THE GAINESVILLE ALLADI 70 CONFERENCE

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University of Florida, Gainesville, FL 32611

ABSTRACTS

Archit Agarwal, IIT Indore

Generalizations of a q-series identity of Uchimura with applications

In 1981, Uchimura rediscovered a q-series identity of Ramanujan whose one side is the generating function for the divisor function $d(n)$. For $|q| < 1$, he showed that

$$\sum_{n=1}^{\infty} nq^n (q^{n+1})_\infty = \sum_{n=1}^{\infty} \frac{(-1)^{n-1} q^{\frac{n(n+1)}{2}}}{(1-q^n)(q)_n} = \sum_{n=1}^{\infty} \frac{q^n}{1-q^n}.$$

This identity has since been generalized in various directions by Uchimura, Dilcher, Andrews–Crippa–Simon, and Gupta–Kumar. We refer to generalizations of the rightmost, middle, and leftmost expressions as *divisor-type*, *Ramanujan-type*, and *Uchimura-type* sums, respectively.

Uchimura also applied this identity to probability theory. Later, Simon, Crippa, and Collenberg showed that the limiting mean of a random variable arising from a random acyclic digraph model is related to the divisor generating function, and Andrews, Crippa, and Simon computed the corresponding limiting variance using q-series methods.

In this talk, we review these results and present a unified framework.

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Amod Agashe, Florida State University

The zeros of the Riemann zeta function and its generalization to modular forms

The Riemann hypothesis says that the Riemann zeta function should have zeros only at complex numbers with real part 1/2 and at negative even integers. We will study the completed Riemann zeta function (the one with the Gamma factor) and discuss how it sheds some light heuristically on the location of the zeros. There is a generalization of the Riemann hypothesis to L-functions of modular forms, and we will discuss what can be said in this context.

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Kritika Aggarwal, Indraprastha Institute of Information Technology

Periodicity associated with a certain class of Arithmetical function of Chandrasekharan and Narasimhan type

In this talk, we discuss the almost periodic properties of the error term associated with a certain class of arithmetical functions introduced by Chandrasekharan and Narasimhan. By employing a Voronoï-type identity for the corresponding error term, we prove that it belongs to the Besicovitch space B^4 of almost periodic functions, which is a stronger condition than $\mathcal{B}^2$-almost periodicity. As a consequence of this property, we show that the error term admits a limiting distribution.

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Scott Ahlgren, University of Illinois

Modular forms modulo squares of primes

Modular forms and their congruences have long played an important role in number theory. The theory of modular forms modulo primes p is well understood. Central to this theory is the theta cycle of a modular form, which is the self-repeating structure arising from repeated differentiation. By contrast until now almost nothing is known about the theta cycle modulo squares of primes. I will describe work with Martin Raum, Olav Richter and Amy Woodall in which we determine (asymptotically) 50% of this theta cycle exactly and provide non-trivial bounds for all of it.

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Yazan Alamoudi, University of Florida

A resolution of a conjecture related to the Alladi-Schur polynomials

In 2016, in a preprint which was ultimately collected for ALLADI60 and published in 2018, G. Andrews conjectured that the polynomial

$$c(n,j) = \sum_{r=0}^{j} \sum_{0 \leq 3i \leq r} \frac{(-1)^i q^{4nj-2nr+j+3i(i-1)}(q^2;q^2)_n}{(q^2;q^2)_{n-j}(q^2;q^2)_{j-r}(q^2;q^2)_{r-3i}(q^6;q^6)_i},$$

has only nonnegative coefficients. Andrews was investigating such polynomials because of their relation to the Alladi-Schur polynomials, which played a key role in his refinement of the Alladi-Schur theorem.

Near the end of last year, I resolved this conjecture using a completely elementary technique. In this talk, I will detail the proof and, if time permits, discuss further lower bounds, as well as highlight intriguing intricacies and potential pitfalls associated with this question. Additionally, I will provide remarks on the connection to Andrews' refinement of the Alladi-Schur theorem.

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George E. Andrews, The Pennsylvania State University

Partition problems in the spirit of MacMahon

(The talk is joint work with T. Amdeberhan, M. Merca, S. Rose and R. Tauraso). In the paper, Further Study on MacMahon-Type Sums of Divisors (Res. in Number Th.11, #19, (2025)), Amdeberhan, Tauraso and I studied five new generating functions (parametrized by an index a taking the values $-2, -1, 0, 1, 2$) generalizing the functions studied by P.A. MacMahon in his paper, Divisors of Numbers and Their Continuations in the Theory of Partitions (Proc. London Math. Soc. (2), 19(1920), 305-340). In this talk, we concentrate on the a=0 case where a new representation of the generating function has close connections with polynomials whose roots provide the maximal real subfields of the cyclotomic fields. We shall also discuss open problems.

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Koustav Banerjee, University of Cologne, Germany

Inequalities for arithmetic sequences via hyperbolicity of Jensen polynomials

In this, we will discuss inequalities (for example, log-concavity, higher Turán inequalities, Laguerre inequalities, infinite log-concavity) for arithmetic sequences through the lens of Jensen polynomials. This is a joint work with Kathrin Bringmann and Larry Rolen.

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Rupam Barman, Indian Institute of Technology Guwahati

Hook length inequalities for t-regular partitions

Integer partitions are fundamental objects in combinatorics, geometry, mathematical physics, number theory, and representation theory. In particular, hook lengths of partitions arise in the study of class numbers of imaginary quadratic fields. Other than the ordinary partition function, hook lengths have also been studied for several restricted partition functions, for example, partitions into odd parts, partitions into distinct parts, and self conjugate partitions. Recently, Ballantine et al. and Craig et al. studied hook length inequalities in partitions into odd parts and partitions into distinct parts. Motivated by the works of Ballantine et al. and Craig et al., we have studied hook length inequalities for t-regular partitions. In this talk, we present several hook length inequalities for t-regular partitions. This is a joint work with Dr. Gurinder Singh.

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Olivia Beckwith, Tulane University

A modular framework for generalized Hurwitz class numbers

We explore the modular properties of generating functions for Hurwitz class numbers endowed with level structure. Our work is based on an inspection of the weight $1/2$ Maass-Eisenstein series of level $4N$ at its spectral point $s = 3/4$, extending the work of Duke, Imamoḡlu and Tóth in the level 4N setting. We construct a higher level analogue of Zagier's level 4 mock modular Eisenstein series and a preimage under the -operator. We explore linear relations among this series, Zagier's Eisenstein series, and higher level holomorphic Eisenstein series defined by Pei and Wang, as well as connections to ternary quadratic forms. Furthermore, we connect the aforementioned results to a regularized Siegel theta lift as well as a regularized Kudla-Millson theta lift for odd prime levels, which builds on earlier work by Bruinier, Funke and Imamoḡlu. This is joint work with Andreas Mono and Ngoc Trinh Le.

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Lea Beneish, University of North Texas

Towards Artin's conjecture on p-adic forms in low degree

Let F be a homogeneous polynomial of degree n in at least d^2+1 variables over the p-adic numbers, $\mathbb{Q}_p$. Artin conjectured that such F always have nontrivial zeros in any p-adic field. Although this has been shown to be false in general, the conjecture is still widely believed to be true for prime degree forms. This conjecture holds for d=2 and d=3 due to Hasse and Lewis, respectively. By the work of Ax and Kochen, the conjecture is also known to hold whenever the characteristic of the residue field is sufficiently large. In this talk, we will explore recent progress for low degree forms towards making bounds on the size of the residue field effective. A wide range of techniques are needed, including Bertini theorems, point counting on curves over finite fields, and computation. This is joint work with Christopher Keyes.

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Alexander Berkovich, University of Florida

Finite analogs of partition bias related to hook length two and a variant of Sylvester's map

In this talk I discuss the total number of hooks of length two in all odd partitions of n and all distinct partitions of n with a bound on the largest part of the partitions. I generalize inequalities of Ballantine, Burson, Craig, Folsom and Wen by showing there is a bias in the number of hooks of length two in all odd partitions over all distinct partitions of n in presence of a bound on the largest part. To establish such a bias, I use a variant of Sylvester's map. This talk is based on a joint work with Aritram Dhar

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Bruce Berndt, University of Illinois at Urbana-Champaign

Koshliakov's Zeta Functions and Summation Formulae

Motivated by a boundary value problem in heat conduction, nearly a century ago, the Russian mathematician, N. S. Koshliakov, showed that the problem's eigenvalues led to new summation formulas and zeta functions. He hinted that a vast, more general theory existed, independent of any connections with boundary value problems, but with naturally occurring 'eigenvalues' A portion of this theory, which is joint work with Atul Dixit and Rajat Gupta, is presented.

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Gaurav Bhatnagar, RamanujanExplained.org

Ramanujan and log derivatives

The recurrence

$$np(n) = \sum_{i=1}^{n} \sigma(i)p(n-i)$$

has been used by Erdős and credited to Ford (1931) but appears in Ramanujan's notebooks. Here the divisor function $\sigma(n)$ is related to the partition function $p(n)$. We show how Ramanujan could have obtained this result, and show some evidence that this was one of Ramanujan's standard tricks. Using a slight modification of this trick, we obtain an elementary proof of Ramanujan's famous congruences $p(5n+4) \equiv 0 \pmod 5$ and $\tau(5n+5) \equiv 0 \pmod 5$. The proof requires no more than what Euler and Jacobi (and Ramanujan) knew and embeds these results in an infinite set of such congruences.

This is joint work with Hartosh Singh Bal.

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Jonathan Bradley-Thrush, Universidade de Lisboa

A classical method with applications to q-series

In late-nineteenth-century work on the theory of elliptic functions, there is a particular method which is used to determine the Fourier series expansion of ratios of theta functions. I will describe this method with reference to Biehler's thesis of 1879, which contains several uses of it. I will then give some examples to show how the method may be applied to q-series, including a very short proof of the special case of Ramanujan's ${}_1\psi_1$ summation which is used to obtain formulae related to sums of squares. I will conclude by explaining how the method may be used to correct Askey's deliberately erroneous series expansion of a particular infinite product, which he gave as a cautionary example in his 1987 paper on formal Laurent series.

