaiming Mok & Professor Tuen Wai Ng
The University of Hong Kong, Hong Kong

***Sponsors*:**

Institute of Mathematical Research & Department of Mathematics
The University of Hong Kong, Hong Kong

PROGRAM

T4, Meng Wah Complex

June 26, 2017
Monday

9:00 – 9:50	***Registration***
9:50 - 10:00	**Tuen-Wai Ng**, Head of Department ***Opening Remarks***
10:00 – 11:00	**Yum-Tong Siu**, Harvard University, USA *Problems and Techniques in Complex Geometry from Nevanlinna Theory*
	Tea Break
11:30 – 12:15	**Yik-Man Chiang**, Hong Kong University of Science & Technology, HK *Complex oscillation and semi-finite gaps of Hill equations*
	Lunch Break
2:00 – 3:00	**Rod Halburd**, University College London, UK *Singularity structure and exact solutions of functional equations*
3:00 – 3:45	**Yang Chen**, University of Macau, Macau *Probabilities in GUE and JUE under double scaling*
	Tea Break
4:05 – 4:30	***Parallel Sessions:***
T4 Meng Wah Complex	**Zhi-Tao Wen**, Taiyuan University of Technology, China & Liu Bie Ju Centre for Mathematical Sciences, City University of Hong Kong, HK *Zero distribution of exponential polynomials*
T5 Meng Wah Complex	**Ji Eun Kim**, Dongguk University, Republic of Korea *Differential operators and regular functions of pseudo-dual-quaternionic variables*
T7 Meng Wah Complex	**Junesang Choi**, Dongguk University, Republic of Korea *An inequality for e and its associated Carleman-type inequalities*
4:35 – 5:00	***Parallel Sessions:***
T4 Meng Wah Complex	**Limei Wang**, University of International Bussiness and Economics, China *Geometric properties of the shifted Gaussian hypergeometric functions*
T5 Meng Wah Complex	**Han Ul Kang**, Pusan National University, Republic of Korea *Regular Functions for Different Kinds of Conjugations in the Bicomplex Number Field*
T7 Meng Wah Complex	**Veerapazham Murugan**, National Institute of Technology Karnataka, India *Points of coincidence and Iterative roots*

June 27, 2017
Tuesday

T4, Meng Wah Complex

9:00 – 10:00 **Armen Sergeev**, Steklov Mathematical Institute, Moscow
Sobolev space of half-differentiable functions and non-smooth strings

10:00 – 10:45 **Tatsuhiro Honda**, Hiroshima Institute of Technology, Japan
Bloch mappings on a complex Banach space

Tea Break

11:10 – 11:55 **Ikkei Hotta**, Yamaguchi University, Japan
Tightness results for infinite-slit limits of the chordal Loewner equation

11:55 – 12:40 **Hirokazu Shimauchi**, Yamanashi Eiwa College, Japan
A numerical algorithm for solving the Loewner equation

Lunch Break

2:00 – 3:00 **Yuefei Wang**, Chinese Academy of Sciences, China
Holomorphic motions and extremal problems

3:00 – 3:45 **Liangwen Liao**, Nanjing University, China
Complex differential, differential-difference equations and related topics

Tea Break

4:05 – 4:30 ***Parallel Sessions:***

T4 Meng Wah Complex **Luis Manuel Tovar**, Instituto Politécnico Nacional, Mexico
Weighted Function Spaces: The Monogenic Case

T5 Meng Wah Complex **Fan-ning Meng,** *Guangzhou University, China*
On Yau sequence over complete intersection surface singularities of Brieskorn type

4:35 – 5:00 ***Parallel Sessions:***

T4 Meng Wah Complex **Jianjun Zhang**, Jiangsu Second Normal University, China
On transcendental meromorphic solutions of certain types of nonlinear complex differential equations

T5 Meng Wah Complex **Ming Li**, Institute for Advanced Study, Shenzhen University, China
Analytic and Geometric Properties of the Briot-Bouquet Differential Equation

