Last name	First name	Institution	Title	Abstract
Dyachenko	Sergey	University of Illinois, Urbana-Champaign	Instability of steep ocean waves and whitecapping.	(Collaborative work with Professor Alan Newell.) Wavebreaking in deep oceans is a challenge that still defies complete scientific understanding. Sailors know that at wind speeds of ap proximately 5m/sec, the random looking windblown surface begins to develop patches of white foam ('whitecaps') near sharply angled wave crests. We idealize such a sea locally by a family of close to maximum amplitude Stokes waves and show, using highly accurate simulation algorithms based on a conformal map representation, that perturbed Stokes waves develop the universal feature of an overturning plunging jet. We analyze both the cases when surface tension is absent and present. In the latter case, we show the plunging jet is regularized by capillary waves which rapidly become nonlinear Crapper waves in whose trough pockets whitecaps may be spawned.
Fillman	Jake	Virginia Tech	Spectral Characteristics of the Unitary Almost-Mathieu Operator	[Joint work with Darren Ong and Zhenghe Zhang] We will discuss spectral characteristics of a one-dimensional quantum walk whose coins are distributed quasi-periodically. The unitary update rule of this quantum walk shares many spectral characteristics with the critical Almost-Mathieu Operator. In particular, this model exhibits Cantor spectrum of zero Lebesuge measure for all irrational frequencies and arbitrary phase. In fact, one can show something stronger, namely, that that the Lyapunov exponent of the associated one-parameter cocycle vanishes on the spectrum. Furthermore, the spectral type is purely singular continuous for every irrational frequency and almost every phase. The key ingredients in our proofs are the global theory of analytic one-frequency quasi-periodic cocycles, self-duality via the Fourier transform, and a Johnson-type theorem for singular dynamically defined CMV matrices which characterizes their spectra as the set of spectral parameters at which the associated cocycles fail to admit a dominated splitting.
Harrison	Jonathan	Baylor University	Pseudo orbits on graphs and counting Lyndon words	Spectral problems on quantum graphs can be investigated by expanding them as sums over pseudo orbits, sets of periodic orbits. It turns out that only a finite collection of primitive pseudo orbits where the total number of edges in the pseudo orbit is less than or equal to the number of edges of the graph contribute. In the case of binary graphs periodic orbits correspond to binary words and primitive orbits to Lyndon words (words that are strictly smaller in lexicographic order than all their cyclic permutations). Evaluating spectral quantities then requires factoring words in decreasing sequences of Lyndon words for which we obtain new results.
Hoang	Vu	Rice University	One-dimensional model equations for the 3D Euler equations	(joint work with A.Kiselev, T. Do, M. Radosz, X. Xu) One of the most difficult questions in fluid mechanics is to decide whether solutions of the 3D Euler equations develop singularities in finite time from smooth initial data. In this talk, I discuss one-dimensional model problems that capture various essential effects that may cause blowup in the Euler equations and report on recent progress to understand blowup for nonlocal, nonlinear transport equations.
Kocic	Sasa	University of Mississippi	Renormalization and rigidity of circle maps with breaks	We proved the renormalization conjecture for circle diffeomorphisms with breaks, i.e., that the renormalizations of any two $C^{2+\alpha}$-smooth ($\alpha\in(0,1)$) circle diffeomorphisms with a break point, with the same irrational rotation number and the same size of the break, approach each other exponentially fast in the C^2-topology. As we have previously shown, this result implies the following strong rigidity statement: for almost all irrational numbers ρ, any two circle diffeomorphisms with a break, with the same rotation number ρ and the same size of the break, are C^1-smoothly conjugate to each other. As we have previously proved, the latter claim cannot be extended to all irrational rotation numbers. These results can be considered an extension of Herman's theory on the linearization of circle diffeomorphisms.

Kryzhevich	Sergey	University of Texas at Dallas	Multishadowing in topological dynamics	This is a joint work with my student, Danila Cherkashin An approach to find a weak form of shadowing is developed. We consider homeomorphisms of a compact metric space. It is proved that every pseudotrajectory with sufficiently small errors contains at least one subsequence that can be shadowed by a subsequence of an exact trajectory with same indices. We study systems with so-called multishadowing property that is any pseudotrajectory can be shadowed by a finite number of exact orbits. Criteria for existence of ε-- networks whose iterations are ε -- networks are given. Relations between multishadowing and some ergodic and topological properties of dynamical systems are discussed.
Lukic	Milivoje	University of Toronto	Almost periodicity in time of solutions of the KdV equation	We study the Cauchy problem for the KdV equation $\partial_t u - 6 u \partial_x u + \partial_x^3 u = 0$ with almost periodic initial data $u(x,0)=V(x)$. We consider initial data V, for which the associated Schr\"odinger operator is absolutely continuous and has a spectrum that is not too thin in a sense we specify, and show the existence, uniqueness, and almost periodicity in time of solutions. This establishes a conjecture of Percy Deift for this class of initial data. The result is shown to apply to all small analytic quasiperiodic initial data with Diophantine frequency vector. This is joint work with I. Binder, D. Damanik, and M. Goldstein.
Lushnikov	Pavel	University of New Mexico	Complex branch cuts of Stokes wave	Stokes wave is the fully nonlinear periodic gravity wave propagating with the constant veloci1ty. Complex analytical structure of Stokes wave is studied as it approaches the limiting form with 120 degrees angle on the crest. A conformal map is used which maps a free fluid surface of Stokes wave into the real line with fluid domain mapped into the lower complex half-plane. The Stokes wave is fully characterized by the complex singularities in the upper complex half-plane. We found that the only singularities of Stokes wave is one square-root branch point per wave period. That branch cut defines the second sheet of the Riemann surface if we cross the branch cut. Second singularity is also the square-root and located in that second (nonphysical) sheet of the Riemann surface in the lower half-plane. Crossing corresponding branch cut in second sheet one arrives to the third sheet of Riemann surface with another singularity etc forming infinite number of sheets. As the nonlinearity increases, all singularities approach the real line forming the classical Stokes solution (limiting Stokes wave) with the branch point of power 2/3.

