Program Nordan 2000
Örnsköldsvik

Supported by Mid Sweden University, Umeå University and NFR

Mid Sweden university
Järnvägsgatan 6, Lecture hall 138
Örnsköldsvik

Friday May 5.

16.00-		Coffee
17.00-17.45	Ozan Öktem, Stockholm	*Extension of separately analytic functions and applications to mathematical tomography.*
18.00-18.45	Norman Levenberg, Auckland	*Transfinite Diameter in C^N*
19.30		Dinner

Saturday May 6.

9.00-9.45	Lars Hörmander, Lund	*Approximation of solutions of boundary problems and of entire functions.*
10.00-10.45	Erik Løw, Oslo	*Solving the d-bar-equations in thin tubes and applications to mappings.*
		Coffee
11.15-12.00	Bo Berndtsson, Göteborg	*Complex analysis on currents*
12.15-13.00	Jan Boman, Stockholm	*A Paley-Wiener Theorem for the analytic wave front set.*
		Lunch
15.00-15.45	Christer Kiselman, Uppsala	*Lineal convexity, C-convexity and convexity*
16.00-16.45	Jockum Aniansson, Stockholm	*Fisher kernels and Cauchy problems for the wave equation.*
17.15-18.00	Nikolay Shcherbina, Göteborg	*Hulls and Levi-flat surfaces.*
19.00		Dinner

Sunday May 7.

9.00-9.45	Lars Filipsson, Gävle	*PDE-preserving polynomial interpolation*
		Coffee
10.00-10.45	Juhani Riihentaus, Joensuu	*Subharmonic Functions: Non--Tangential and Tangential Boundary Behavior*
11.00-11.45	Hasse Carlsson, Göteborg	*Harmonic analysis and several complex variables*
		Lunch

Dinners etc.

Dinner on Friday will be at 19.30 at "Restaurant Mamma mia", located in the centre of Örnsköldsvik, Storgatan 6.

Lunch on Saturday will be in the locations of Mid Sweden university and Umeå univeristy. A house called "Arken" near the place where the seminars take place.

Dinner on Saturday will be at 19.00 at "Restaruant Varvsberget". This restaurant is located on the top of one of the mountains in Örnsköldsvik. There will be a bus from the hotel at 18.45 taking us there. The bus returns at 21.30.

Lunch on Sunday will be outside the lecture hall.

Departure

There is a bus to the airport departing from the bus station nearby the hotel one hour before each flight.

NORDAN 2000 IN ÖRNSKÖLDSVIK
ABSTRACTS

Friday May 5.

17.00-17.45 Ozan Öktem

Extension of separately analytic functions and applications to mathematical tomography.
Given a test function h in $\mathbb{R}^2$, we define the *generalized exponential Radon transform* $R_\rho(h)$ of h as

$$R_\rho(h)(\omega, p) := \int_{x\cdot\omega=p} h(x)e^{\rho(\omega)x\cdot\omega^\perp}\,dm(x).$$

In the definition above, $\rho\colon S^1 \to \mathbb{R}$ is a fixed function (which in our case is a rational function), $\omega := (\cos\alpha, \sin\alpha)$ for $0 \leq \alpha < 2\pi$, $\omega^\perp := (-\sin\alpha, \cos\alpha)$, and dm is the 1-dimensional Lebesgue measure on the line $x \cdot \omega = p$.
Problems of interest within mathematical tomography are to invert, study uniqueness properties, and to characterize the image of the operator R_ρ when it acts on various spaces.
In this joint work with Prof. Jan Boman, I will confine myself to the last problem, more precisely to characterize the image of R_ρ when it acts on the set of test functions in $\mathbb{R}^2$. I will show how extension properties of separately analytic functions play a central role when solving the range characterization problem of the generalized exponential Radon transform.

18.00-18.45 Norman Levenberg

Transfinite diameter in $\mathbb{C}^n$.
Let E and F be compact subsets of $\mathbb{C}^N$ with E contained in F. We show that $d(E) = d(F)$ if and only if $F - E$ is pluripolar where $d(E)$ denotes the transfinite diameter of E. The result is, admittedly, uninspiring; however, we think (hope!) the method of proof – which uses weighted pluripotential theory – will be of interest. This is joint work with Tom Bloom.

Saturday May 6.