June 28, 2017
Wednesday

T4, Meng Wah Complex

9:00 – 10:00	**Walter Bergweiler**, Christian--Albrechts--Universität zu Kiel, Germany *Quasiconformal surgery and linear differential equations*
10:00 – 10:45	**Toshiyuki Sugawa**, Tohoku University, Japan *Convexity of domains and its characterization with respect to various metrics*
	Tea Break
11:10 – 11:55	**Chung Chun Yang**, Shenzhen University, China *On factorization, value-sharing and functional equations*
11:55 – 2:00	***Lunch at Jumbo Kingdom Floating Restaurant***
2:00 – 8:30	***Excursion & Conference Dinner***

June 29, 2017
Thursday

T4, Meng Wah Complex

9:00 – 10:00 **Weixiao Shen**, Fudan University, China
Monotonicity of entropy for one-parameter families of unimodal interval maps

10:00 – 10:45 **Jian-Hua Zheng**, Tsinghua University, China
Iteration of meromorphic functions escaping to infinity

Tea Break

11:10 – 11:55 **William Cherry**, University of North Texas, USA
An extremal problem involving n+2 hyperplanes in general position in $\mathbf{CP}^n$

11:55 – 12:40 **Qi Han**, Texas A&M University - San Antonio, USA
A non-integrated hypersurface defect relation for meromorphic maps over complete Kähler manifolds into projective algebraic varieties

Lunch Break

2:00 – 3:00 **Sai-Kee Yeung**, Purdue University, USA
Geometric approach to arithmeticity of non-uniform lattices in Hermitian symmetric spaces

3:00 – 3:45 **Makoto Abe**, Hiroshima University, Japan
A characterization of q-pseudoconvexity for unramified domains over $\mathbf{C}^n$

Tea Break

4:05 – 4:30 ***Parallel Sessions:***

T4 Meng Wah Complex **Chengfa Wu**, Institute for Advanced Study, Shenzhen University, China
Meromorphic solutions of a third order ODE

T5 Meng Wah Complex **Rakesh Kumar Parmar**, Government College of Engineering and Technology, Bikaner, India
Fractional Calculus of the (p, q)--extended Struve function

4:35 – 5:00 ***Parallel Sessions:***

T4 Meng Wah Complex **Weihong Yao**, Shanghai Jiao Tong University, China
Second Main Theorem for Random Holomorphic Maps

T5 Meng Wah Complex **Purnima Chopra**, Marudhar Engineering College, Bikaner, India
Certain unified integrals involving (p, q)--extended Bessel and Modified Bessel functions

June 30, 2017
Friday

T4, Meng Wah Complex

9:00 – 10:00 **Cho-Ho Chu**, Queen Mary, University of London, UK
Algebraic structures of symmetric domains

10:00 – 10:45 **Jinsong Liu**, Chinese Academy of Sciences, China
Quasihyperbolic metric and Quasisymmetric mappings between metric spaces

Tea Break

11:10 – 11:55 **Feng Rong**, Shanghai Jiao Tong University, China
An Alexander-type theorem for quasi-balanced domains

11:55 – 12:40 **Avery Ching**, Hong Kong University of Science and Technology, HK
Special Solutions of Hypergeometric Equations with Additional Apparent Singularities

Lunch Break

2:00 – 3:00 **Xiangyu Zhou**, Chinese Academy of Sciences, China
Some results on multiplier ideal sheaves

3:00 – 3 :15 ***Ngaiming Mok***, Director, Institute of Mathematical Research
Closing Remarks

Abstracts

Makoto Abe, Hiroshima University, Japan

A characterization of q-pseudoconvexity for unramified domains over $\mathbf{C}^n$

An unramified domain (D, π) over $\mathbf{C}^n$ is said to be q-pseudoconvex, where $1 \leq q \leq n$, if the function $-\ln d_D$ is q-plurisubharmonic on D, where d_D denotes the Euclidean boundary distance function of (D, π). An unramified domain (D, π) over $\mathbf{C}^n$ is q-pseudoconvex, where $1 \leq q \leq n$, if and only if the following condition is satisfied:

Let $\breve{\lambda} : \overline{\mathsf{B}_q(0,1)} \times [0,1] \to \breve{D}$, where $\mathsf{B}_q(0,1)$ denotes the unit ball in $\mathbf{C}^q$, be a continuous map which satisfies the conditions that $\breve{\lambda}(\overline{\mathsf{B}_q(0,1)} \times [0,1] \setminus \{(0,1)\}) \subset D$, there exists a holomorphic map $\lambda = (\lambda_1, \lambda_2, \ldots, \lambda_n) : \mathbf{C}^{q+1} \to \mathbf{C}^n$ of the form $\lambda_\nu(z_1, z_2, \ldots, z_q, t) = P_\nu(z_1, z_2, \ldots, z_q) + c_\nu t$, where P_ν is a polynomial of variables $z_1, z_2, \ldots, z_q$ of degree at most 2 and $c_\nu \in \mathbf{C}$ for every $\nu = 1, 2, \ldots, n$, such that $H := \lambda(\mathbf{C}^{q+1})$ is a $(q+1)$-dimensional complex affine subspace of $\mathbf{C}^n$, the induced map $\lambda : \mathbf{C}^{q+1} \to H$ is biholomorphic, and $\breve{\pi} \circ \breve{\lambda} = \lambda$ on $\overline{\mathsf{B}_q(0,1)} \times [0,1]$. Then, we have that $\breve{\lambda}(0,1) \in D$.
This is a joint work with Tadashi Shima and Shun Sugiyama.

This generalizes theorems of Yasuoka (Math. Sem. Notes Kobe Univ. **11**:139–148, 1983) and Sugiyama (Toyama Math. J. **38**:101–114, 2016).

Walter Bergweiler, Christian–Albrechts–Universität zu Kiel, Germany

Quasiconformal surgery and linear differential equations

We consider the frequency of zeros of solutions of the differential equation $w'' + Aw = 0$ with an entire coefficient A. First we review the results for a polynomial coefficient A. Next we discuss various results due to Bank, Laine and others dealing with the case that A is a transcendental entire function. We then describe a method to construct such differential equations for which there are two linearly independent solutions with relatively few zeros. We start with coefficients A for which the solutions can be given explicitly and then sketch how solutions for different coefficients can be "glued" using quasiconformal maps. This is a joint work with Alexandre Eremenko.

Yang Chen, University of Macau, Macau

Probabilities in GUE and JUE under double scaling

The probability that a gap $(-t, t)$ is formed in the ground state of **finite density** impenetrable bosons in one dimension was shown by Jimbo-Miwa-Mori-Sato (1979) to be associated with a parameter free Painleve V. The large t asymptotic expansion gap probability has a constant t independent term–Widom-Dyson constant. Obtained by Widom (1973) in a problem on $(n \times n)$ Toeplitz determinant, where the generating function vanishes on an arc. See also Torsten Ehrhardt (2008). I will show how this and other constants, which occur in the Smallest Eigenvalue distribution of the Laguerre Unitary and Jacobi Unitary Enesmbles can be found via the Linear Statistics Formula.

William Cherry, University of North Texas, USA

An extremal problem involving $n+2$ hyperplanes in general position in $\mathbf{CP}^n$

I will discuss Mark Fincher's solution to an extremal problem involving $n+2$ hyperplanes in general position in $\mathbf{CP}^n$ that is loosely related to an effective Landau theorem of Cherry and Eremenko for holomorphic maps omitting hyperplanes in projective space. The extremal configuration consists of hyperplanes whose defining forms consist of $n+2$ unit vectors pointing to the vertices of a regular simplex inscribed in the unit sphere in $\mathbf{R}^{n+1}$.

Edmund Yik-Man Chiang, Hong Kong University of Science and Technology, HK

Complex oscillation and semi-finite gaps of Hill equations

Recently, there has been a surge of interest in estimating the gap of classical Whittaker-Hill equations. The problem was first considered by Ince around 1920s. We show those semi-finite gap solutions investigated by earlier researchers are amongst those complex non-oscillatory solutions in the language of Bank and Laine, i.e., entire solutions having zero as a Borel exceptional value. Moreover, we have found explicit representation of these complex non-oscillatory solutions.

Avery Ching, Hong Kong University of Science and Technology, HK

Special Solutions of Hypergeometric Equations with Additional Apparent Singularities

One of the important features of the classical Hypergeometric equation is that each of its solution admits an Euler integral representation. This feature is formulated as a rigid local system in a geometric context. In this talk we will discuss how this property of the hypergeometric equation is shared by equations with some additional apparent singularities. This is a joint work with YM. Chiang and CY. Tsang

Junesang Choi, Dongguk University, Republic of Korea

An inequality for e and its associated Carleman-type inequalities

We aim to establish a double inequality involving the constant e by using an alternating and decreasing sequence which is sure to be *experimentally* true. Using this inequality, we also give a generalization of the Carleman-type inequality.