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Walter Bridges, University of North Texas

Integer partitions and statistics for random representations of Lie algebras

Choose a partition of a large integer uniformly at random. How big do we expect the largest part to be? How many 1's are there? What does the Young diagram look like? For that matter, how can we generate large partitions efficiently, to collect data and make conjectures? In 1993, Fristedt introduced a statistical mechanics inspired approach to these sorts of questions that has proved widely useful in analytic combinatorics. Adapting Fristedt's conditioning device to our setting, I will describe how a typical, large-dimensional representation looks for the family of complex Lie algebras, $\mathfrak{sl}_{r+1}(\mathbb{C})$. (The case $r = 1$ corresponds to integer partitions.) In particular, we give asymptotic probability distributions for the multiplicity of small irreducible representations, as well as the largest dimension, the largest height, and the total number of irreducible resentations appearing in the decomposition of a representation sampled uniformly from all representations with the same dimension. This is joint work with Kathrin Bringmann and Caner Nazaroglu.

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Glenn Bruda, University of Florida

Generalized polygonal number representations

For $k \geq 5$ and $n \geq 4$, let $r_n^{(k)}(N)$ be the number of representations of N as the sum of n generalized k-gonal numbers and $r_n^{\square}(N)$ be the number of representations of N as the sum of n squares. By modifying the Heath-Brown circle method, we obtain an explicit asymptotic relation between $r_n^{(k)}(N)$ and $r_n^{\square}(N)$. Consequently, we relate the number of representations of N as the sum of four ordinary k-gonal numbers to $r_4^{\square}(N)$ via a result of Bringmann–Jang–Kane–Tse.

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Bryden Cais, University of Arizona

Iwasawa theory of unramified geometric Z_p-extensions of function fields

In this talk, I will describe a novel Iwasawa theory for unramified Z_p-extensions of global function fields over an algebraically closed field of characteristic p. In this context, the p-adic slopes of Frobenius acting on the first crystalline cohomology of the associated Z_p-tower of algebraic curves provide a new kind of Iwasawa-theoretic object to study, and I will present evidence for a recent conjecture about the limiting behavior of these slopes.

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Frank Calegari, University of Chicago

A new proof that π is transcendental

In recent work with Dimitrov and Tang, we showed how one could adapt the method of Apery to prove new results in irrationality. This talk will discuss other applications of our techniques to a number of problems including the effective S-unit equation and a new proof that π is transcendental.

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Cruz A. Castillo, University of Illinois Urbana Champaign

Non-vanishing for quartic Hecke L-functions and elliptic curve L-functions

We show that a positive proportion of Hecke L-functions attached to the quartic residue symbol modulo squarefree Gaussian integers do not vanish at the central point. Our method also extends to the Hecke characters associated to squarefree quartic twists of the congruent number elliptic curve over the Gaussian field. In particular, we prove that a positive proportion (ordered by norm) of squarefree quartic twists of the congruent number elliptic curve over the Gaussian field have Mordell-Weil rank 0. This is joint work with Alexandre de Faveri and Alexander Dunn.

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M.P. Chaudhary, International Scientific Research and Welfare Organization, New Dehli

On discrete measure and the Riemann hypothesis on functions fields

We introduce the discrete measure on function fields, further study its Mellin transform and analytic proprieties. Moreover, we give an equivalence to the Riemann hypothesis on function fields using the discrete measure and also present several results including upper bounds of the functions $\zeta_K(2), L_K(\frac{1}{q^2})$ and $\xi_K(2)$.

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Dandan Chen, Shanghai University

On the total number of ones associated with cranks of partitions modulo 11

In 2021, Andrews mentioned that George Beck introduced partition statistics $M_w(r, m, n)$, which denote the total number of ones in the partition of n with crank congruent to r modulo m. Recently, a number of congruences and identities involving $M_w(r, m, n)$ for some small m have been developed. We establish the 11-dissection of the generating functions for $M_\omega(r, 11, n) - M_\omega(11 - r, 11, n)$, where $r = 1, 2, 3, 4, 5$. In particular, we discover a beautiful identity involving $M_\omega(r, 11, 11n + 6)$. This is joint with Rong Chen and Siyu Yin.

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Rong Chen, Shanghai Normal University

Congruence families for generalized Frobenius patitions

Garvan, Sellers and Smoot discovered a remarkable symmetry in the families of congruences for generalized Frobenius partitions $c\psi_{2,0}$ and $c\psi_{2,1}$. They also emphasized that the considerations for the general case of $c\psi_{k,b}$ are important for future work. In the present work, we construct a vector-valued modular form for the generating functions of $c\psi_{k,b}$, and determine an equivalence relation among all b. Within each equivalence class, we can identify modular transformations relating the congruences of one $c\psi_{k,b}$ to that of another $c\psi_{k,b'}$. Furthermore, correspondences between different equivalence classes can also be obtained through linear combinations of modular transformations. As an example, with the aid of these correspondences, we prove a family of congruences of $c\phi_3$, the Andrews' 3-colored Frobenius partition. This is a joint work with Xiao-Jie Zhu.

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Shiva Chidambaram, University of Wisconsin-Madison

Minimal objects in the visibility category of Shafarevich-Tate groups

For an elliptic curve E and an element σ of its Shafarevich-Tate group, the visualization category consists of abelian varieties that contain E and visualize the torsor representing σ. We answer several fundamental questions about minimal objects in this category, including Mazur's question about how different two minimal objects can be. We revisit two constructions for proving visibility, due to Cremona-Mazur, and Agashe-Stein. When ξ has order 2, by making the Cremona-Mazur construction explicit, we produce interesting examples, and a totally explicit proof of visibility of such elements in abelian surfaces (originally due to Bruin, and Klenke). Conditions for minimal visualization in the Agashe-Stein construction, naturally translate to interesting arithmetic statistics questions about Galois groups of number fields.

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Howard Cohl, National Institute of Standards and Technology

Connection formulas for Askey-Wilson polynomials and related expansions

We derive and study expansions of and over the Askey–Wilson polynomials. We study these expansions and examine some limits to the continuous dual q-Hahn, Al-Salam–Chihara, continuous big q-Hermite and continuous q-Hermite polynomials and their q^{-1}-analogues. The Poisson kernel for the infinite discrete orthogonality relation for the q^{-1}-Al-Salam–Chihara polynomials is derived which in a special case reduces to the Gupta–Masson biorthogonal rational ${}_4\phi_3$-functions. This Poisson kernel implies new infinite series connection relations for the Askey–Wilson polynomials involving these rational ${}_4\phi_3$-functions. We also consider various interesting limits.

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Philip Cuthbertson, Michigan Technological University

Joint Distributions of Hook Lengths in Integer Partitions

Hook lengths in integer partitions have been widely studied and much work has gone into understanding how they are distributed. Inspired by an identity of Anible and Keith, we derive generating functions for some joint distributions of hook lengths and provide a conjecture for the general form that these series will take.

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Madeline Dawsey, University of Texas at Tyler

Densities of Subsets of Primes in the Spirit of Alladi

Inspired by work of Alladi in the 1970s, a flurry of activity over the last ten years has resulted in new formulas for densities of sets of prime numbers. Most of our understanding of the distribution of primes comes from the Prime Number Theorem. More specifically, one can ask whether the methods

from analytic number theory yield formulas for densities of subsets of primes. One famous instance of this is the strong form of Dirichlet's famous theorem on primes in arithmetic progressions. In 2017, we established formulations of Dirichlet's Theorem, and more generally the Chebotarev Density Theorem, which may be viewed as the non-abelian extension of Alladi's work. Following this work, several further generalizations by Sweeting–Wu, Kural–McDonald–Sah, Ono–Scchneider–Wagner, and others have led to many new density formulas.

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Aritram Dhar, University of Florida

On Glaisher's Partition Theorem

Glaisher's theorem states that the number of partitions of n into parts which repeat at most $m-1$ times is equal to the number of partitions of n into parts which are not divisible by m. The $m=2$ case is Euler's famous partition theorem. Recently, Andrews, Kumar, and Yee gave two new partition functions $C(n)$ and $D(n)$ related to Euler's theorem. Lin and Zhang extended their result to Glaisher's theorem by generalizing $C(n)$. In this talk, we generalize $D(n)$, prove an analogous partition identity for the $m=3$ case, and show that the general case is an example of an almost partition identity. We also provide a new series equal to Glaisher's product both in the finite and infinite cases. This is joint work with George E. Andrews.

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Atul Dixit, Indian Institute of Technology Gandhinagar

Non-Rascoe partitions and a rank parity function associated with the Rogers-Ramanujan partitions

We study an interesting analogue of Ramanujan's celebrated quantum modular form $\sigma(q)$. It is the generating function of the excess number of Rogers-Ramanujan partitions with odd rank over those with even rank. Using combinatorial and analytical techniques, we show that this generating function is closely connected with an interesting class of restricted partitions termed here as **non-Rascoe partitions**. These are the partitions into distinct parts where the number of parts is not a part. We derive several arithmetic properties of the number of such partitions via this connection and conjecture an interesting mod 4 congruence. Generalizations of most of these results in a parameter ℓ are obtained in conjunction with the generalized Rogers-Ramanujan partitions associated with some results of Garrett, Ismail and Stanton. Using a generalized modular relation occurring on page 27 of Ramanujan's Lost Notebook, we obtain a congruence involving the number of non-Rascoe partitions and coefficients of certain tenth order mock theta functions. This is joint work with Gaurav Kumar and Aviral Srivastava.

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Alex Dunn, Georgia Tech

Recent developments in non-vanishing for higher order Hecke L-functions

In this talk I will describe recent progress on the non-vanishing problem for cubic and quartic Hecke L-functions (over number fields). The cubic case is based on a joint work with A. de Faveri, C.David, and J.Stucky. The quartic case Is joint work in progress with C.Castillo and A. de Faveri.

