Probabilistic Combinatorics
(Org: **Tom Bohman** and/et **Po-Shen Loh** (Carnegie Mellon University))

LOUIGI ADDARIO-BERRY, McGill University
The second eigenvalue of random lifts

Joint work with Simon Griffiths. For a fixed d-regular graph H, a random n-lift is obtained by replacing each vertex v of H by a "fibre" containing n vertices, then placing a random matching between adjacent fibres. We show that whp, all eigenvalues of the lift that are not eigenvalues of H ("new" eigenvalues), have order $O(\sqrt{d})$, and that any exceptionally large new eigenvalues are whp caused by a dense subgraph of size $O(|E(H)|)$.

KEVIN COSTELLO, Georgia Institute of Technology
On Randomizing Derandomized Greedy Algorithms

Some of the oldest, simplest, and easiest implemented approximation algorithms can be thought of as greedy derandomizations of some naive random algorithm. We consider two such algorithms (Johnson's algorithm for Maximum Satisfiability and the greedy algorithm for Maximum Cut) and ask whether considering the variables in a random order as opposed to an arbitrary one can improve the approximation guarantee of the algorithm.

Joint work with Asaf Shapira and Prasad Tetali.

JACOB FOX, MIT
Graph regularity and removal lemmas

Szemerédi's regularity lemma is one of the most powerful tools in graph theory. It was introduced by Szemerédi in his proof of the celebrated Erdős-Turán conjecture on long arithmetic progressions in dense subsets of the integers. Roughly speaking, it says that every large graph can be partitioned into a small number of parts such that the bipartite subgraph between almost all pairs of parts is random-like. One of the most important applications is the graph removal lemma, which roughly says that every graph with few copies of a fixed graph H can be made H-free by removing few edges. It remains a significant problem to estimate the bounds in the regularity lemma and the removal lemma, and their variants. In this talk I discuss recent joint work with David Conlon which makes progress on this problem.

PO-SHEN LOH, Carnegie Mellon University
Rainbow Hamilton cycles in random graphs

We show that in the setting of randomly edge-colored Erdős-Rényi random graphs, a rainbow-colored Hamilton cycle appears under conditions that are asymptotically best-possible. Specifically, when the edges of $G_{n,p}$ are randomly colored from a set of $(1 + o(1))n$ colors, with $p = (1 + o(1))\frac{\log n}{n}$, w.h.p. there exists a Hamilton cycle which has the further property that all edges are distinctly colored (rainbow). This improves earlier bounds of Cooper and Frieze.

Joint work with Alan Frieze.

BRUCE REED, McGill University
Bounding χ as a convex combination of ω and $\Delta + 1$

Abstract: It has been conjectured that χ is at most $\lceil \frac{\omega + \Delta + 1}{2} \rceil$. It is known that there is a positive ϵ such that $\chi \leq \lceil \epsilon\omega + (1 - \epsilon)(\Delta + 1) \rceil$. We provide a new proof of the latter result which yeilds an improved value of ϵ. This is joint work with Andrew King.