Purnima Chopra, Marudhar Engineering College, Bikaner, India

Certain unified integrals involving (p,q)–extended Bessel and Modified Bessel functions

We aim to present certain unified integral formulas involving the (p,q)-extended Bessel $J_{\nu,p,q}(z)$ and modified Bessel $I_{\nu,p,q}$ functions. We prove that such integrals are expressed in terms of the (p,q)–extended generalized hypergeometric type function. Some interesting special cases of our main results are also considered. This is a joint work with R.K. Parmar.

Cho-Ho Chu, Queen Mary, University of London, UK

Algebraic structures of symmetric domains

We discuss the Jordan and Lie algebraic structures of both finite and infinite dimensional bounded symmetric domains and explain how they can be used to study holomorphic maps and geometry of these domains.

Rod Halburd, University College London, UK

Singularity structure and exact solutions of functional equations

It has long been known that the singularity structure of solutions of an ordinary differential equation in the complex domain gives a strong indicator of its integrability. Equations with the Painlevé property (that all solutions are single-valued about all movable singularities) are particularly important in this respect. Several generalisations of this property will be described.
Singularity structure will be used to find particular exact solutions of some classes of non-integrable differentiable equations. Extensions to difference, discrete and delay-differential equations will be explored.

Qi Han, Texas A&M University - San Antonio, USA

A non-integrated hypersurface defect relation for meromorphic maps over complete Kähler manifolds into projective algebraic varieties

In this paper, a non-integrated defect relation for meromorphic maps from complete Kähler manifolds M into smooth projective algebraic varieties V intersecting hypersurfaces located in k-subgeneral position is proved. The novelty of this result lies in that both the upper bound and the truncation level of our defect relation depend only on k, $\dim_{\mathbb{C}}(V)$ and the degrees of the hypersurfaces considered. In addition, this defect relation recovers Hirotaka Fujimoto [Theorem 1.1; MR0884636 (88m:32049); Japan. J. Math. (N.S.) 11 (1985), no. 2, 233-264.] when subjected to the same conditions. This is a joint work with Wei Chen.

Tatsuhiro Honda, Hiroshima Institute of Technology, Japan

Bloch mappings on a complex Banach space

We consider generalising of the concept of Bloch functions on the unit disc in the complex plane $\mathbb{C}$ to holomorphic functions on a unit ball of a complex Banach space. We also give some characterisations of Bloch functions on a unit ball of a complex Banach space.

Ikkei Hotta, Yamaguchi University, Japan

Tightness results for infinite-slit limits of the chordal Loewner equation

In [dMS16], the authors noted that the conformal mappings for a certain multiple SLE (Schramm-Loewner evolution) process for N simple curves in the upper half-plane $\mathbb{H} := \{z \in \mathbb{C} : \mathsf{Im}\, z > 0\}$ converges as $N \to \infty$. The deterministic limit has a simple description: The conformal mappings $f_t : \mathbb{H} \to \mathbb{H}$ satisfy the Loewner PDE

$$\frac{\partial f_t(z)}{\partial t} = -\frac{\partial f_t(z)}{\partial z} \cdot M_t(z), \quad f_0(z) = z \in \mathbb{H},$$

where M_t satisfies the complex Burgers equation

$$\frac{\partial M_t(z)}{\partial t} = -2\frac{\partial M_t(z)}{\partial z} \cdot M_t(z).$$

In several situations, partial differential equations of this type appear to describe the limit of N-particle systems.
In this talk, we consider the same multiple SLE measure for N curves connecting N points on $\mathbb{R}$ with ∞. We describe the growth of these curves by a Loewner equation with weights that correspond to the speed for these curves in the growth process, and we obtain an abstract differential equation for limit points as $N \to \infty$. Furthermore, we see that an equation of a similar type also appears in the limit behavior of a Loewner equation describing the growth of trajectories of a certain quadratic differential.

