Abstracts

**Weidong Chen** - Minnesota State University, Mankato  
**Title:** The Ill-posedness of Restoring Lost Samples and Regularized Restoration for Band-limited Signals  
**Abstract:** In this presentation the ill-posedness of restoring lost samples is discussed. The restoration algorithm by Shannon’s Sampling Theorem is analyzed.

A regularized restoring algorithm for band-limited signals is presented. The convergence of the regularized restoring algorithm is studied and compared with the restoration algorithm by Shannon’s sampling theorem.

**Max Engelstein** - University of Minnesota  
**Title:** Elliptic Measure in Higher Co-Dimension  
**Abstract:** We discuss an ongoing attempt to generalize the results discussed by S. Hofmann and Z. Zhao to sets whose boundary is of co-dimension $< 1$ (think about the complement of a curve in $\mathbb{R}^3$). While some results still hold, there are other situations in which wild behavior occurs. In particular, for any self-similar fractal set of co-dimension $< 2$, we can construct an operator for which the associated elliptic measure behaves nicely on that set!

This is joint work with G. David (U. Paris Sud) and S. Mayboroda (U. Minnesota).

**Steve Hofmann** - University of Missouri, Columbia  
**Title:** Quantitative absolute continuity of harmonic and caloric measure  
**Abstract:** For a domain $\Omega \subset \mathbb{R}^d$, quantitative, scale-invariant absolute continuity (more precisely, the weak-$A_\infty$ property) of harmonic measure with respect to surface measure on $\partial \Omega$ is equivalent to the solvability of the Dirichlet problem for Laplace’s equation, with data in some $L^p$ space on $\partial \Omega$, with $p < \infty$. A similar equivalence holds for caloric measure and the initial-Dirichlet problem for the heat equation, in a domain contained in space-time $\mathbb{R}^{n+1}$. Drawing an analogy to the famous Wiener criterion, which characterizes the domains in which the classical Dirichlet problem, with continuous boundary data, can be solved, it is of interest to find criteria for $L^p$ solvability, thus allowing for singular boundary data.

We shall review known results in this direction in the elliptic/harmonic setting, in which (within the past 18 months) a rather complete picture has now emerged, and then we shall discuss recent progress in the parabolic/caloric case.
Lizaveta Ihnatsyeva - Kansas State University  
**Title:** Besov functions on metric measure spaces  
**Abstract:** There are several analogues for Besov spaces in a quite general setting, which, in particular, includes certain topological manifolds, fractals, graphs and Carnot-Carathéodory spaces. Some of these Besov spaces are interpolation spaces between $L^p$ and Hajłasz-Sobolev spaces. Besov-type spaces also naturally appear as the traces of Sobolev spaces. Using available definitions, we will discuss a characterization of extension domains for Besov-type functions in the setting of a metric measure space with a doubling measure; as a special case in the Euclidean setting we obtain a characterization of extension domains for classical Besov spaces defined via $L^p$-modulus of smoothness. We will also discuss some characterizations of the traces of functions from classical Besov spaces and Triebel-Lizorkin spaces to Ahlfors regular subsets of the Euclidean space, for instance, to some Cantor-type sets and self-similar sets. The talk is based on joint work with Heli Tuominen, Toni Heikkinen and with Antti V. Vähäkangas.

Kim Klinger-Logan - Kansas State University  
**Title:** Applications of solutions of PDEs to number theory and particle physics  
**Abstract:** Recently, physicists such as Green, et al., have discovered that the behavior of gravitons (hypothetical particles of gravity represented by massless string states) is closely related to eigenvalue problems for $\Delta = y^2(\partial_x^2 + \partial_y^2)$ on $SL_2(\mathbb{Z}) \backslash \mathbb{H}$. Similar equations also appear in the study of automorphic forms and have a possible connection of zeros of the Riemann zeta function. We will discuss methods for analyzing solutions to perturbed eigenvalue problems as well as interesting applications to physics and number theory.

Zhehui Liang - Brown University  
**Title:** inverse spectrum problem for Hankel operators  
**Abstract:** Given a self-adjoint operator, we will discuss under what spectral multiplicity condition will this operator be unitary equivalent to a self-adjoint Hankel operator. Here the construction of such Hankel operator highly relies on the asymptotically stability of a contraction. Especially, for a self-adjoint compact operator with simple eigenvalues, we can always find a Hankel operator unitary equivalent to the given compact operator, and we can get a better result under compactness. The talk will mostly based on paper The inverse spectral problem for self-adjoint Hankel operators’ by A.V.Megretskii, V.V.Peller, S.R.Treil, and a little bit independent work.
Evangelos Nastas - Syracuse University  
**Title:** Dissipated nonlinear oscillator system with initial interval of self-resonance  
**Abstract:** This talk is devoted to the existence of a stable, yet increasing, solution of auto-resonant pumping main equation with decreasing amplitude, on whose interval it exists. The main asymptotics is $O(\sqrt{t})$ irrespective of the force order on an interval.

Min Ranabhat - Kansas State University  
**Title:** Poincaré and Sobolev inequalities associated to certain convex functions.  
**Abstract:** The developments of Poincaré and Sobolev inequalities associated to certain convex functions, at their early stage, involved the decay rate for the distribution function of Green’s function associated to the linearized Monge-Ampère operator. In this talk we will see a different approach towards establishing new and improved versions of such Poincaré and Sobolev inequalities under various assumptions on the corresponding Monge-Ampère measure. This is joint work with Diego Maldonado.

Trung Truong - Kansas State University  
**Title:** Shape reconstruction of anisotropic periodic structures from near field scattering data  
**Abstract:** This talk is about a study of the Factorization method for shape reconstruction of anisotropic periodic structures from near field scattering data. This method provides a fast numerical algorithm and a unique determination for the shape reconstruction of the scatterer. We present a rigorous justification for the Factorization method and several numerical examples to show how well it performs in different situations. This is joint work with I. Harris, D.-L. Nguyen and J. Sands.

Zihui Zhao - University of Chicago  
**Title:** Elliptic measures and rectifiability of domain boundaries  
**Abstract:** Given a domain, absolute continuity between harmonic measure and the boundary surface measure implies that the boundary is rectifiable. On the other hand for elliptic measures, singularity may arise from oscillations of the elliptic operators, as well as singularity of the boundary. We show that for an elliptic operator whose gradient satisfies a Carleson measure assumption, quantitative absolute continuity of the corresponding elliptic measure does imply the boundary is uniformly rectifiable. This is joint work with S. Hofmann, J.M. Martell, S. Mayboroda and T. Toro.