9.00-9.45 Lars Hörmander

Approximation of solutions of boundary problems and of entire functions

Let $\Omega \subset \mathbb{R}^n$ be open and convex, $\omega = \{x \in \Omega, x_n = 0\} \neq \emptyset$, and let $P(D)$ and $Q_1(D), \ldots, Q_J(D)$ be differential operators with constant coefficients such that the plane $x_n = 0$ is not characteristic with respect to $P(D)$. Set

$$C^\infty_{P,Q}(\Omega) = \{u \in C^\infty(\Omega); P(D)u = 0 \text{ in } \Omega, Q_1(D)u = \cdots = Q_J(D)u = 0 \text{ in } \omega\}.$$

The lecture will be devoted to the problem of deciding when $C^\infty_{P,Q}(\mathbb{R}^n)$ restricted to Ω is dense in $C^\infty_{P,Q}(\Omega)$. Duality and the Fourier-Laplace transformation reduces this to questions on approximating entire functions of exponential type by such functions of slower growth. Only partial answers to these questions can be given.

10.00-10.45 Erik Løw

Solving the d and $\bar\partial$-equations in thin tubess and applications to mappings
We construct a family of integral kernels for solving the $\bar\partial$-equation with C^k and Hölder estimates in thin tubes around totally real submanifolds in $\mathbb{C}^n$ (theorems 1.1 and 3.1). Combining this with the proof of a theorem of Serre we solve the d-equation with estimates for holomorphic forms in such tubes (theorem 5.1). We apply these techniques and a method of Moser to approximate C^k-diffeomorphisms between totally real submanifolds in $\mathbb{C}^n$ in the C^k-topology by biholomorphic mappings in tubes, by unimodular and symplectic biholomorphic mappings, and by automorphisms of $\mathbb{C}^n$.
(Joint with Franc Forstnerič and Nils Øvrelid)

11.15-12.00 Bo Berndtsson

Complex analysis on currents
(joint work with N Sibony)
We first discuss dbar-operators on positive (p,p)-currents, and the resulting definitions of holomorphic functions and forms on a current. We then prove solvability and L^2-estimates for the inhomogeneous dbar-equation for currents that are closed or more generally satisfies $dd^cT \leq 0$. The ideas are illustrated by examples relating to singular varieties, Bernstein-type problems on separate analyticity, concave domains and foliations.

12.15-13.00 Jan Boman

A Paley-Wiener Theorem for the analytic wave front set

It follows from the Paley-Wiener Theorem and the Phragmén-Lindelöf Theorem that the supporting function H for the support of a distribution u with compact support is given by

$$H(\eta) = \sup_{\xi\in\mathbb{R}^n} i_{\hat u}(\xi + i\eta) = i_{\hat u}(i\eta), \quad \eta \in \mathbb{R}^n; (1)$$

here $i_{\hat u}$ is the indicator function of $\hat u$, which is defined as the upper semicontinuous regularization of the function $\zeta \mapsto \overline{\lim}_{t\to\infty} t^{-1}\log|\hat u(t\zeta)|$. I will describe how information about the analytic singularities of u can be recovered from $i_{\hat u}(\zeta)$ for ζ near $\mathbb{R}^n$ as follows. For given $\xi \in \mathbb{R}^n \setminus \{0\}$, the supporting function H_ξ of the set

$K_\xi = \{x;\ (x,\xi) \in WF_A(u)\}$ of analytic singularities with cotangent direction ξ is given by

$$H_\xi(\eta) = \lim_{\delta\to+0} \varliminf_{s\to+0} \sup_{|\tilde\xi-\xi|<\delta} i_{\hat u}(\tilde\xi+is\eta)/s = \overline{\lim}_{s\to+0,\tilde\xi\to\xi} i_{\hat u}(\tilde\xi+is\eta)/s, \quad \eta\in\mathbb{R}^n. (2)$$

This statement is also valid for hyperfunctions with compact support. The convex hull of singsupp$_A$ u, the set of all analytic singularities of u, is of course equal to the convex hull of supp u, so it can already be determined by (1). It turns out that (2) gives no more information on singsupp$_A$ u than (1), for we show that the union of all K_ξ is equal to the convex hull of supp u. The proof consists of a topological argument involving existence of certain vector fields on spheres.
This is joint work with Lars Hörmander (Asian J. Math vol3, no4, 1999).

