

## 2020 One Day Workshop on Analytic and Enumerative Combinatorics

**Speaker:** 羅元勳 (國立屏東大學應用數學系)

**Title:** On the study of signed Euler-Mahonian identities

**Time:** (未定), Friday, October 30, 2020

**Venue:** Room 070221, 2F, Zhi Xi Building(志希樓 2 樓 E 化教室)

### Abstract

A relationship between signed Eulerian polynomials and the classical Eulerian polynomials on  $\mathfrak{S}_n$  was given by Désarménien and Foata in 1992 as

$$\sum_{\pi \in \mathfrak{S}_n} (-1)^{\ell(\pi)} t^{\text{des}(\pi)} = (1-t)^{\lfloor n/2 \rfloor} \sum_{\pi \in \mathfrak{S}_{\lfloor n/2 \rfloor}} t^{\text{des}(\pi)}.$$

A refined version of the even case, called signed Euler-Mahonian identity

$$\sum_{\pi \in \mathfrak{S}_{2n}} (-1)^{\ell(\pi)} t^{\text{des}(\pi)} q^{\text{maj}(\pi)} = \prod_{i=1}^n (1 - tq^{2i-1})^n \sum_{\pi \in \mathfrak{S}_n} t^{\text{des}(\pi)} q^{2\text{maj}(\pi)},$$

together with a bijective proof were proposed by Wachs in the same year. By generalizing this bijection, in this talk we will extend the above results to the Coxeter groups of types  $B_n$ ,  $D_n$ , and the complex reflection group  $G(r, 1, n)$ , where the ‘sign’ is taken to be any one-dimensional character. Some obtained identities can be further restricted on some particular set of permutations. We also derive some new interesting sign-balance polynomials for types  $B_n$  and  $D_n$ .