This presentation is based on a joint work with Andrea Del Monaco and Sebastian Schleißinger [dMHS].

References

[dMS16] A. del Monaco and S. Schleißinger, *Multiple SLE and the complex Burgers equation*, Math. Nachr. **289** (2016), no. 16, 2007–2018.

[dMHS] A. del Monaco, I. Hotta and S. Schleißinger, *Tightness results for infinite-slit limits of the chordal Loewner equation*, Comput. Methods Funct. Theory, to appear (arXiv:1608.04084).

Han Ul Kang, Pusan National University, Republic of Korea

Regular Functions for Different Kinds of Conjugations in the Bicomplex Number Field

In this paper, using three types of conjugations in a bicomplex number filed $\mathcal{T}$, we provide some basic definitions of bicomplex number and definitions of regular functions for each differential operators. And we investigate the corresponding Cauchy-Riemann systems and the corresponding Cauchy theorems in $\mathcal{T}$ in Clifford analysis.

Ji Eun Kim, Dongguk University, Republic of Korea

Differential operators and regular functions of pseudo-dual-quaternionic variables

The purpose of this paper is to introduce and develop the new concept of pseudo-dual-quaternions, which generalize at the same time complex, dual numbers and quaternions. We define pseudo-dual-quaternions and some of their basic properties. In addition, we give another representation of pseudo-dual-quaternions basing on matrices. We extend the concept of holomorphicity to pseudo-dual-quaternionic functions. Moreover, a corresponding Cauchy-Riemann formulas were obtained.

Ming Li, Institute for Advanced Study, Shenzhen University, China

Analytic and Geometric Properties of the Briot-Bouquet Differential Equation

In this talk, I will present some analytic and geometric properties of the solution $q(z)$ to the Briot-Bouquet differential equation $q(z)+zq'(z)/q(z) = h(z)$ with the initial condition

$q(0) = 1$ for a given analytic function $h(z)$ on the unit disk $|z| < 1$ in the complex plane with $h(0) = 1$. In particular, we investigate the possible largest constant $c > 0$ such that the condition $|\Im[zf''(z)/f'(z)]| < c$ on $|z| < 1$ implies starlikeness of an analytic function $f(z)$ on $|z| < 1$ with $f(0) = f'(0) - 1 = 0$. Joint work with Prof. Toshiyuki Sugawa.

Liangwen Liao, Nanjing University, China

Complex differential, differential-difference equations and related topics

In this talk, we will present some new results about researches on complex differential and differential-difference equations.

Jinsong Liu, Chinese Academy of Sciences, China

Quasihyperbolic metric and Quasisymmetric mappings between metric spaces

In this talk we prove that the quasihyperbolic metric is quasi-invariant under a quasisymmetric mapping in the suitable metric space. Meanwhile, we also show that the quasi-invariant of the quasihyperbolic metric implies the quasiconformality.
At the end, as an application of above theorems, we prove that the compose of two quasisymmetric mappings in metric spaces is a quasiconformal mapping.
This is a joint work with Prof Xiaojun Huang.

Fan-ning Meng, Guangzhou University, China

On Yau sequence over complete intersection surface singularities of Brieskorn type

In this paper, we study Yau sequence whose members are complete intersection surface singularity of Brieskorn type and provide a similar property as Tomaru's results over these singularities.

References

[1] M. Artin, *On isolated rational singularities of surfaces*, Amer. J. Math. 88(1), 1966, 129–138.

[2] F. Hirzebruch, *Uber vierdimensionale Riemannsche Flachen mehrdeutiger analytischer Funktionen von zwei komplexen Veranderlichen*, Math. Ann. **126** (1953), 1–22.

[3] M. Jankins, W. D. Neumann, *Lectures on Seifert manifolds (Brandeis Lecture Notes, 2)*. Brandeis University, Waltham, MA, 1983.

[4] H. Laufer, *On minimally elliptic singularities*, Amer. J. Math., **99** (1972), no. 6, 1257–1295.

[5] F. N. Meng and T. Okuma, *The maximal ideal cycles over complete intersection surface singularities of Brieskorn type*, Kyushu J. Math. **68**(2014), no. 1, 121–137.

[6] K. Konno and D. Nagashima, *Maximal ideal cycles over normal surface singularities of Brieskorn type*, Osaka J. Math, **49** (2012), no. 1, 225–245.

