

Program

abstracts and practical information

Holomorphic Days 2019

June 18–19, 2019

Carlsberg Academy, Copenhagen, Denmark

Version of June 20, 2019

The Conference is sponsored by the Danish Council for Independent Research | Natural Sciences via grant DFF 4181-00502.

Venue and entrance

The conference is held at the Carlsberg Academy

Carlsberg Academy
Gamle Carlsberg Vej 15
1799 Copenhagen V

In the map the main entrance is marked with the red pointer. To access the venue from the city center (direction east) you may walk along the path (“Carlsberggruten”) near, but high above, the railway tracks. Those coming from Valby (direction west) may walk along “Valby Langgade”, “Skovbogårds Allé” and “Banevolden”.

You may of course take alternative routes; it is a good idea to follow the signs to “Visit Carlsberg”. Notice that the academy cannot be accessed directly from the garden “J.C. Jacobsens Have”.



Carlsberg Academy towards city center



Carlsberg Academy towards Valby

Entrance to the conference premises is via the main entrance. **We ask participants to enter the building between 9:00 and 9:30.** Should you need to enter later please call (45) 2943 4424 (Henrik) or (45) 2346 2718 (Carsten) during one of the intermissions.

Lecture room

The lectures all take place in the hall called “Pompeji”. There will be a laptop and a beamer and we suggest all speakers to use the beamer for their talk. There are also whiteboards (however not so large). The lunches and coffee breaks take place in an adjacent room.

Internet access

You may access the wireless networks called **Carlsberg Guest** and **Visit Carlsberg** without password.

Dinner

All registered participants are signed up for dinner on Tuesday and Wednesday. Tuesday the dinner is at the Carlsberg Academy at 18:00. The conference dinner takes place on Wednesday, June 19 at 19:00 at

Restaurant Gorilla
Flæsketorvet 63
1711 København V



Location of Restaurant Gorilla

Program – Tuesday

09:00 – 09:30	Registration, coffee, opening
09:30 – 10:30	Kristian Seip Value distribution of some zeta functions
10:30 – 11:00	Refreshments
11:00 – 12:00	Davoud Cheraghi Quasi-periodic dynamics in complex dimension one
12:00 – 13:30	Lunch
13:30 – 14:30	Jacob Christiansen Finite-gap CMV matrices: Periodic Coordinates and a Magic Formula
14:30 – 15:00	Refreshments
15:00 – 16:00	Vasiliki Evdoridou Singularities of inner functions associated to entire maps in the class B
16:00 – 17:00	Avner Kiro On Taylor coefficients of smooth functions
18:00 –	Dinner at the Carlsberg Academy

Program – Wednesday

09:00 – 09:30	Coffee
09:30 – 10:30	Niels Martin Møller Liouville Theorems in Nonlinear Geometric PDEs
10:30 – 11:00	Refreshments
11:00 – 12:00	Walter Bergweiler Quasiconformal surgery and linear differential equations
12:00 – 13:30	Lunch
13:30 – 14:30	Karl-Mikael Perfekt Carleson measures for the Dirichlet space of the bidisc
14:30 – 15:00	Refreshments
15:00 – 16:00	Walter Van Assche Orthogonal polynomials on the Julia set of a polynomial
16:00 – 17:00	Pascale Roesch From polynomial to rational maps
19:00 –	Conference dinner at Restaurant Gorilla

Abstracts

Quasiconformal surgery and linear differential equations

WALTER BERGWELER

CHRISTIAN-ALBRECHTS-UNIVERSITÄT ZU KIEL, GERMANY

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 new method to construct coefficients A for which there are two linearly independent solutions with relatively few zeros. We start with certain coefficients A for which the solutions can be given explicitly and then sketch how solutions for different coefficients can be “glued” using quasiconformal maps.

The results are joint work with Alexandre Eremenko.

Quasi-periodic dynamics in complex dimension one

DAVOUD CHERAGHI

IMPERIAL COLLEGE LONDON, UNITED KINGDOM

Quasi-periodic dynamics in one complex variable reveals fascinating interplay between complex analysis and Diophantine approximations. The question of whether a nonlinear perturbation of a linear rotation is conjugate to a linear rotation (linearisation) dates back to more than a century ago, with remarkable contributions by C. Siegel, A. Brjuno, and J.-C. Yoccoz. The behaviour of non-linearisable maps is very complicated. Indeed, there is not a single example of a non-linearisable map whose local behaviour is completely understood. There is major recent advances on this problem which has lead to a complete description of the topological behaviour of typical orbits. This is an introductory talk to demonstrate some of these results.

Finite-gap CMV matrices: Periodic Coordinates and a Magic Formula

JACOB STORDAL CHRISTIANSEN

LUND UNIVERSITY, SWEDEN

We prove a bijective unitary correspondence between 1) the isospectral torus of almost-periodic, absolutely continuous CMV matrices having fixed finite-gap spectrum E and 2) special periodic block-CMV matrices satisfying a Magic Formula. This latter class arises as E -dependent operator Möbius transforms of certain generating CMV matrices which are periodic up to a rotational phase; for this reason we call them MCMV. Such matrices are related to a choice of orthogonal rational functions on the unit circle, and their correspondence to the isospectral torus follows from a functional model in analog to that of GMP matrices. As a corollary of our construction we resolve a conjecture of Simon; namely, that Caratheodory functions associated to such CMV matrices arise as quadratic irrationalities.

