**The Majority Rule and Combinatorial Geometry** (via **the Symmetric Group**)

**Speaker: James Abello, DIMACS**

**Abstract.** The Marquis du Condorcet recognized 200 years ago that majority rule can produce intransitive group preferences if the domain of possible (transitive) individual preference orders is unrestricted. We present results on the cardinality and structure of those maximal sets of permutations for which majority rule produces transitive results (Consistent Sets). Consistent sets that contain a maximal chain in the Weak Bruhat Order (i.e. a balanced tableau of staircase shape) inherit from it an upper semi modular sub lattice structure. They are intrinsically related to a special class of Hamiltonian graphs called persistent graphs. These graphs in turn have a clean geometric interpretation.

We highlight the main tools used to prove these connections and state computationally open research questions.

*Related References*

[1] J. Abello and C. R. Johnson, *How Large are Transitive Majority Domains?,* SIAM J. Alg. Disc. Meth. Vol. 5(1984), pp. 603-618.

[2] J. Abello, *The Weak Bruhat Order, Consistent Sets and Catalan Numbers*, SIAM J. Alg. Disc. Meth. Vol. 1.(1991), pp. 1-16.

[3] J. Abello, Krishna Kumar, *Visibility Graphs and Oriented Matroids*, Discrete & Computational Geometry 28(4): 449-465 (2002).

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**Speaker Bio Sketch**: James Abello received the PhD degree in Combinatorial Algorithms from the University of California, San Diego, and the MS degree in Operating Systems from the University of California, Santa Barbara. He is the recipient of a University of California President's Postdoctoral Fellowship in Computer Science and was awarded a UCSB Outstanding Teaching Award.

James is the co-editor of External Memory Algorithms, Vol. 50 of the AMS-DIMACS series (with J. Vitter,1999) , The Kluwer Handbook of Massive Data Sets (with P. Pardalos and M. Resende, 2002) and Discrete Methods in Epidemiology (with Graham Cormode, 2006). James research focus has been on Algorithms and Data Structures, Massive Data Sets, Algorithm Animation and Visualization, Combinatorial and Computational Geometry, Discrete Mathematics, and some applications in Petroleum Engineering and Epidemiology. He has lead the development of software systems like: MGV (A Massive Graph Visualizer, with J. Korn), AGE (An Animated Graph Environment, with T. Veatch), Mirage (An Interpreted Language for Algorithm Animation, with C. Smith), A Quasi-Clique Extractor (with S. Sudarsky), Ask Graph View (with F. Van Ham) and CGV (with Christian Tominski).

James has held several academic positions and has been senior research scientist at Ask.com and senior member of technical staff at AT&T Shannon Laboratories and Bell Labs. He is currently a research professor at DIMACS, Rutgers University. Information about some of James's visualization research projects can be obtained by accessing http://www.mgvis.com

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