PROGRAM NORDAN 2017

Friday, May 19

13.15-14.00	Joaquim Ortega Cerdà (colloquium a Chalmers)
14.30	Bus departing for Nääs Fabriker
	Coffee break
16.00-16.45	Nikolay Shcherbina
17.00-17.45	Håkan Persson
18.00-18.45	Tristan Collins
19.30	*Dinner*

Saturday, May 20

9.00-9.45	Jean Ruppenthal
	Coffee break
10.15-11.00	Alain Yger
11.15-12.00	Eleonora Di Nezza
	Lunch
13.15-14.00	Daniel Barlet
14.15-15.00	Yanir Rubinstein
15.30-19.00	Excursion to Nääs Castle
20.00	*Banquet*

Sunday, May 21st

9.00-9.45	Han Peters
	Coffee break
10.15-11.00	Berit Stensones
11.15-12.00	Alexander Rashkovskii
	Lunch
13.30	Bus departing for Gothenburg central station
	(arriving around 14.15)

ABSTRACTS

Daniel Barlet (Nancy)
On nearly-smooth complex spaces (joint work with J. Magnusson).

Abstract. We introduce an interesting class of normal complex spaces having only mild singularities (near to quotient singularities) in which we can generalize the notion of (analytic) fundamental class for complex cycles and also the notion of relative fundamental class for an analytic family of cycles. We also generalize to these spaces the intersection theory for cycles with rational positive coefficients. This also extends to the intersection of analytic families of cycles. We show that almost all the properties of these notions generalize to this context with the exception of the fact that the fundamental classes of the intersection of two cycles whose intersection has the expected co-dimension is not always given by the cup-product of their fundamental classes.

Tristan Collins (Harvard)
Kähler Currents and Restricted Volumes

Abstract: I will discuss a notion of restricted volume for big (1,1) classes. Conjecturally, the restricted volume determines the non-Kähler locus. I will discuss a proof of this conjecture in the nef case. Time permitting, I will give some geometric applications to the Kähler-Ricci flow. Joint work with V. Tosatti.

Eleonora Di Nezza (Imperial)
The space of Kähler metrics on singular varieties

Abstract: The geometry and topology of the space of Kähler metrics on a compact Kähler manifold is a classical subject, first systematically studied by Calabi in relation with the existence of extremal Kähler metrics. Then, Mabuchi proposed a Riemannian structure on the space of Kähler metrics under which it (formally) becomes a non-positive curved infinite dimensional space. Chen later proved that this is a metric space of non-positive curvature in the sense of Alexandrov and its metric completion was characterized only recently by Darvas.

In this talk we will talk about the extension of such a theory to the setting where the compact Kähler manifold is replaced by a compact singular normal Kähler space.

As one application we give an analytical criterion for the existence of Kähler-Einstein metrics on certain mildly singular Fano varieties, an analogous to a criterion in the smooth case due to Darvas and Rubinstein. This is based on a joint work with Vincent Guedj.

Joaquim Ortega-Cerdà (Barcelona)
Tjebysjov quadratures in algebraic varieties

Abstract: Spherical designs are collections of points in the sphere where one can integrate exactly polynomials of a fixed degree with a quadrature formula that has equal weights. These points must be very well distributed on the sphere and, except on a few cases, their precise location is unknown. Bondarenko, Radchenko and Viazovska recently settled a conjecture of Korevaar and Meyers on the optimal number of nodes that a spherical design can have as the degree of the polynomial grows. I will present a natural generalization of their work to algebraic varieties based on a joint work with Jordi Marzo and Ujué Etayo.

Han Peters (Amsterdam)
Applications of complex dynamics to graph theory

Abstract: A subset of the vertices of a finite graph is called independent if no pair of vertices is linked by an edge. The collection of all independent subsets generates the independence polynomial, a function with applications both in graph theory and statistical physics.

Considering large graphs of bounded degree, one might be interested in approximating the independence polynomial, and preferably by using a fast algorithm. It turns out that this can be done on a domain where the independence polynomial does not vanish, thus leading to the question on which domains this non-vanishing can be guaranteed.

By considering this question for regular trees, one can define an recursive procedure, naturally leading to the iteration of a family of rational functions. Using classical tools from complex dynamical systems it is possible to determine exactly the maximal domain on which non-vanishing can be guaranteed. Somewhat surprisingly, these observations can be used to answer a conjecture of Sokal regarding the non-vanishing of independence polynomials for arbitrary graphs.