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Dennis Eichhorn, University of California, Irvine

Infinite Products that Enjoy a Curious Self-Convolutive Property

In 2002, Andrews, Lewis, and Lovejoy introduced the combinatorial objects called *partitions with designated summands*. If we restrict our attention to PDO(n), the number of partitions with designated summands in which all parts are odd, a very curious property emerges. The very unexpected identity

$$\sum_{n=0}^{\infty} \mathrm{PDO}(2n)q^n = \left(\sum_{n=0}^{\infty} \mathrm{PDO}(n)q^n\right)^2$$

holds. That is, the sequence $\{\mathrm{PDO}(2n)\}_{n=0}^{\infty}$ is the convolution of the sequence $\{\mathrm{PDO}(n)\}_{n=0}^{\infty}$ with itself! We now refer to sequences with this property as "2-convolutive."

An exhaustive search of the over 385,000 entries in the Online Encyclopedia of Integer Sequences reveals only a very small handful of previously known 2-convolutive sequences. In this talk, in joint work with Chern, Fu, and Sellers, we expand this short list of interesting 2-convolutive sequences, and we use both combinatorial and analytic techniques to study PDO(n) and other partition functions that share this curious property. In addition, we begin the exploration of 3-convolutive sequences (defined analogously), and we present several unsolved problems in this area.

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Larry Ericksen, NJ

Multicolor overpartitions in arbitrary bases - Number sequences and polynomial analogues

We discuss the combinatorics of overpartitions in any base representation. Their parts are expressed in a fixed number of colors, and we consider restrictions on the number of parts in each color. From specific subsets of the overpartitions, we obtain certain special integer sequences.

We analyze polynomial analogues of the partitions with generating functions, recursions, and Chebyshev polynomials. We consider several sequences of single-variable polynomials that have meaningful combinatorial interpretations as well as interesting zero distributions This is joint work with Karl Dilcher.

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Amanda Folsom, Amherst College

q-series and quantum modularity

q-series identities within the unit disk and at roots of unity on its boundary play important roles in the intersecting areas of q-hypergeometric series, partition theory, and modularity. For example, part of Ramanujan's original 1920 characterization of his mock theta functions implies that they are q-hypergeometric series for which there are theta functions compensating for their exponential asymptotic growth as q radially tends towards suitable roots of unity. Cohen and Zagier have established related identities in other contexts more recently, along with many others. We will offer a brief overview of this topic, and also present new results which establish quantum modularity of related q-series and identities. Some of what we present in this talk is preliminary joint work with J. Dousse (Geneva) and J. Lovejoy (Paris).

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Ayla Gafni, University of Mississippi

Rough numbers between consecutive primes

Erdős problem #682 conjectures that almost every prime gap contains a rough number whose smallest prime factor is at least the size of the gap. We confirm this conjecture and give upper bounds for the size of the exceptional set of gaps. Further, we establish precise asymptotics for the exceptional set, under the assumption of the Hardy-Littlewood prime tuples conjecture. This is joint work with Terence Tao.

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Krystian Gajdzica, Jagiellonian University

Rectangle partitions generalizing integer partitions

The story of integer partitions goes back to Euler, who, among other things, discovered the generating function for the partition function $p(n)$:

$$\sum_{n=0}^{\infty} p(n)q^n = \prod_{n=1}^{\infty} \frac{1}{1-q^n}.$$

There is a wealth of ways to generalize the partition function. In this talk, we present a "geometric" extension of the partition function, and consider the number $p(m,n)$ of ways to partition a rectangle of size $m \times n$ into rectangular blocks with integer sides, where two partitions of the rectangle are considered the same if they consist of the same multiset of blocks (their geometric arrangement is neglected). We show some basic properties of $p(m,n)$ and derive the analog of Hardy-Ramanujan formula in the case of $p(2,n)$. Moreover, we also investigate the asymptotic behavior of the number of restricted partitions of a rectangle, where only blocks of special sizes can be used as parts.

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Meghali Garg, IIT Indore

Rademacher-type exact formula and higher order Turán inequalities for cubic overpartitions

In 1918, Hardy and Ramanujan made a breakthrough by developing the circle method to deduce an asymptotic formula for the partition function p(n), which was later refined by Rademacher in 1937 to produce an absolutely convergent series representation for p(n). Since then, Rademacher-type exact formulas for various partition functions have been investigated by many mathematicians. The concept of overpartitions was introduced by Lovejoy and Corteel in 2004. Kim, in 2010, studied an overpartition analogue of cubic partitions, termed as cubic overpartitions. The main objective of this talk is to establish a Rademacher-type exact formula for cubic overpartitions and, as an application, to derive an explicit error term that leads to their log-concavity. Furthermore, applying a result of Griffin, Ono, Rolen, and Zagier, we establish higher-order Turán inequalities for cubic overpartitions. In addition, we obtain log-subadditivity and generalized log-concavity properties for cubic overpartitions inspired by the work of Bessenrodt-Ono and DeSalvo-Pak on the ordinary partition function.

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Wissam Ghantous, University of Central Florida

A symmetric p-adic symbol for triples of modular forms

We introduce a new p-adic triple symbol based on the Garrett-Rankin p-adic L-function and show that it satisfies symmetry relations, when permuting the three input modular forms. We also provide computational examples illustrating this symmetry property. To do so, we develop algorithms to compute ordinary projections of nearly overconvergent modular forms as well as certain projections over spaces of non-zero slope. Our work also gives an efficient method to calculate certain Poincare pairings in higher weight, which may be of independent interest.

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Dorian Goldfeld, Columbia University

A Generalization of Dedekind's eta function for Hecke groups over a real quadratic field

Let $D \equiv 1 \pmod 4$ be a discriminant of a real quadratic field. For z in the upper half plane we consider the Hecke group $H(\sqrt{D})$ generated by the transformations

$$z \mapsto -\frac{1}{z}, \qquad z \mapsto z + \sqrt{D}.$$

The fundamental domain for this Hecke group has infinite volume.

For $q = e^{2\pi i z}$ we construct a certain generalization of the q-product for the Dedekind eta function and show that this infinite product is a (non square integrable) holomorphic modular form for the Hecke group $H(\sqrt{D})$ which vanishes at the cusp at ∞. We also show that these modular forms have Fourier expansions where the Fourier coefficients have exponential growth. This is joint work with Debmalya Basak, Winston Heap, Nicolas Robles, Alexandru Zaharescu.

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Ankush Goswami, University of Texas Rio Grande Valley

Resurgence, Habiro elements and strange identities

We prove resurgence properties for the Borel transform of a formal power series associated to elements in the Habiro ring which satisfy a general type of strange identity. As an application, we prove a conjecture in quantum topology due to Costin and Garoufalidis for two families of torus knots. This is a joint work with Crew (Imperial), Fantini (Orsay), Wheeler (IHES) and Osburn (UCC).

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Jena Gregory, University of Texas Rio Grande Valley

Combinatorial statistics witnessing an infinite family of congruences for a sum of partition functions.

In 2007, Kronholm established infinite families of congruences in arithmetic progression, modulo any prime ℓ, for $p(n, m)$, the function enumerating the partitions of n into parts whose sizes come from the set $\{1, 2, \ldots, m\}$. In 2022, Eichhorn, Kronholm, and Larsen proved there are combinatorial statistics described in terms of the multiplicities of the part sizes, called "Multiplicity Based Statistics" (MB) that witness Kronholm's congruences. Here, "witness" means given a congruence of the form

$$p(n, m) \equiv 0 \pmod{\ell},$$

a combinatorial statistic classifies the set of partitions of n into ℓ equally sized subsets by directly inspecting the partitions themselves.

In this talk, we prove the same MB statistics witnessing Kronholm's congruences witness another infinite family of congruences of the form

$$p(a, m) \pm p(b, m) \equiv 0 \pmod{\ell},$$

where b is determined by a and a and b are not necessarily the same numbers in Kronholm's original result. We conclude by showing that we can gently modify these MB statistics to witness a third infinite family of congruences. This modification answers a question posed by Eichhorn, Kronholm, and Larsen.

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Rajat Gupta, Indian Institute of Technology Jodhpur, India

On the kth smallest part of a partition into distinct parts

In this talk, we first review a classic theorem of Uchimura which states that the difference between the sum of the smallest parts of the partitions of n into an odd number of distinct parts and the corresponding sum for an even number of distinct parts is equal to the number of divisors of n. Then

we introduce the notion of k-th smallest part of a partition of n, $s_k(\pi)$ and extend the Uchimura's result.
This is a joint work with Noah Lebowitz-Lockard and Professor Joseph Vandehey.

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Bernhard Heim, University of Cologne

Reframing the Structure and Zeros of Generalized D'Arcais Polynomials

In this joint work with Markus Neuhauser, we investigate D'Arcais polynomials, which extend k-colored partitions and encompass all powers of the Dedekind eta function. We present new results on their zero distributions, examine their coefficients, and apply both analytic and algebraic number theoretic techniques, particularly excluding nontrivial roots of unity as zeros. We also provide a broader framework connecting combinatorial and number theoretic problems and highlight novel insights.

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Timothy Huber, University of Texas Rio Grande Valley

Counting holomorphic modular forms generated by generated by quotients of Klein forms

Let a_0 be an even positive integer. For each fixed integer $N \geq 5$, we give closed formulas for the number of products

$$q^r (q^N; q^N)_\infty^{a_0} \prod_{i=1}^{\lfloor N/2 \rfloor} (q^i, q^{N-i}; q^N)_\infty^{a_i}, \qquad r := \frac{N}{24} a_0 + \sum_{i=1}^{\lfloor N/2 \rfloor} \left(\frac{N}{12} - \frac{i}{2} + \frac{i^2}{2N} \right) a_i$$

that are holomorphic modular forms for $\Gamma_1(N)$ of weight $a_0/2$ by counting integer lattice points satisfying linear congruences in appropriate polytopes. The Fourier coefficients of certain products in these classes satisfy Ramanujan-type congruences for primes and prime powers.

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Abhishek Jha, University of Illinois Urbana-Champaign

Linnik's problem for Euler's totient function

Linnik's famous theorem states that there exists a positive constant C such that for any sufficiently large integer q and any integer a co-prime to q, there exists a prime number $p \leq q^C$ such that $p \equiv a \pmod q$. Thanks to works of Jutila, Heath-Brown, Xylouris and others, we now know that one may take $C = 5$. In this talk I will discuss a variant of Linnik's problem for the Euler's totient function.