Ong	Darren	University of Oklahoma	Spreading Estimates for Quantum Walks on the Integer Lattice via Power-Law Bounds on Transfer Matrices	with David Damanik and Jake Fillman We discuss spreading estimates for dynamical systems given by the iteration of an extended CMV matrix. Using a connection due to Cantero--Gr\"unbaum--Moral--Vel\'azquez, this enables us to study spreading rates for quantum walks in one spatial dimension. We prove several general results which establish quantitative upper and lower bounds on the spreading of a quantum walk in terms of estimates on a pair of associated matrix cocycles. To demonstrate the power and utility of these methods, we apply them to several concrete cases of interest. In the case where the coins are distributed according to an element of the Fibonacci subshift, we are able to rather completely describe the dynamics in a particular asymptotic regime. As a pleasant consequence, this supplies the first concrete example of a quantum walk with anomalous transport, to the best of our knowledge. We also prove ballistic transport for a quantum walk whose coins are periodically distributed.
Simanek	Brian	Baylor University	Right Limits of the Bergman Shift Matrix	The Bergman Shift is the multiplication-by-variable operator on a Hilbert space of functions. When using the basis of orthonormal polynomials, the matrix representation of this operator is a Hessenberg matrix. We will discuss the relationship between properties of this matrix and properties of the corresponding orthonormal polynomials with a special focus on ratio asymptotics.
Sukhinin	Alexey	Southern Methodist University	Collapse event of co-propagating high-intensity optical beams.	Recently, filamentation based on co-propagating beams with different wavelengths has gained some attention. Filament propagation is formed due to self-focusing and plasma defocusing. Self-focusing of a single high intensity beam, described by Nonlinear Schrodinger Equation, is a well-studied phenomenon in nonlinear optics. However, this is not the case for co-propagating beams. In this talk I will discuss the collapsing solutions of two-color filament model as well as other possible evolution scenarios.
Sun	Juntao	University of Texas Rio Grande Valley	Ground state solution for a class of non-autonomous Schrodinger-Poisson systems in dimension three	Schrodinger-Poisson system, also known as the nonlinear Schrodinger-Maxwell equations, is suggested as a model describing the interaction of a charged particle with the electrostatic field in quantum mechanics. In this talk, by introducing a new set, which is the filtration of the Nehari manifold together with variational methods, we are concerned with the existence of ground state solution for a class of non-autonomous Schrodinger-Poisson systems without any symmetry assumptions. Some applications are also provided.
Weyand	Tracy	Baylor University	Spectral Zeta Function of the Dirac Operator on Quantum Graphs	The spectral zeta function generalizes the Riemann zeta function by replacing the sum over integers with a sum over a spectrum. Here we take that spectrum to be the spectrum of the Dirac operator acting on a quantum graph. Since all eigenvalues are roots of a secular equation, we can calculate the spectral zeta function explicitly by taking a particular contour integral and applying the argument principle. This will be done first for a rose graph, and then for general graphs. This is based on joint work with Jon Harrison.
Yang	Yunyun	Baylor University	Distribution theory and spectral asymptotics.	I will briefly introduce the theory of thick distributions. I will also introduce the asymptotic expansions of distributions and of thick distributions. As an example, I will show how recent observations of Kolomeisky et al.\ [Phys.\ Rev.\ A \textbf{87} (2013) 042519] fit into the established framework of the distributional asymptotics of spectral functions. A common tool in Casimir physics (and many other areas) is the asymptotic (high-frequency) expansion of eigenvalue densities, employed as either input or output of calculations of the asymptotic behavior of various Green functions.

Yoon	Jasang	The University of Texas Rio Grande Valley	An answer to a question of A. Lubin: The lifting problem for commuting subnormals	In this talk we give an answer to a long-standing open problem on the lifting problem for commuting subnormals (due to A. Lubin): The subnormality for the sum of commuting subnormal operators does not guarantee the existence of commuting normal extensions.