15.00-15.45 Christer Kiselman
Lineal convexity, C-convexity, and convexity.
In addition to ordinary convexity and pseudoconvexity, there are several interesting notions of convexity in complex geometry. A set is said to be lineally convex if its complement is a union of complex hyperplanes. An open set is said to be C-convex if its intersection with every complex line is either empty or contractible to a point. In my lecture I will discuss a result which connects several notions of convexity: I will show that lineally convex Hartogs domains define a convex set if they satisfy a condition which is implied by C-convexity.

16.00-16.45 Jockum Aniansson
Fischer kernels and Cauchy problems for the wave equation.
Let $P(W)$ and $Q(Z)$ be two polynomials in n complex variables. We want to decompose the exponential kernel $e^{W\cdot Z} = \exp(w_1z_1 + \cdots w_nz_n)$ into a sum $e^{W\cdot Z} = h(W,Z) + g(W,Z)$, where $P(D_z)h = 0$, and $Q(Z)$ divides g. If there are unique entire functions $h(W,Z)$ and $g(W,Z)$, of exponential type w r t Z, performing this, then we call them *Fischer kernels*. We will give some concrete examples.
One aim of the talk is to show how the solution φ to the inhomogeneous Cauchy–Goursat problem in $\mathbb{R}^n$,

$$\begin{cases} P(D)\varphi = \psi \\ \quad \varphi = f \quad \text{when} \quad Q = 0, \end{cases}$$

can be linked the Fischer kernels.

17.15-18.00 Nikolay Shcherbina
Hulls and Levi-flat surfaces.
A survey of the last results and a currant state in the theory of hulls and Levi-flat surfaces will be given.

Sunday May 7.

9.00-9.45 Lars Filipsson
PDE-preserving polynomial interpolation
Kergin interpolation, a multivariate generalization of Lagrange interpolation, is *PDE-preserving* in the sense that for any homogeneous polynomial q,

$$q(D)f = 0 \implies q(D)Kf = 0,$$

where Kf is any Kergin polynomial of f. It turns out that Kergin interpolation can be characterized in terms of this property. Indeed, if a continuous linear projector is such that it takes holomorphic functions into polynomials of degree d and furthermore interpolates function values at $d+1$ points, then it is a Kergin operator. (Joint with Jean-Paul Calvi)

10.00-10.45 Juhani Riihentaus
Subharmonic Functions: Non–Tangential and Tangential Boundary Behavior.
It is a classical result that every subharmonic function, defined and $\mathcal{L}^p$-integrable for some $p > 1$ on the unit disc is for almost all θ of the form $o((1-|z|)^{-\frac{1}{p}})$, uniformly as $z \to e^{i\theta}$ in any Stolz domain. Recently Stoll improved this result by showing that for domains in $\mathbb{R}^n$, $n \geq 2$, with C^1 boundary, every subharmonic function satisfying a certain weighted integrability condition has weighted non-tangential and tangential boundary limits. We improve Stoll's result still further by relaxing both the weighted integrability condition and also the assumption of C^1 boundary of the domain. Especially, we extend the result for domains whose boundaries are of finite d-dimensional Hausdorff measure (i.e. d-sets) and which in addition satisfy a rather mild accessibility condition.

11.00-11.45 Hasse Carlsson
Harmonic analysis and several complex variables
I will survey some aspects of the interplay betwee harmonic analysis and several complex variables. In particular I will discuss how the so called T1-theorem (for homogeneous spaces) about L^2-boundedness of singular integrals can be used to prove the duality between H^1 and BMOA and atomic decomposition of H^1.

Preliminär deltagarlista Nordan2000, Örnsköldsvik

Föredragshållare

Aniansson, Jochum	Stockholm
Berndtsson, Bo	Göteborg
Boman, Jan	Stockholm
Carlsson, Hasse	Göteborg
Filipsson, Lars	Gävle
Hörmander, Lars	Lund
Kiselman, Christer	Uppsala
Levenberg, Norman	Auckland
Løw, Erik	Oslo
Riihentaus, Juhani	Joensuu
Shcherbina, Nikolay	Göteborg
Öktem, Ozan	Stockholm

Deltagare

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Andersson, Mats	Göteborg	
Backlund, Ulf	Umeå	
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Ebenfeldt, Peter	Stockholm	
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Ivarsson, Björn	Uppsala	
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