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Prassanna Nand Jha, Indian Institute of Technology, Gandhinagar

Higher Order Dualities over Global Function Fields and Weighted Möbius Sums over $\mathbb{F}_q[T]$

Alladi's duality identities (1977) provide a fundamental relation between the smallest and the k-th largest prime factors of integers. In this paper, we establish these dualities in the setting of global function fields, extending a result of Duan, Wang, and Yi (2021) to higher orders. We apply this to study a function field analogue of the sum $\sum \mu(n)\omega(n)/n$, when restricted to integers whose smallest prime factor lies in an arbitrary subset of primes possessing a natural density. These results demonstrate how the higher-order duality identities govern the asymptotic behaviour of these weighted Möbius sums in the function field setting.

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Jayashree Kalita, Vanderbilt University

From a Conjecture of Andrews to Almost Alternating Sign Patterns

Computer experiments led Andrews, in 1986, to conjecture striking sign patterns and growth phenomena for the coefficients of five partition-theoretic q-series from the Ramanujan's Lost Notebook. The first of these functions, the now-famous series

$$\sigma(q) := \sum_{n\geq 0} \frac{q^{n(n+1)/2}}{(-q;q)_n}$$

exhibits remarkable growth and vanishing behavior, which was proven by Andrews, Dyson, and Hickerson, by tying this series to the arithmetic of the quadratic field $\mathbb{Q}(\sqrt{6})$. Cohen further uncovered that the numerical phenomenon was due to the q-series being what we would now call, thanks to work of Lewis-Zagier, a period integral of a Maass waveform. This example also foreshadowed the modern theories of mock Maass theta functions initiated by Zwegers, and quantum modular forms introduced by Zagier.

However, the other four q-series remained largely unexplored until recent work of Folsom, Males, Rolen, and Storzer, who proved some of the Andrews' conjectures for the series

$$v_1(q) := \sum_{n\geq 0} \frac{q^{n(n+1)/2}}{(-q^2;q^2)_n}.$$

Jointly with Kundu, Storzer and Wang, we established almost alternating sign patterns for coefficients of the remaining three q-series along with proving a conjecture of Andrews from his 1986 paper. Using analytic techniques such as the method of steepest descent and the circle method, we derived asymptotics for the coefficients, whose alternating and oscillatory behavior explains the observed patterns. We also introduced a new family of q-series exhibiting similar phenomena. In this talk, I will give a non-technical overview of the main ideas.

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Soon-Yi Kang, Kangwon National University

Quasi-Modularity and Prime Detection in MacMahon-Type Partition Variants

Building upon the framework of Craig, van Ittersum, and Ono, we examine the generating functions of MacMahon-type partition variants and show that they admit quasi-modular descriptions. This provides effective structural control over their coefficients, leading to a new prime-detecting expression as a key application. Furthermore, we discuss these developments through the lens of the recently introduced traces of partition Eisenstein series by Amdeberhan, Griffin, Ono, and Singh.

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William Keith, Michigan Technological University

On a conjecture of Andrews and Bachraoui

Recently, Andrews and Bachraoui considered a generating function $F_{k,m}(q)$ associated with certain two-color partitions, and conjectured that this function has non-negative coefficients for $m = 1$. They showed this property for $1 \leq k \leq 4$. With Kathrin Bringmann and Koustav Banerjee, the speaker showed that $F_{k,1}(q)$ has non-negative coefficients for $5 \leq k \leq 10$. Shane Chern has recently completed the proof of the original conjecture. This talk therefore focuses on a refined conjecture on the positivity of particular summands in the expression, which arose in the proof methods employed with Bringmann and Banerjee.

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Chadaphorn Kodsueb, Suranaree University of Technology, Thailand

Multiplication table with diagonal condition on the Gaussian integers

Multiplication table of a ring with identity **1** is said to have the diagonal condition if **1**'s occur only on the main diagonal. In this work, we study the diagonal condition in the ring of Gaussian integers $\mathbb{Z}[i]$. Furthermore, we also find the Gaussian integers α so the ring of Gaussian integers modulo α have the diagonal condition.

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Louis Kolitsch, University of Tennessee Martin

Partition Results Related to a Special Case of Jacobi's Triple Product Identity

In this talk, some partition results related to a special case of Jacobi's Triple Product Identity will be presented. These results will be presented both algebraically and combinatorially.

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Joe Kramer-Miller, Lehigh University

On the diagonal and Hadamard grades of hypergeometric functions

Diagonals of multivariate rational functions are an important class of functions arising in number theory, algebraic geometry, combinatorics, and physics. For instance, many hypergeometric functions are diagonals as well as the generating function for Apery's sequence. A natural question is to determine the diagonal grade of a function, i.e., the minimum number of variables one needs to express a given function as a diagonal. The diagonal grade gives the ring of diagonals a filtration. In this talk we study the notion of diagonal grade and the related notion of Hadamard grade (writing functions as the Hadamard product of algebraic functions), resolving questions of Allouche-Mendes France, Melczer, and proving half of a conjecture recently posed by a group of physicists. This work is joint with Andrew Harder.

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Christian Krattenthaler, Universität Wien

Uvarov's formula — a thorough discussion

Christoffel's classical theorem provides a determinantal formula for the orthogonal polynomials corresponding to a polynomial deformation of a given measure in terms of the original orthogonal polynomials. Uvarov's formula from around 1960 provides a generalisation to the case of a rational deformation of a given measure. While the formula has been widely used since then, it seems that it has never been rigorously proved. After reviewing some history, I shall present a determinant identity that implies Uvarov's formula. To the best of my knowledge, this constitutes the first rigorous proof of the formula.

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Brandt Kronholm, University of Texas Rio Grande Valley

Varieties of Congruences and Cranks for Partitions into Parts from a Finite Set

We will showcase several varieties of infinite families of congruences for partitions into parts from a finite set. We will discuss the corresponding varieties of crank statistics witnessing these congruences and show that Dyson's rank of a partition witnesses infinitely many of them. Our methods include polyhedral geometry, identifying power series to polynomials, and q-series. This talk will set up Jena Gregory's presentation: "Combinatorial Statistics Witnessing and Infinite Family of Congruences for a Sum of Partition Functions".

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Rahul Kumar, Indian Institute of Technology Roorkee

Euler's theorem, and partition classes arising from parity, differences, and repeated smallest parts

In this talk, we first discuss the famous Euler's partition theorem and introduce new partition functions related to it. Next, we present various classes of partition functions such as those related to the parity of the number of parts, to differences of partition numbers, and to partitions with a repeated smallest part. We establish identities connecting these various classes of partitions. Moreover, we will discuss how these identities help us to extend the Euler's partition theorem. If time permits, we will also present an analogue of Legendre's theorem of the partition-theoretic interpretation of Euler's pentagonal number theorem is also derived. This talk is based on the joint works with George Andrews and Aa Ja Yee, and with Nargish Punia.

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Kagan Kursungoz, Sabanci University

A combinatorial construction of Russell's series for CMPP partitions

Recently, Capparelli, Meurman, Primc and Primc introduced a class of colored partitions which has since been called CMPP partitions. This generalized earlier work by Primc and Šikić. One main reason why CMPP partitions are significant is the authors' conjecture that the generating functions are infinite products in all cases. This question has partially been settled by Dousse and Konan. CMPP partitions are true extensions of the partition classes in the Rogers-Ramanujan-Gordon identities which are defined by difference conditions. As such, a natural question is to look for generating functions similar to the series side of Andrews-Gordon identities. Russell found such bivariate series for one case, and Kanade, Russell, Tsuchioka and Warnaar conjectured another series for another case. Dousse and Konan used representation theory of vertex operator algebras, and Russell used symbolic computation in their proofs. We will combinatorially interpret Russell's bivariate series in a base partition and moves setting.

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Jeff Lagarias, University of Michigan

Complex equiangular lines and orders of real quadratic fields

This talk surveys the problem of the existence of maximal sets of d^2 complex equiangular lines in $\mathbb{C}^d$. Conjecturally such sets exist in all dimensions d. This is currently proved in a finite number of dimensions, now up to dimension 50. This pure geometric problem, which is also important in quantum information theory, was studied by physicists, who found it to have a surprising connection with number theory. The known constructions involve algebraic numbers in abelian extensions of the real quadratic field $\mathbb{Q}(\sqrt{(d+1)(d-3)})$, for $d \geq 4$. Gene Kopp (LSU) made a connection of the algebraic numbers in this problem with the Stark conjectures for real quadratic fields, published in 2019. This talk describes this important connection and conjectural phenomenology of these configurations, with specific ray class fields of orders, associated to over-orders of the quadratic order of discriminant $(d+1)(d-3)$.

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Runqiao Li, University of Texas Rio Grande Valley

DSPP and polynomial identities imple Göllnitz and Gordon identities

In 2017, Guo-Niu Han and Huan Xiong studied the properties of skew shaped double shifted plane partitions(DSPP) and obtained their generating functions for arbitrary profiles expressed as an infinite product. It turns out that when the profiles have length 3, the generating functions are closely related to classic mod 8 identities due to Göllnitz and Gordon. In this talk, our main objects are DSPP of profile length 3 with a bounded length of diagonal. By applying MacMahon's partition analysis, combinatorial argument, and qFunctions packages, we will show their generating functions and related polynomial identities, which turn out to be finite forms of mod 8 identities due to Göllnitz and Gordon.

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Winnie Li, The Pennsylvania State University

Various aspects of hypergeometric functions

The classical hypergeometric functions are studied from analytic viewpoint, as solutions to linear differential equations. The focus of this talk is the algebraic aspect, as hypergeometric Galois representations introduced by Katz. These Galois representations have their Frobenius traces given by hypergeometric character sums, which are finite field analog of the classical hypergeometric functions. Furthermore, since the Katz representations are geometric, they are expected to be automorphic by Langlands philosophy. We'll explain algebraic and geometric properties of hypergeometric character sums, and discuss the automorphy results for low degree hypergeometric Galois representations.
This is a joint work with Tong Liu and Ling Long.