[7] J. Stevens, *Kulikov singularities*, Thesis, Universiteit Leiden, Holland, 1985.

[8] T. Tomaru, *On Gorenstein surface singularities with fundamental genus $p_f \geq 2$ which satisfy some minimality conditions*, Pacific J. Math., **170** (1995), no. 1, 271–295.

[9] S. S. -T. Yau, *On maximally elliptic singularities*, Trans. Amer. Math. Soc., **257** (1980), no. 2, 269–329.

Veerapazham Murugan, National Institute of Technology Karnataka, India

Points of coincidence and Iterative roots

A function f is called an iterative root of order n of F if the n-th iterate of f equals F. Iterative roots of continuous functions are not necessarily unique, if exists. We obtain conditions when iterative roots of an order preserving homeomorphism from an interval onto itself is unique using the points of coincidence of functions. This is a joint work with M. Suresh Kumar.

Rakesh Kumar Parmar, Government College of Engineering and Technology, Bikaner, India

Fractional Calculus of the (p, q)–extended Struve function

We aim to present some formulas for Saigo hypergeometric fractional integral and differential operators involving (p, q)-extended Struve function $\mathbf{H}_{\nu,p,q}(z)$, which are expressed in terms of the Hadamard product of the (p, q)-extended Gauss hypergeometric function and the Fox-Wright function ${}_r\Psi_s(z)$. A number of interesting special cases of our main results are also considered. Further, it is emphasized that the results presented here, which are seemingly complicated series, can reveal their involved properties via those of the two known functions. This is a joint work with Junesang Choi.
pending

Feng Rong, Shanghai Jiao Tong University, China

An Alexander-type theorem for quasi-balanced domains

The classical Alexander theorem states that proper holomorphic self-maps of the unit ball must be automorphisms. In the past decades, many Alexander-type theorems have been obtained for various domains. In this talk, we will first give a brief introduction to this topic and then state several preparatory results which we need. Our objective is to show that proper holomorphic self-maps of smoothly bounded pseudoconvex quasi-balanced domains of finite type are automorphisms. This is a joint work with Fengbai Li.

Armen Sergeev, Steklov Mathematical Institute, Moscow

Sobolev space of half-differentiable functions and non-smooth strings

The phase space of d-dimensional smooth string theory can be identified with the space of smooth loops with values in the d-dimensional Mikowski space R_d. The symplectic form ω on this space admits a natural extension to the Sobolev space $V_d = H_0^{1/2}(S^1, R_d)$ of half-differentiable loops with values in R_d and this is the largest space in Sobolev scale of spaces $H_0^s(S^1, R_d)$ to which this form ω admits a correctly defined extension. The group $\mathrm{QS}(S^1)$ of reparameterizations of such loops consists of quasisymmetric homeomorphisms of the circle and its action on the Sobolev space V_d preserves symplectic form ω. So we take V_d, provided with the action of the group $\mathrm{QS}(S^1)$), for the phase space of the theory of non-smooth strings.
If the action of $\mathrm{QS}(S^1)$) on V_d would be smooth then we could take for the classical system, associated with the phase space V_d, the pair, consisting of V_d and the Lie algebra of the group $\mathrm{QS}(S^1)$). But the action of $\mathrm{QS}(S^1)$) on V_d is not smooth so we cannot associate

with the pair $(V_d, \mathrm{QS}(S^1))$ any classical Lie algebra. However, using the methods of noncommutative geometry, we can construct directly a quantum Lie algebra, associated with the system $(V_d, \mathrm{QS}(S^1))$.

Weixiao Shen, Fudan University, China

Monotonicity of entropy for one-parameter families of unimodal interval maps

Thurston's algorithm was used by Tsujii, Levin and Epstein, among others, to study transversality problems in holomorphic dynamics. We modify this algorithm so that it applies to maps which are only locally holomorphic. We obtain 'positively-oriented'transversality and monotonicity of entropy for certain families of unimodal interval maps with 'essential singularities'. This is a joint work with Genadi Levin and Sebastian van Strien.

