

1135-05-381

**Ira M. Gessel** and **Yan Zhuang\*** (zhuangy@brandeis.edu). *Shuffle-compatible permutation statistics.*

We call a permutation statistic  $st$  *shuffle-compatible* if for any two disjoint permutations  $\pi$  and  $\sigma$ , the distribution of  $st$  over the shuffles of  $\pi$  and  $\sigma$  depends only on  $st(\pi)$ ,  $st(\sigma)$ , and the lengths of  $\pi$  and  $\sigma$ . We associate to every shuffle-compatible permutation statistic  $st$  an algebra, called the *shuffle algebra* of  $st$ , whose multiplication describes the distribution of  $st$  over shuffles of permutations. In this talk, we present a shuffle-compatibility criterion which shows that the shuffle algebra of every shuffle-compatible descent statistic (i.e., a statistic which is a coarsening of the descent set) is a quotient of the algebra  $\text{QSym}$  of quasisymmetric functions, as well as a dual criterion which exploits the duality between  $\text{QSym}$  and the coalgebra structure of noncommutative symmetric functions. These results are used to give explicit descriptions of the shuffle algebras of many shuffle-compatible descent statistics. (Received August 29, 2017)