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Wanlin Li, Vanderbilt University

Algebraic cycles associated to curves

Following the work of Griffiths, a homologically trivial algebraic cycle characterizes a class of extensions of mixed Hodge structures. Furthermore, a family of such cycles characterizes a variation of mixed Hodge structures in the form of a normal function. In the work of Hain, quotients of the fundamental group of a curve in its lower central series carry mixed Hodge structures, and there exist normal functions over the moduli of curves associated with them. For curves of genus $g > 2$, there exists a normal function over M_g associated to the Ceresa cycle/modified diagonal cycle corresponding to the Hodge structure on the second nilpotent quotient of the fundamental group. This normal function vanishes on the hyperelliptic loci. In this talk, I will discuss some recent developments on the study of cycles constructed from algebraic curves.

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Ling Long, Louisiana State University

Atkin and Swinnerton-Dyer Congruences for meromorphic modular forms

In the 1970's, Atkin and Swinnerton-Dyer conjectured that Fourier coefficients of holomorphic modular cusp forms on noncongruence subgroups satisfy certain p-adic recurrence relations which are analogous to Hecke's recurrence relations for congrunece subgroups. In 1985, this was proven in seminal work of Scholl and it was recently extended to weakly holomorphic modular forms by Kazalicki and Scholl. We show that Atkin and Swinnerton-Dyer type congruences extend to the setting of meromorphic modular forms. This is a joint work with Michael Allen and Hasan Saad.

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Bibekananda Maji, IIT Indore

Rademacher-type exact formula and higher order Turán inequalities for r-colored l-regular partitions

In 1937, Rademacher refined the circle method of Hardy and Ramanujan to derive an exact convergent series for the partition function $p(n)$. In 1942, Hua derived an exact formula for the distinct part partition function, and in 1971, Hagis generalized this result to the case of l-regular partitions. More recently, Iskander, Jain, and Talvola established a Rademacher-type exact formula for the r-colored partition function. In this talk, we shall discuss a Rademacher-type exact formula for r-colored l-regular partitions for any r and $l \geq 2$. As an application, we derive higher order Turán inequalities for the r-colored l-regular partition function using a result of Griffin, Ono, Rolen, and Zagier. This is joint work with Archit Agarwal and Meghali Garg.

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Amita Malik, The Pennsylvania State University

The shifted convolution problem in function fields

We will discuss some results on the shifted convolution problem for the divisor function over function fields in the large degree limit, that is, the average value of $d(f)d(f+h)$ where f runs over monic polynomials of given degree in $\mathbb{F}_q[T]$, and h is a given monic polynomial. We prove an asymptotic formula in the range $\deg(h) < (2-\epsilon)\deg(f)$. The central ingredient for this work is a Voronoi summation formula for the divisor function. The results also extend to various correlations of the convolution of 1 with a Dirichlet character mod ℓ, where ℓ is a monic irreducible polynomial. This is joint work with Alexandra Florea, Matilde Lalin, and Anurag Sahay.

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Elena Mantovan, California Institute of Technology

Infinitely many primes of basic reduction for some abelian fourfolds

Elkies proved that if E is an elliptic curve defined over a field with at least one real embedding, then it has infinitely many primes of supersingular reduction. In this talk, I will discuss a generalization of this result for certain abelian fourfolds with multiplication by the 5th cyclotomic field. The proof relies on the study of the distribution of real CM points on a unitary Shimura curve. This is based on joint work with W. Li, R. Pries and Y. Tang.

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Richard McIntosh, University of Regina (retired)

Mock theta conjectures for the sixth order mock theta functions

The mock theta conjectures for the sixth order mock theta functions were proved by Richard McIntosh in a recent paper. Ramanujan expressed the six order mock theta functions ϕ and ψ as generalized Lambert series, which in turn can be expressed in terms of Zwegers' μ-function (or the m-function of Hickerson and Mortenson). In an earlier paper, McIntosh constructed a formula expressing the μ-function in terms of the universal mock theta function g_2, which appears in the mock theta conjectures for the even order mock theta functions.

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Jimmy McLaughlin, West Chester University PA

q-extensions of formulae for π with free parameters

We prove several q-series identities which have one or more free parameters on one side.
An example is given by

$$\sum_{n=1}^{\infty}(q^4;q^6)_n(q^6;q^6)_{n-1}q^n\,\frac{(q^5/bc;q^6)_n}{(q^5/b,q^5/c,q^6;q^6)_n} - \sum_{n=1}^{\infty}\frac{(q^4;q^6)_n(q^6;q^6)_{n-1}}{(q^5,q;q^6)_n}q^n\,\frac{(1-q^{12n-1})(1/q,b,c;q^6)_n}{(1-1/q)(q^5/b,q^5/c,q^6;q^6)_n}\left(\frac{-q^5}{bc}\right)^n q^{3(n^2-n)} = \frac{1}{3}\left(\frac{\psi^3(q)}{\psi(q^3)}-1\right). \quad (1)$$

Upon letting $q \to 1$ on both sides leads to Ramanujan-type series for expressions involving π.
From the identity above, for example, one gets that if b and c are complex numbers such that $Re(b+c) < 13/2$ and neither is a positive integer $\equiv 5 \pmod 6$, then

$$\sum_{n=1}^{\infty}\frac{\left(\frac{2}{3}\right)_n\left(\frac{1}{6}(-b-c+5)\right)_n}{n\left(\frac{5-b}{6}\right)_n\left(\frac{5-c}{6}\right)_n} - \sum_{n=1}^{\infty}\frac{(12n-1)\left(\frac{2}{3}\right)_n\left(\frac{b}{6}\right)_n\left(\frac{c}{6}\right)_n(-1)^n}{n(6n-1)\left(\frac{1}{6}\right)_n\left(\frac{5-b}{6}\right)_n\left(\frac{5-c}{6}\right)_n} = \pi\sqrt{3}. \quad (2)$$

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David Metacarpa, Amherst College

Antiquantum q-series identities and mock theta functions

Ramanujan's original definition of mock theta functions from 1920 involves their asymptotic behaviors at roots of unity on the boundary of the disk of convergence $|q| < 1$. One question of interest to us is: do q-series identities involving the mock theta functions still hold at roots of unity? Inspired by Lovejoy's work on quantum q-series identities, we explore antiquantum q-series identities, or identities between series which are equal inside the disk $|q| < 1$ but which hold at dense sets of roots of unity on the boundary for which one of the series diverges and is unnaturally truncated. In this talk, we will establish antiquantum q-series identities for all of Ramanujan's third order mock theta functions. This talk comes from joint work with Amanda Folsom (Amherst College).

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Victor Moll, Tulane University

Integration can be reduced to solving small linear systems (thanks to Ramanujan)

I will present a collection of examples illustrating a method of integration (developed jointly with Ivan Gonzalez, Physics Department, Universidad de Valparaiso, Chile) in the context of integrals coming from Feynman diagrams. The method consists of a small number of rules, the first one being Ramanujan's Master Theorem.

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Todd Molnar, University of Florida

Some Analytic Proofs of Alladi Density

For relatively prime $(\ell, m) = 1$ the following sum was first evaluated in a 1977 paper by K. Alladi:

$$\sum_{\substack{n\geq 2\\ p_1(n)\equiv \ell (\mathrm{mod}\ m)}} \frac{\mu(n)}{n} = -\frac{1}{\phi(m)},$$

where $p_1(n) = \min\{p : p|n\}$, $\phi(n)$ is Euler's ϕ-function, and $\mu(n)$ is the Moebius function. The term $-1/\phi(m)$ on the right of the above sum has been referred to by some authors as "Alladi density". The original proof of this result utilizes elementary techniques but assumes certain results (such as Walfisz's strong form of the prime number theorem for arithmetic progressions) which at present can only be obtained by analytic methods. Moreover, this proof (and all subsequent demonstrations) makes use of a duality principal and is, in a certain sense, indirect.

In this talk, we will present several new analytic proofs of the above result. The first demonstration gives a direct proof which appears to be novel in that it does not rely on the previously mentioned duality.

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Michael Mossinghoff, Center for Communications Research

Ideal solutions in the Prouhet-Tarry-Escott problem

For given positive integers m and n with $m < n$, the *Prouhet–Tarry–Escott problem* asks if there exist two disjoint multisets of integers of size n having identical kth moments for $1 \le k \le m$; in the *ideal* case one requires $m = n - 1$, which is maximal. We describe some new searches for ideal solutions to the Prouhet–Tarry–Escott problem, especially solutions possessing a particular symmetry, both over $\mathbb{Z}$ and over the ring of integers of several imaginary quadratic number fields. This is joint work with D. Coppersmith, D. Scheinerman, and J. VanderKam.

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Avi Mukhopadhyay, University of Florida

Identities for Mock Modular Forms

Mock modular forms are the holomorphic parts of harmonic Maass forms. In his famous deathbed letter to Hardy, Ramanujan introduced mock theta functions, which are examples of mock modular forms of weight 1/2. In this talk, we present new identities for mock modular forms of weight 3/2 obtained by examining their non-holomorphic counterparts. This is joint work with Frank Garvan.

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Melvyn Nathanson, CUNY

Diversity, equity, and inclusion for problems in additive number theory

This talk will review the diversity of problems in additive number theory, observe that equity suggests the consideration of less currently popular problems, and argue for their inclusion in the additive canon. Of particular interest will be problems about the range of sizes of sumsets of finite sets and problems about the intersection of sumsets.

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Badri Vishal Pandey, University of Cologne

Quasimodularity and Limiting Behavior for Variations of MacMahon Series

We discuss recent results showing that large families of MacMahon-type q-series arising in partition theory are quasimodular forms with rich algebraic structure, with applications from quasi-shuffle algebras. These functions provide effective approximations to classical partition functions and infinite product reciprocals, revealing new connections between quasimodularity, partition statistics, and explicit product expansions.

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Paul Pollack, University of Georgia

How badly does unique factorization fail, normally?