Hirokazu Shimauchi, Yamanashi Eiwa College, Japan

A numerical algorithm for solving the Loewner equation

The Loewner equation provides a one-parametric family of conformal maps on the unit disk whose image describes a flow of expanding simply-connected domain, called the Loewner flow, on the complex plane. In this talk, a numerical algorithm for solving the radial Loewner equation is presented. Further we will show some numerical experiments and properties of approximants. This talk is based on a joint work with Ikkei Hotta.

Yum-Tong Siu, Harvard University, USA

Problems and Techniques in Complex Geometry from Nevanlinna Theory

Will start with a discussion of the history and recent results and problems in the interface between Nevanlinna theory and complex geometry. Will then discuss the role of Nevanlinna theory in one approach to the abundance conjecture in algebraic geometry and the current status of that approach.

Toshiyuki Sugawa, Tohoku University, Japan

Convexity of domains and its characterization with respect to various metrics

Let Ω be a domain in the complex plane with hyperbolic metric $\lambda_\Omega(z)|dz|$ of Gaussian curvature -4. Mejía and Minda[2] proved that Ω is (Euclidean) convex if and only if $d(z,\partial\Omega)\lambda_\Omega(z) \geq 1/2$ for $z \in \Omega$, where $d(z,\partial\Omega)$ denotes the Euclidean distance from z to the boundary $\partial\Omega$. Recently, the speaker found a spherical counterpart of this result in[4]. That is, a proper subdomain Ω of the Riemann sphere is spherically convex if and only if $\sigma(z,\partial\Omega)\mu_\Omega(z) \geq 1/2$ for $z \in \Omega$, where $\sigma(z,\partial\Omega)$ denotes the spherical distance from z to the boundary $\partial\Omega$ and $\mu_\Omega(z) = (1+|z|^2)\lambda_\Omega(z)$ is the spherical density of the hyperbolic metric $\lambda_\Omega(z)|dz|$. Here, the spherical distance is normalized so that $\sigma(z,w)/|z-w| \to 1/(1+|z|^2)$ when $w \to z$.

In this talk, we will report on a similar characterization for a hyperbolically k-convex subdomains of the hyperbolic plane (see[3] for its definition) in terms of the hyperbolic density of the hyperbolic metric $\lambda_\Omega(z)|dz|$. A key idea is, in a similar way in[1], to obtain a geometric characterization of such convex domains relative to the specific metric.

References

[1] F. R. Keogh, *A characterization of convex domains in the plane*, Bull. London Math. Soc. **8** (1976), 183–185.

[2] D. Mejía and D. Minda, *Hyperbolic geometry in k-convex regions*, Pacific J. Math. **141** (1990), 333–354.

[3] D. Mejía and D. Minda, *Hyperbolic geometry in hyperbolically k-convex regions*, Rev. Colombiana Mat. **25** (1991), 123–142.

[4] T. Sugawa, *Spherical convexity and hyperbolic metric*, J. Analysis **24** (2016), 167–175.

Luis Manuel Tovar, Instituto Politécnico Nacional, Mexico

Weighted Function Spaces: The Monogenic Case

In this talk I present results concerning the main properties of Dirichlet Spaces, Bloch Spaces,Hardy Qp-Spaces and $F(p, q, s)$ Spaces when we consider monogenic functions defined in the three dimensional unit ball.

Limei Wang, University of International Bussiness and Economics, China

Geometric properties of the shifted Gaussian hypergeometric functions

In this talk, the conditions on the triplet a, b, c are determined such that the shifted hypergeometric function $z_2F_1(a, b; c; z)$ is a member of a specific subclass of starlike functions. For example, we study starlikeness of order α, λ-spirallikeness of order α and strong starlikeness of order α. This talk is based on a joint work with Toshiyuki Sugawa.

Yuefei Wang, Chinese Academy of Sciences, China

Holomorphic motions and extremal problems

Holomorphic motions were introduced by Mane, Sad and Sullivan in 1980's to solve the density problem of structural stability of rational maps. Since then Holomorphic motions have many important applications in complex dynamics, quasiconformal geometry, Teichmuller spaces, etc. In this talk, I will talk about the topic and its applications on extremal problems of polynomial maps.