Håkan Persson (Uppsala)
Approximation of plurisubharmonic functions

Abstract: Suppose that X is a compact set in $\mathbb{C}^n$. We discuss different aspects of the problem of approximating functions that are upper semicontinuous on X and plurisubharmonic in the interior of X by functions that are smooth and plurisubharmonic in (shrinking) neighborhoods of X.

Alexander Rashkovskii (Stavanger)
Local geodesics for plurisubharmonic functions

Abstract: We consider geodesics for plurisubharmonic functions from Cegrell's classes on a bounded hyperconvex domain and show that, as in the case of metrics on Kähler compact manifolds, they linearize the energy functional. As a consequence, we get a uniqueness theorem for the functions from the Cegrell classes in terms of total masses of certain mixed Monge-Ampère currents. Geodesics of relative extremal functions are studied and a reverse Brunn-Minkowski inequality is proved for capacities of multiplicative combinations of toric compact sets. We also show that psh functions with strong singularities generally cannot be connected by (sub)geodesic arcs.

Yanir Rubinstein (Maryland)
Real/complex Legendre/interpolation

Abstract: The work of Coifman, Cwikel, Rochberg, Sagher, and Weiss, generalizing earlier work of Calderon, shows how to associate to a family of complex norms on the boundary of the disc an "interpolating family" of complex norms in the interior of the disc. On the other hand, work of Alexander–Wermer and Slodkowski concerns "polynomial hulls" with convex fibers over the boundary of the disc. In recent joint work with Berndtsson, Cordero-Erausquin, and Klartag, a method of interpolation of real (finite-dimensional) Banach spaces and of convex functions is presented, unifying and generalizing the above works. The underlying duality in this method is given by the classical Legendre transform. Inspired by this, we introduce a complex analogue of the Legendre transform, and tie this to several foundational works in complex geometry going back to Moriyon, Lempert, Mabuchi, Semmes, and Donaldson.

Jean Ruppenthal (Wuppertal)
Canonical sheaves at isolated canonical singularities

Abstract: The canonical line bundle and the corresponding canonical sheaf belong to the most important geometric/analytic objects associated to a complex manifold. They play a crucial role e.g. in classification theory, Serre duality or vanishing theorems. If we consider singular varieties instead of smooth manifolds, then there exist various possibilities to generalize the canonical sheaf to that setting. One can consider for example the Grothendieck-Barlet-Henkin-Passare dualizing sheaf or the Grauert-Riemenschneider L^2-sheaf. In this talk, we will discuss another possible generalization, i.e., the sheaf of L^2 holomorphic n-forms with a certain boundary condition at the singular set. This sheaf is essential for L^2-$\bar{\partial}$-theory on singular spaces, but difficult to understand. We will describe it explicitly for isolated canonical Gorenstein singularities.

Nikolay Shcherbina (Wuppertal)
Cores of domains: An overview of some recent results.

Berit Stensønes (Trondheim)
Automorphisms of $\mathbf{C}^2$ *with an invarant Fatou Component biholomorphic to* $\mathbf{C} \times (\mathbf{C} \setminus \{0\})$

Abstract: We are constructing automophisms that have Fatou Components that are not simply connected, these maps to also show that the so called "Snail Lemma" do no longer hold in Dimension 2 and up.

Alain Yger (Bordeaux) *An arithmetic elimination theorem and bounds for multivariate residues*

Abstract: I will present an elimination theorem inspired by a classical theorem of Oskar Perron, combined with the approach proposed in 2005 by Zbigniew Jelonek towards the sharp geometric effectiveness of Hilbert's Nullstellensatz. I will show next how such a result can be used in order to get precise estimates (in terms of the geometric and arithmetic complexity of all the data, fitting with both geometric and arithmetic Bézout theorems) for the logarithmic height of total sums of multivariate residues related to polynomials maps defined over $\mathbb{Q}$ over an algebraic variety also defined over $\mathbb{Q}$. Methods start with revisiting Euclid's algorithm, together with Bergman-Weil developments. This is a recent joint work with Martín Sombra (ICREA and University of Barcelona). I will also profit from the presentation of such results in order to emphasize how some of the concepts or tools involved in the methods extensively developped in Göteborg under the impulsion of Mats Andersson towards questions in multivariate residue theory and intersection theory, happen to be also, at the same time, closely related with the concept of logarithmic height and in particular with the realization of closed expressions for such height : among them, Bochner-Martinelli type currents, Crofton's type formulaes, Ronkin's type functions or currents,...