Let K be a number field, and let α be a nonzero, nonunit in O_K (the ring of integers of K). The elasticity of α, denoted $\rho(\alpha)$, is defined as the largest ratio m/n, where m and n range over all possible lengths of factorizations of α into irreducible elements of O_K. It can be shown that the elasticities $\rho(\alpha)$, as α ranges over O_K, cluster around a single constant depending only on K. This constant is most simply described in terms of optimal play in a game Enrique Treviño and I call "group solitaire", with the group in question being the class group of K. This talk will describe these connections in detail and introduce results with Treviño determining optimal play in group solitaire for two new families of groups.

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Carl Pomerance, Dartmouth College

The Erdős–Straus conjecture

In 1948 Erdős and Straus conjectured that for every integer $n > 1$, the fraction $4/n$ is equal to $1/a + 1/b + 1/c$ for some positive integers a, b, c. Still unsolved after nearly 80 years, this curious conjecture has been studied by Sierpinksi, Schinzel, Mordell, Vaughan, Elsholtz & Tao, and many others. This talk will review what is known and discuss some new results. (Joint work with Andreas Weingartner.)

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Rachel Pries, Colorado State University

Supersingular curves that are cyclic covers of the projective line

The celebrated Eichler–Deuring mass formula counts the number of supersingular elliptic curves in positive characteristic. Ibukiyama, Katsura, and Oort generalized this formula to count the number of supersingular curves of genus 2 that have an automorphism of order 3 or order 4. In this talk, I will explain how to generalize these results for any 1-parameter family of cyclic covers of the projective line. This gives a formula for the number of non-ordinary curves in the family in positive characteristic. The proof uses intersection theory in the Chow ring and is joint work with Cavalieri. If time permits, I will talk about (i) in-progress work with Cavalieri and Mantovan, where we find a formula for the number of supersingular curves in special families of curves of genus 3-7; and (ii) some joint work with Booher about the existence of supersingular curves of genus 5 for all primes congruent to 3 modulo 4.

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Maksym Radziwill, Courant Institute of Mathematical Sciences, New York

The Fyodorov-Hiary-Keating conjecture

The Fyodorov-Hiary-Keating conjecture describes the distribution of the local maximum of the Riemann zeta-function. In other words, pick a typical t between 0 and T, then the conjecture describes the fluctuations of the local maximum of the Riemann zeta-function $\zeta(1/2 + iu)$ in a unit interval around t. The choice of a unit interval is immaterial and this can be enlarged or shrunk as needed. In recent work with Arguin and Bourgade we establish tightness, thus for 99% of t's the local maximum is of size $(\log T)(\log\log T)^{-3/4}$. I will describe the broader context in which this work fits which is the study of log-correlated systems and the main ideas from the proof. Those are motivated by work of Bramson on branching random walks (and those in turn are motivated by the KPP equation in PDE's). In particular the proof shows that whenever the local maximum is achieved at $1/2 + iu$, say, then the partial sums of $\log \zeta$ at that point have to evolve in a very specific and rigid way.

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Maksym Radziwill, Courant Institute of Mathematical Sciences, New York

Bias in quadratic Gauss sums

Quadratic Gauss sums are defined as $\sum_{x mod q} \exp(2\pi i x^2/q)$. One can view these as finite field analogues of Gaussian integrals, besides they are quite useful, for example one can derive quadratic reciprocity from properties of Quadratic Gauss sums. Kummer, motivated by attempts at deriving cubic reciprocity, was interested in the properties of Cubic Gauss sums, defined as $\sum_{x mod q} \exp(2\pi i x^3/q)$. Kummer noticed a numerical bias in the signs of these (real-valued) sums. The existence of this bias perplexed number theorists for a long time. Patterson was the first to realize that cubic Gauss sums can be realized as coefficients of very exotic (weight 1/3) automorphic forms. This led to a conjectural explanation of the bias that Kummer observed, the existence of which was finally confirmed (conditionally on the Generalized Riemann Hypothesis) in recent-ish work of the speaker with Alex Dunn. I will discuss the circle of ideas surrounding cubic Gauss sums, and the reasons why they remain both interesting and mysterious.

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Maksym Radziwill, Courant Institute of Mathematical Sciences, New York

Automorphic approaches to the mixing conjecture of Michel-Venkatesh

I will discuss joint work with Blomer and Brumley on an automorphic approach to the mixing conjecture of Michel-Venkatesh.

Specifically, we prove a conjecture of Michel-Venkatesh on joinings of distinct Linnik problems, in the setting of simultaneous quaternionic embeddings of imaginary quadratic fields having sufficiently many small split primes. This splitting condition is expected to hold for all discriminants, and is known to hold unconditionally for all but $O((\log\log X)^{1+o(1)})$ discriminants up to X.

We also treat a non-equivariant form of this conjecture proposed by Aka-Einsiedler-Shapira, which in particular applies to the classical Gaußconstruction joining Linnik points on the sphere with CM points on the modular surface.

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Diksha Rani, Indian Institute of Technology Indore

Non-trivial zeros of Dedekind zeta function on the critical line

In 1914, Hardy proved the existence of infinitely many non-trivial zeros of the Riemann zeta function on the critical line using the Jacobi theta relation. This result was extended in 1968 by Chandrasekharan and Narasimhan to the Dedekind zeta functions of quadratic fields, and in 1970 by Berndt to number fields with at most three real embeddings. In this talk, we shall discuss a number field analogue of the Jacobi theta relation and, as an application, show that the Dedekind zeta function has infinitely many non-trivial zeros on the critical line.

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Olav Richter, University of North Texas

Weighted recursions for Hurwitz class numbers

I will report on recent joint work with Matthew Ortiz and Martin Raum.
We establish new recursions for Hurwitz class numbers with polynomial weights. In contrast to previous recursions, our results decouple class numbers of even and odd discriminants. Our main tool is the vector-valued holomorphic projection operator applied to mock modular forms. We invoke representation theory to connect the relevant spaces of vector-valued modular forms to spaces of classical new and old forms. We thereby leverage the vanishing of spaces of vector-valued cusp forms not available in the scalar case.

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Larry Rolen, Vanderbilt University

Inequalities for the partition function and other combinatorial sequences

The study of asymptotic properties of sequences is of fundamental interest in number theory and combinatorics. We are especially interested in proving inequalities among sequences of numbers. This topic has seen a large outpouring of work in recent years. For instance, Nicolas and DeSalvo-Pak independently proved that the partition function $p(n)$ is eventually log-concave. Specifically, they showed that $p^2(n) - p(n-1)p(n+1) \geq 0$ for $n \geq 26$. Work of Griffin, Ono, Zagier, and myself placed this in a larger context by proving that related polynomial zero properties follow from a general phenomenon dictated by Hermite polynomials.
In this talk, describing joint work with Koustav Banerjee and Kathrin Bringmann, I will present a unified framework to prove a wide class of inequalities of sequences.

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Erick Ross, Clemson University

Boundary CM points and Class Groups of Small Exponent

Let $\mathcal{F}$ denote the fundamental domain for $\mathrm{SL}_2(\mathbb{Z})$ on the upper half plane $\mathcal{H}$. William Duke showed that as fundamental discriminants $D \to -\infty$, the sets CM_D (CM points of discriminant D) are equidistributed in $\mathcal{F}$. In this talk, we investigate the behavior of CM points on the boundary of $\mathcal{F}$. We prove that such CM points are equidistributed on the boundary, and also give a complete characterization of when every CM_D point lies on the boundary. Along the way, we also (conditionally) give a complete classification of negative discriminants with class group of small exponent.

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Rishabh Sarma, The Pennsylvania State University

Overpartition rank and crank differences in terms of Dedekind eta-quotients

In this talk, we present new identities for some overpartition rank and crank differences modulo p, where p is a prime congruent to 3 modulo 4, purely in terms of eta products, which are weakly holomorphic modular forms on $\Gamma_0(2p)$ with real character. We also present new identities for some partition rank and crank differences modulo prime p, which are weakly holomorphic modular forms on $\Gamma_0(p)$ with real character. This is joint work with Frank Garvan.

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Peter Sarnak, Institute for Advanced Study, Princeton and Princeton University

On indefinite ternary quadratic forms

We describe the solution to two problems concerning indefinite integral ternary quadratic forms. The first about anisotropic forms was popularized by Margulis following his solution of the Oppenheim Conjecture. The second about the density of isotropic forms was raised by Serre. Joint work with A.Gamburd, A.Ghosh and J.Whang.

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Michael J Schlosser, University of Vienna

A bilateral extension of the Ramanujan function

We derive expansions for a a bilateral extension of the Ramanujan function and consider so-called m-extensions of that function, hereby extending work by Garrett, Ismail and Stanton, by Bowman, McLauphlin and Wyshinski, and more recently, by Ismail and Zhang. The presented material is based on joint work with Mourad Ismail and dedicated to the memory of Ruiming Zhang.

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Darren Schmidt, University of Florida

Ekedahl-Oort Types and Newton Polygons of Abelian Covers of $\mathbf{P}^1$ *Branched at Three Points*

Let X be a curve of genus g that is an abelian cover of the projective line branched at three points. I implemented an algorithm in SageMath that computes the Newton polygon and Ekedahl-Oort type of X. For a fixed genus g, I compute the natural densities of primes p such that there is a curve of genus g that is an abelian cover of $\mathbf{P}^1$ branched at three points that is supersingular, superspecial, or has an unlikely Ekedahl-Oort type or unlikely Newton polygon. These computations show that supersingular curves, superspecial curves, and unlikely Ekedahl-Oort types/Newton polygons occur much more frequently than expected for such a specific family of curves. Using patterns we found in these computations, we prove results that give examples of supersingular curves for arbitrarily large genus, provide evidence for a conjecture of Oort, and determine the limsup of the supersingular density.

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Carsten Schneider, RISC, Johannes Kepler University Linz

Symbolic summation and aymptotics for the partition function

We illustrate how symbolic summation enters the game to derive the asymptotic expansion up to order N (for any fixed positive integer N) along with estimates for error bounds for the shifted quotient of the partition function, which generalizes a result of Gomez, Males, and Rolen.

