1039-05-105 **Sergey Kitaev**, **Jeffrey Liese** and **Jeffrey B. Remmel*** (jremmel@ucsd.edu), Department of Mathematics, University of California, San Diego, La Jolla, CA 92093-0112, and **Bruce E. Sagan**. *Rationality, irrationality, and Wilf equivalence in the generalized factor order.* Preliminary report.

Let P be a poset and P^* be the set of all words over P. Define the generalized factor order on P^* by letting $u \leq w$ if there is a factor w' of w such that $|u| = |w'|$ and $u \leq w'$ where the comparison of u and w' is done componentwise using the partial order in P. One obtains the ordinary factor order by insisting that $u = w'$. Given $u \in P^*$, we prove that the language $\mathcal{F}(u) = \{w : w \geq u\}$ is accepted by a finite state automaton. If P is finite, it follows that the generating function $F(u) = \sum_{w \geq u} w$ is rational. This is an analogue of a result of Björner and Sagan for the generalized subword order. Björner found a recursive formula for the Möbius function of the ordinary factor order. We show that there are finite P and $u \in P^*$ such that the generating function $M(u) = \sum_{w \geq u} |\mu(u, w)| w$ is not rational.

We also consider the positive integers $\mathbb{P}$ under the usual order. In this case, one obtains a generating function $F(u; t, x)$ by substituting tx^n each time n appears in $F(u)$. We show that $F(u; t, x)$ is always rational. For $u, v \in \mathbb{P}^*$, we say that u is Wilf equivalent to v iff $F(u; t, x) = F(v; t, x)$. We give combinatorial proofs of various Wilf equivalences. (Received March 08, 2008)