Zhi-Tao Wen, Taiyuan University of Technology, China and
Liu Bie Ju Centre for Mathematical Sciences, City University of Hong Kong, HK

Zero distribution of exponential polynomials

An exponential polynomial of order q is an entire function of the form

$$g(z) = P_1(z)e^{Q_1(z)} + \cdots + P_k(z)e^{Q_k(z)},$$

where the coefficients $P_j(z), Q_j(z)$ are polynomials in z such that

$$\max\{\deg(Q_j)\} = q.$$

It is known that the majority of the zeros of a given exponential polynomial are in domains surrounding finitely many critical rays. The shape of these domains is refined by showing

that in many cases the domains can approach the critical rays asymptotically. Further, a new sufficient condition for the majority of zeros to be simple is found.

It is a joint work with Janne Heittokangas, Katsuya Ishizaki, Kazuya Tohge. The results are accepted in Israel Journal of Mathematics.

Chengfa Wu, Institute for Advanced Study, Shenzhen University, China

Meromorphic solutions of a third order ODE

In this talk, we will consider meromorphic solutions of the differential equation

$$Au'(z)^2 + Bu(z)u''(z) = u^{(3)}(z) + \alpha u''(z) + \beta u'(z) + \gamma u(z) + \delta,$$

where $AB \neq 0$ and $A, B, \alpha, \beta, \gamma, \delta \in \mathbb{C}$. This equation includes many differential equations with mathematical or physical backgrounds as special cases, some of which will be introduced, e.g. the Falkner-Skan equation and Chazy's equation.
For generic situation, the classification of all meromrophic solutions will be discussed, after which explicit construction of these solutions will be given. For non-generic situation, the structure of meromorphic solutions may vary a lot (depending on the parameters), which will be illustrated using certain examples.

Chung Chun Yang, Shenzhen University, China

On factorization, value-sharing and functional equations

It's clear that any problem or question concerning factorization or vlaue sharing of meromorphic functions will lead to the finding meromorphic solutions of a functional equation. In the talk, background and relevant (new and old) results that associated with some outstanding old and new conjectures regarding these topics are posed or reposed, for further studies.

Weihong Yao, Shanghai Jiao Tong University, China

Second Main Theorem for Random Holomorphic Maps

Nevanlinna theory plays an important role in mathematics. But there are few people to work on the counterpart for random meromorphic functions. The speaker has proved the first main theorem for random meromorphic functions (Weihong Yao, The Distribution of Normalized Zero-Sets of Random Meromorphic Functions, Science China (Mathematics), 2010(06):1-5). In this talk, the speaker will consider the possibility of extending the second main theorem to the case of random meromorphic functions.

Sai-Kee Yeung, Purdue University, USA

Geometric approach to arithmeticity of non-uniform lattices in Hermitian symmetric spaces

It has been proved by Margulis that any lattice of semi-simple Lie group of real rank at least two is arithmetic. There is a geometric approach to the result using harmonic maps, which succeeded only for uniform lattices in the past. We would explain the difficulties for non-uniform lattices and a method to overcome the difficulties, by focusing on the cases of Hermitian symmetric spaces.

Jianjun Zhang, Jiangsu Second Normal University, China

On transcendental meromorphic solutions of certain types of nonlinear complex differential equations

In the talk, we will introduce some results on existence or the form of transcendental meromorphic solutions of the following nonlinear differential equation

$$f^n + Q_d(z, f) = p_1(z)e^{\alpha_1(z)} + p_2(z)e^{\alpha_2(z)},$$

where n is an integer ≥ 3, $Q_d(z, f)$ is a differential polynomial in f of degree $d \leq n - 1$ with rational functions as its coefficients, p_1, p_2 are non-vanishing rational functions and α_1, α_2 are nonconstant polynomials.

Jian-Hua Zheng, Tsinghua University, China

Iteration of meromorphic functions escaping to infinity

In this talk, we discuss the relation between difference of speeds escaping to infinity at two distinct points in a Fatou component U and the existence of large annulus in the orbit of this U. We will give some sufficient conditions about the relations and some examples to deny the relation.

Xiangyu Zhou, Chinese Academy of Sciences, China

Some results on multiplier ideal sheaves

We'll first recall the background, definition and basic properties of the multiplier ideal sheaves, and then talk about our recent solution of Demailly's strong openness conjecture on the multiplier ideal sheaves, and the corollaries and applications of the solution.