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Robert Schneider, Michigan Technological University

Partition-theoretic model of prime distribution

We propose a deterministic model of prime number distribution, from first principles related to properties of integer partitions, that naturally predicts the prime number theorem as well as the twin prime conjecture. The model posits that, for $n \geq 2$,

$$p_n \ = \ 1 \ + \ 2\sum_{j=1}^{n-1} \left\lceil \frac{d(j)}{2} \right\rceil \ + \ \varepsilon(n),$$

where p_k is the kth prime number, $d(k)$ is the divisor function, and $\varepsilon(k)$ is an explicit error term that is negligible asymptotically; both the main term and error term represent enumerative functions. We refine the error term to give numerical estimates of $\pi(n)$ similar to those provided by the logarithmic integral, and much more accurate than $\mathrm{li}(n)$ up to $n = 100{,}000$ where the estimates are almost exact.

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Paul Schwartz, Stevens Institute of Technology

Constructing Totally Ramified Extra-Special p-Extensions of Locals Fields and Resulting Galois Module Structure.

The normal basis theorem states that if L/K is a Galois extension of fields, then L is a free module of rank one over the group algebra $K[G]$ ($G = \mathrm{Gal}(L/K)$). Naturally, number theorists asked, is there such a thing as an integral basis theorem? That is to say, if L/K is a Galois extension of number fields, with ring of integers $\mathfrak{O}_L$ and $\mathfrak{O}_K$ respectively, is $\mathfrak{O}_L$ free over $\mathfrak{O}_K[G]$? In 1932, E. Noether found that, $\mathfrak{O}_L$ is locally free over $\mathfrak{O}_K[G]$ precisely when L/K is at most tamely ramified. That served as a spring board into the local case. In 1959, for a Galois extension of local fields L/K, H.W. Leopoldt introduced the associated order of $\mathfrak{O}_L$ given by $\mathfrak{A}_{L/K} = \{\sigma \in K[G] : \sigma\mathfrak{O}_K \subseteq \mathfrak{O}_K\}$. It is well know that $\mathfrak{A}_{L/K}$ is the only $\mathfrak{O}_K$-order of $K[G]$ which $\mathfrak{O}_L$ can be free over; however, $\mathfrak{O}_L$ need not be free over its associated order.

Over the past decade, the theory of Galois scaffolds has been developed. It has been discovered that if L/K is a totally ramified Galois extension of local fields which possesses a "precise enough" scaffold, then there are necessary and sufficient conditions for $\mathfrak{O}_L$ to be free over $\mathfrak{A}_{L/K}$ which can be stated in terms of the ramification numbers for L/K. Given a Galois extension of local fields L/K, a Galois scaffold for L/K, in essence, is a K-basis for the group ring $K[G]$ ($G = \mathrm{Gal}(L/K)$) whose effect on the valuation of elements of L is easy to determine.

An extra-special p-group is a group G of order p^{2n+1} such that $G/Z(G) \cong \mathbb{Z}^{2n}$. In this talk we will use Artin-Schreier polynomials to construct totally ramified extra-special p-extensions which possess a Galois Scaffold and use the theory of Byott, Childs, and Elder to study the Galois module structure of these extensions. This is joint work with Kevin Keating (University of Florida).

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James Sellers, University of Minnesota Duluth

Arithmetic properties of MacMahon-type sums of divisors: the odd case

A century ago, P. A. MacMahon introduced two families of generating functions,

$$\sum_{1\le n_1<n_2<\cdots<n_t} \prod_{k=1}^{t} \frac{q^{n_k}}{(1-q^{n_k})^2} \quad \text{and} \quad \sum_{\substack{1\le n_1<n_2<\cdots<n_t\\ n_1,n_2,\ldots,n_t \text{ odd}}} \prod_{k=1}^{t} \frac{q^{n_k}}{(1-q^{n_k})^2},$$

which connect sum-of-divisors functions and integer partitions. These have recently drawn renewed attention. In particular, Amdeberhan, Andrews, and Tauraso extended the first family above by defining

$$U_t(a,q) := \sum_{1\le n_1<n_2<\cdots<n_t} \prod_{k=1}^{t} \frac{q^{n_k}}{1+aq^{n_k}+q^{2n_k}}$$

for $a = 0, \pm1, \pm2$ and investigated various properties, including some congruences satisfied by the coefficients of the power series representations for $U_t(a,q)$. These arithmetic aspects were subsequently expanded upon by the authors of the present work.

Our goal in this talk is to generalize the second family of generating functions, where the sums run over odd integers, and then apply similar techniques to show new infinite families of Ramanujan–like congruences for the associated power series coefficients.

This is joint work with Roberto Tauraso, Dipartimento di Matematica, Universita di Roma "Tor Vergata".

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Sroyon Sengupta, University of Florida

Higher order dualities between prime ideals

This talk aims to provide a generalization to Sweeting and Woo's first order duality between prime ideals, which was primarily inspired by Alladi's Duality identity from 1977. We state and prove the general higher order duality between prime ideals in number rings. We then use the second order duality to obtain the a new formula for the Chebotarev Density involving sums of the generalized Möbius function $\mu_K(I)$ and the prime ideal counting function $\omega_K(I)$. In the end, I will also talk about the duality in a slightly more general setting. The talk will conclude by shedding light on how this duality can be of use further.

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Iris Shi, University of Florida

A T-adic computation of the Cartier operator

The Cartier operator is dual to the Frobenius on $H^1(X, O_X)$ via Serre duality, making it a key tool in the algorithmic study of curves over finite fields. For Artin-Schreier curves in characteristic p, computing the matrix of the Cartier operator on the space of regular differentials is a fundamental computational problem. In this talk, we introduce a T-adic method for computing the Cartier operator. This approach provides significant algorithmic improvements over the classical method of directly computing the image of each basis element. The T-adic method exploits p-adic analysis to reduce the computational complexity. We will compare various computational approaches and discuss their relative efficiency and implementation strategies.

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Andrew Sills, Georgia Southern University

The Rogers–Ramanujan–Slater Database

First announced as a work-in-progress at the Andrews–Berndt 85th birthday conference at Penn State in 2024, an update on the Rogers–Ramanujan–Slater database will be given at ALLADI70. Once again, q-series researchers and programmers will be invited to contribute to the project. The development team currently includes the speaker, Hunter Waldron, Kevin "KG" Gomez, Shashank Kanade, and Ali Uncu.

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Nicolas Smoot, University of Vienna

Partition Congruences and Topology

The integer partition function $p(n)$ counts the number of ways to add positive integers to n ($p(4) = 5$, since we have 4, $3+1$, $2+2$, $2+1+1$, $1+1+1+1$). Ramanujan discovered that $p(n)$ is divisible by any given power of 5 whenever $24n - 1$ is so divisible (He also discovered similar properties for $p(n)$ with respect to powers of 7 and 11). This remarkable set of congruence properties derives from the fact that $p(n)$ is counted by the coefficients of a certain modular form. Indeed, analogous divisibility properties have been found for the coefficients of a great variety of different modular forms—many of which count interesting arithmetical objects. However, the difficulty of proving these congruence families can vary substantially; some are proved with routine techniques, while others are standing conjectures. Part of the difficulty is due to the topology of the modular curve associated with a given congruence family. In this talk we discuss some new results in the theory of partition congruences, in which topological considerations play a central role.

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Jaebum Sohn, Yonsei University

Corners of $(t, tk \pm 1)$-Core Partitions and Their Self-Conjugate Analogues

The number of corners of a partition equals the number of its distinct parts. Following the work of Huang and Wang, the enumeration of simultaneous core partitions with a fixed number of corners has attracted considerable attention. Huang and Wang enumerated $(t, t+1)$-core and $(t, t+1, t+2)$-core partitions with m corners, and Cho, Huh, and Sohn later generalized this to $(t, t+1, \ldots, t+p)$-core partitions.

In this talk, we study $(t, tk \pm 1)$-core partitions with a fixed number of corners. We first derive an explicit formula for the number of such partitions. Furthermore, in the self-conjugate case, we construct a bijection between self-conjugate $(t, tk \pm 1)$-core partitions with a fixed number of corners and certain $(\lfloor t/2 \rfloor + 1)$-tuples satisfying explicit conditions. As a consequence, we obtain an enumeration formula for the self-conjugate case as well.

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Richard Stanley, University of Miami

Sprout symmetric functions

We will discuss certain sequences $(R_0, R_1, \ldots)$ of symmetric functions that we call *sprout symmetric functions*. Many examples of sprout symmetric functions have already appeared in the literature, connected with such topics as the symmetric function generalization of the Tutte polynomial of a graph, Hirzebruch's L-genus, and zeta polynomials of binomial posets. We first consider basic properties of sprout symmetric functions, in particular, their expansion into classical bases for symmetric functions. Especially interesting is the Schur function expansion, which is closely related to the Edrei-Thoma theorem from the theory of total positivity. We conclude with an example related to permutation enumeration.

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Sergei Suslov, Arizona State University

One century of the wave mechanics discovery by Louis de Broglie, Werner Heisenberg, Erwin Schrodinger, and Paul A.M. Dirac

Historical development of major ideas of quantum physics - the so-called two quantum revolutions (1924-28) - will be outlined from a modern mathematical perspective. Connection of old quantum mechanics by Bohr and Sommerfeld with transuranium elements will be presented.

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Yunqing Tang, UC Berkeley

The arithmetic of power series and applications to irrationality

We will first briefly discuss our approach to prove irrationality of certain periods such as certain product of two log values. Our method uses rational approximations from the literature such as the work of Alladi and Robinson inspired by the work of Apéry; we develop a new framework to make use of these approximations. The key ingredient is an arithmetic holonomy theorem built upon earlier work by André, Bost, Charles (and others) on arithmetic algebraization theorems via Arakelov theory; a version of our arithmetic holonomy theorem was also used in our proof of the unbounded denominators conjecture. We will then discuss our recent result on irrationality measures. This is joint work with Frank Calegari and Vesselin Dimitrov.