Singularities of inner functions associated to entire maps in the class B

VASILIKI EVDORIDOU

THE OPEN UNIVERSITY, UNITED KINGDOM

Let f be a transcendental entire function and U an unbounded, invariant Fatou component of f . We can associate an inner function, g say, to the restriction of f to U . We consider two classes of functions in the B having finitely many tracts. We show that if f belongs to either of these two classes the number of singularities of g on the unit circle is equal to the number of tracts of f . This is joint work with N. Fagella, X. Jarque and D. Sixsmith.

On Taylor coefficients of smooth functions

AVNER KIRO

TEL-AVIV UNIVERSITY, ISRAEL

The talk will be about two classical problems in the theory of Carleman classes of smooth functions. The first one is to describe the image of a Carleman class under the Borel map (which maps a smooth function to its jet of Taylor coefficients at a given point). The second one concerns possible ways to construct a function in a given Carleman class with prescribed Taylor coefficients. I will present solutions to both problems based on Moment summation methods of divergent series.

Liouville Theorems in Nonlinear Geometric PDEs

NIELS MARTIN MØLLER

UNIVERSITY OF COPENHAGEN, DENMARK

The classical Liouville theorem, that a bounded holomorphic function defined on all \mathbb{C} must be constant, has many analogues for the important nonlinear partial differential equations of Riemannian geometry. In this talk, I will survey some of the many such Liouville-like results for hypersurfaces (with proofs of a couple of them), broadly with the slogan "spatially confined stationary surfaces for elliptic integrals are very few (sometimes non-existent)". I will draw on my own work for concrete examples of this, ranging from (bi-)half-space theorems for minimal surfaces and mean curvature flow solitons to certain bubbling phenomena related to the (lack of) compactness of solutions to degenerate partial differential equations.

Carleson measures for the Dirichlet space of the bidisc

KARL-MIKAEL PERFEKT

UNIVERSITY OF READING, UNITED KINGDOM

Carleson measures are fundamental to the study of holomorphic function spaces, as they are connected to the characterization of the corresponding multiplier algebras, existence of boundary values, interpolating sequences, Hankel-type operators, etc. I will discuss a description of the Carleson measures for the Dirichlet space of the bidisc, in terms of a newly developed bi-parameter potential theory which is based on kernels of tensor-product structure. There are very significant differences to classical potential theory. In particular, the maximum principle fails. Yet, perhaps surprisingly, the bi-parameter theory completely characterizes the Carleson measures, in analogy with Stegenga's description of the Carleson measures for the Dirichlet space of the disc.

Based on joint work with Nicola Arcozzi, Pavel Mozolyako, and Giulia Sarfatti.

From polynomial to rational maps

PASCALE ROESCH

UNIVERSITÉ PAUL SABATIER, TOULOUSE, FRANCE

TBA

Value distribution of some zeta functions

KRISTIAN SEIP

NTNU, NORWAY

Zeta functions of the form $\sum_{n=1}^{\infty} \chi(n)n^{-s}$, with χ a completely multiplicative function taking only unimodular values, arise as the limit functions of sequences of vertical translates of the Riemann zeta function in $\operatorname{Re} s > 1$. Following the pioneering work of Harald Bohr, we study the value distribution of such zeta functions in the half-critical strip $1/2 < \operatorname{Re} s < 1$ in the case when they extend meromorphically at least to the half-plane $\operatorname{Re} s > 1/2$. We give conditions for Voronin universality and show in particular that zeros and poles may be located “anywhere”, subject to a density condition akin to the famous density hypothesis, with the zeta function in question nevertheless being universal.

Orthogonal polynomials on the Julia set of a polynomial

WALTER VAN ASSCHE

KU LEUVEN, BELGIUM

The connection between iterations of a polynomial T and orthogonal polynomials on the Julia set for T was made in 1982 by Barnsley, Geronimo and Harrington [1] and Bessis, Mehta and Moussa [2]. If T is a polynomial of degree N , then the iterates $T^n(z) = T^{n-1}(T(z))$ are polynomials of degree N^n which are orthogonal with respect to the equilibrium measure (invariant measure, balanced measure) on the Julia set J of the polynomial T . The full sequence of orthogonal polynomials for this measure is investigated, in particular the recurrence coefficients a_n and b_n in the three term recurrence relation

$$P_{n+1}(x) = (x - b_n)P_n(x) - a_nP_{n-1}(x),$$

which exists when the Julia set is real, and in many cases also when the Julia set is complex but for a non-Hermitian inner product. In order to study the relations between the recurrence coefficients, Geronimo and I investigated orthogonal polynomials connected via a polynomial mapping [3]. The special case of a fixed point for the polynomial mapping T then gives the orthogonal polynomials on the Julia set J . In many cases the recurrence coefficients turn out to be limit periodic. I will present some known results about these recurrence coefficients and some open problems.

References

- [1] M.F. Barnsley, J.S. Geronimo, A.N. Harrington, *Orthogonal polynomials associated with invariant measures on Julia sets*, Bull. Amer. Math. Soc. (New Series) **7** (1982), no. 2, 381–384.
- [2] D. Bessis, M.L. Mehta, P. Moussa, *Orthogonal polynomials on a family of Cantor sets and the problem of iterations of quadratic mappings*, Lett. Math. Phys. **6** (1982), 123–140.
- [3] J.S. Geronimo, W. Van Assche, *Orthogonal polynomials on several intervals via a polynomial mapping*, Trans. Amer. Math. Soc. **308** (1988), no. 2, 559–581.

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