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**Yuval Peres\*** (peres@stat.berkeley.edu), Statistics Department, University of California, Berkeley, CA 94720, and **Oded Schramm**, **Scott Sheffield** and **David Wilson**. *Hex, Random Turn Games, and the Infinity Laplacian*.

The infinity Laplacian (informally, the "second derivative in the gradient direction") is a simple yet mysterious operator with many applications, in particular to optimal Lipschitz extensions. Classical analysis of this operator is hampered by nonsmoothness of solutions. "Tug of war" is a two player random turn game played as follows: Given disjoint target sets  $T_1$  and  $T_2$  in the plane, and a token at  $x$ , toss a fair coin; the player who wins the coin toss moves the particle up to distance  $r$  in the direction of his/her choice. This is repeated until the token reaches a target set  $T_i$ ; player  $i$  is then declared the winner. Write  $u_r(x)$  for the probability that player 1 wins when both players play optimally. We show that as  $r \rightarrow 0$ , the functions  $u_r(x)$  converge to the infinity harmonic function with boundary conditions 1 on  $T_1$  and 0 on  $T_2$ . Our analysis of tug of war leads yields new estimates, and significant generalizations of several classical results about infinity Laplacians. I will also describe our original motivation for studying random-turn games: A variant of the game of Hex with a conformally-invariant limit. (Received March 06, 2006)