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Frank Thorne, University of South Carolina

6-torsion in class groups of quadratic fields

I will discuss joint work with Peter Koymans, Robert Lemke Oliver, and Efthymios Sofos obtaining asymptotic formulas for 6-torsion in class groups of quadratic fields. We also obtain an asymptotic formula counting Galois D_6-extensions by discriminant. A variety of disparate ingredients go into the proof, and I will talk about what these are and how they fit together.

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Jack Thorne, University of Cambridge

Arithmetic statistics and the heights of rational points

Although computing the solutions to a given Diophantine equation is hard (!), families of equations often display striking statistical regularity – this is the case, for example, for the family of Weierstrass elliptic curves over $\mathbb{Q}$ given by the equations $y^2 = x^3 + Ax + B$, for which theorems of Bhargava–Shankar and Poonen–Rains give (respectively) exact formulae for the average size of certain Selmer groups and predictions for the distribution of the isomorphism type of the group. I will discuss recent progress in this area and new work that addresses the distribution not only of the number of rational points but their heights. (Joint work with Jef Laga.)

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Jesse Thorner, University of Illinois Urbana-Champaign

Tatuzawa's theorem for Rankin–Selberg L-functions

Let π and π' be unitary cuspidal automorphic representations of $\mathrm{GL}(n)$ and $\mathrm{GL}(n')$ over a number field F. We establish a new zero-free region for all GL(1)-twists of the Rankin–Selberg L-function $L(s, \pi \times \pi')$, generalizing Tatuzawa's refinement of Siegel's work on Dirichlet L-functions. As a corollary, we show that for all $\epsilon > 0$, there exists an effectively computable constant $c > 0$ depending only on $(n, n', [F : \mathbb{Q}], \epsilon)$ such that $L(s, \pi \times \pi')$ has at most one zero (necessarily simple) in the region

$$\mathrm{Re}(s) \geq 1 - c/(C(\pi)C(\pi')(|\mathrm{Im}(s)| + 1))^{\epsilon},$$

where $C(\pi)$ and $C(\pi')$ are the analytic conductors.

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Shunsuke Tsuchioka, Institute of Science Tokyo

Schur partition theorems from the viewpoint of spin representations of the symmetric groups

Motivated by spin modular representations of the symmetric groups, we propose two generalizations of the Schur regular partitions for an odd integer $p \geq 3$. One forms a subset of the set of p-strict partitions, and the other forms that of strict partitions. We prove that each set has a basic $A^{(2)}_{p-1}$-crystal structure. For $p = 3$, it reproves Schur's 1926 partition theorem, a mod 6 analog of the Rogers-Ramanujan partition theorem (RRPT). For $p = 5$, it gives a computer-free proof of a conjecture by Andrews during his 3-parameter generalization of RRPT, which was first proved by Andrews-Bessenrodt-Olsson. This is a joint work with Masaki Watanabe.

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Ali K. Uncu, University of Bath, Department of Computer Science

A Weighted words study of MacMahon's and Russell's modulo 6 identities

We give new proofs of MacMahon and Russell's modulo 6 identities using the method of weighted words. We also present a new refinement of MacMahon's identity, some related finite sum identities, and a companion partition theorem to sequence avoiding partitions theorem of the author and Andrews.

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Akshaa Vatwani, IIT Gandhinagar

Divisor-bounded multiplicative functions in arithmetic progressions

We establish a general mean-value estimate for trilinear forms involving arbitrary sequences over arithmetic progressions, after excluding the contribution of exceptional characters. Our result requires only minimal hypotheses on the growth of the sequences and we prove upper bounds in terms of the L^2-norms of the corresponding sequences. As an application, we obtain a Bombieri-Vinogradov type theorem for a broad class of multiplicative functions supported on smooth numbers. In particular, we show that these functions are equidistributed in arithmetic progressions on average over moduli $q \leq x^{3/5-\varepsilon}$, if they satisfy a Siegel-Walfisz criterion.

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Robert Vaughan, Penn State University

Some remarks on ternary additive questions

The subject of this talk has its origins in a series of papers concerned with the following question. For which integers j, k, l with $2 \leq j \leq k \leq l$ are almost all positive integers n represented in the form $x_1^j + x_2^k + x_3^l$ with the x_r lying in an interesting subset of the positive integers?

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Clayton Williams, University of Illinois at Urbana-Champaign

The Kohnen-Zagier Formula in Level 1 for Eta Multipliers

Kohnen-Zagier formulae give an explicit identity between the coefficients of half-integer weight modular forms at discriminants to central values of twisted L-functions through the Shimura correspondence, which is for modular forms transforming with respect to the theta multiplier. They have a number of arithmetic applications. Recently Ahlgren, Andersen, and Dicks, building on work of Yang, found a Shimura Correspondence for eta multipliers, $\mathscr{S}_t : S_{\lambda+1/2}(\Gamma_0(N),\ u_\eta^r\chi) \to S_{2\lambda}^{\text{new } 2,3}(6N, \chi^2)$ for N with $\gcd(N, 6) = \gcd(r, 2) = 1$ and $t > 0$, with precise information at the primes 2 and 3. Here χ is a character modulo N. When $N = 1$ Yang proved that a linear combination of the $\mathscr{S}_t$ maps is an isomorphism of Hecke modules. In this talk I will present a proof of a new Kohnen-Zagier formula using the new Shimura correspondence for eta multipliers when $N = 1$. I will also discuss the main technical theorem in the proof, which requires relating Kloosterman sums to quadratic Weyl sums using the Weil representation for quadratic modules.

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Amy Woodall, University of Illinois Urbana-Champaign

The Weil bound for generalized Kloosterman sums of half-integral weight

Let L be an even lattice of odd rank with discriminant group L'/L, and let $\alpha, \beta \in L'/L$. We prove the Weil bound for the Kloosterman sums $S_{\alpha,\beta}(m, n, c)$ of half-integral weight for the Weil

Representation attached to L. We obtain this bound by proving an identity that relates a divisor sum of Kloosterman sums to a sparse exponential sum. This identity generalizes Kohnen's identity for plus space Kloosterman sums with the theta multiplier system.

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Hui Xue, Clemson University

Distribution of CM points on geodesics

In his celebrated work in 1988, William Duke showed that CM points of fundamental discriminant are equidistributed on the upper half plane as the discriminant approaches infinity. He also obtained a similar result for the distribution of geodesics associated to indefinite binary quadratic forms. In this talk, we will discuss the distribution of these quadratic objects on geodesics in the upper half plane.

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Ae Ja Yee, The Pennsylvania State University

On the number of t-hooks in self-conjugate and doubled distinct partitions

Partition hooks play a key role in connecting the partition theory and representation theory, and they are interesting combinatorial objects in their own right. Recently, the total number of t-hooks has received a lot of attention, for example the work of Griffin, Ono, and Tsai on the distribution of the number of t-hooks in partitions of n, and the work of Ballantine, Burson, Craig, Folsom, and Wen on hook length bias. In this talk, I will discuss some results on the number of t-hooks and hook length bias in self-conjugate and doubled distinct partitions. This talk is based on joint work with Hyunsoo Cho, Byungchan Kim and Eunmi Kim.

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Dongxi Ye, Beijing Normal-Hong Kong Baptist University

Central L-values of congruent number curves

In this talk, we report a lovely formula for the central L-values of congruent number curves that provides an "alternative" answer to a question of Cohen on the vanishing of some Dirichlet theta functions. This talk is based on joint work with Xuejun Guo and Hongbo Yin.

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Jeffrey Yelton, Wesleyan University

Non-archimedean uniformization of superelliptic curves

Let K be a field with a discrete valuation, and let C be a superelliptic curve given by an equation of the form $y^p = f(x)$ for some prime p. The arithmetic of such a curve can be understood in terms of its ramification points, which correspond to roots of the polynomial f. In particular, a lot of arithmetic information about C is determined from the cluster data of this set of roots (that is, how close different subsets of the roots are to each other under the non-archimedean metric). Certain curves, called Mumford curves, can be uniformized as a subset of the projective line over K modulo a group of fractional linear transformations. I will demonstrate an explicit way to view the uniformization of a Mumford superelliptic curve C and discuss its implications for the associated cluster data.

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Hamza Yesilyurt, Bilkent University

Shifted Partition Identities with Distinct Parts

Shifted partition identities are equalities of the form

$$p(S, n) = p(T, n - a), \quad \text{for } n \neq a,$$

where $p(S, n)$ counts partitions of n with parts taken from a set S. The study began with Andrews in 1987. Soon after, Alladi introduced related identities involving partitions into distinct parts, showing important parallels with the shifted case. Garvan later discovered many more shifted identities, greatly expanding the scope of the subject. In this talk, we review the development of shifted partition identities from their origins to later advances, and we present new identities and recent developments that continue to enrich the interplay between partition theory and theta functions.

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Ruixiang Zhang, UC Berkeley

The Mizohata-Takeuchi Conjecture for convex hypersurfaces

The Mizohata-Takeuchi Conjecture is a problem with PDE background. It predicts an L^2 estimate of functions with Fourier support on a convex hypersurface. It looks deceptively simple but remains a difficult problem to understand. I will talk about a recently found counterexample with Cairo showing power blowups for this conjecture for many hypersurfaces in all dimensions. Our construction was inspired by intuitions from additive combinatorics and lattice point counting for curves.

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Zhiyu Zhang, Stanford University

Modularity of arithmetic theta series over finite fields

Special families of abelian varieties over finite fields occur naturally in different contexts. Consider such a special family over a projective line, from Shimura curves with Drinfeld uniformization. As in the Kudla program, one may count the number of elements in this family with extra symmetry, and form an arithmetic analog of theta series. Our main result is that such a counting series is indeed a modular form. Then I will discuss some arithmetic applications of modularity.

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David Zureick-Brown, Amherst College

Angle ranks of Abelian varieties

I will discuss an elementary notion – the rank of the multiplicative group generated by roots of a polynomial. For Weil polynomials one calls this the angle rank. I'll present new results about angle ranks and give some applications to the Tate conjecture for Abelian varieties over finite fields and to arithmetic statistics.

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