1119-05-36 **Kevin Rao*** (m_xing@hotmail.com), 38 DuPont Circle, Sugar Land, TX 77479, and **Hans Li** and **William Liu**. *A combinatorial proof for the rank-unimodality of poset order ideals.* Preliminary report.

Posets are sets with ordering relations between some of its elements. Our research deals with order ideals of the product of linear posets called *chains* (denoted $n_1 \times n_2 \times n_3 \dots$). We aim to show that these levels, or the structure of $L(n_1 \times n_2 \times n_3 \dots)$, are rank unimodal.

We improved a standard poset algorithm and demonstrating rank unimodality in novel infinite families of posets. We thus gained insight on the structure of higher dimensional posets. Then we found an ingenious bijection between $L(n_1 \times n_2 \times n_3 \dots)$ and $W_1(n_1 \times n_2 \times n_3 \dots)$, which is the first proof that holds for all possible products of chains. Applying our bijection, we proved our second result that the product of any three chains is rank-unimodal, making the biggest breakthrough since O'Hara's 1990 proof of two-chain posets. Finally, we extended all of these results to outline a proof for the rank unimodality of infinite dimensional posets. (Received January 26, 2016)