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**Ruth Davidson, Augustine O’Keefe\*** (aokeefe@conncoll.edu) and **Daniel Parry**. *A new shellability proof of an old identity of Dixon.*

We give a new proof of an old identity of Alfred Cardew Dixon (1865-1936). The new proof uses tools from topological combinatorics. Dixon’s identity is re-established by constructing a family of non-pure shellable simplicial complexes  $\Delta(n)$ , whose structure is a function of any positive integer  $n$ . The alternating sum of the numbers of faces of  $\Delta(n)$  of each dimension is the left-hand side of the identity, and we show that the alternating sum of the Betti numbers of the complex is equal to the right-hand side of the identity. In other words, Dixon’s identity is re-established by using the Euler-Poincaré relation for  $\Delta(n)$ . The Betti numbers are calculated by showing that for any  $n$ ,  $\Delta(n)$  is shellable. Then, using the well-known fact that a (possibly non-pure) shellable simplicial is homotopy equivalent to a wedge of spheres, we count the number of faces of  $\Delta(n)$  of each dimension that attach along their entire boundary-also known as homology facets-in the shelling order, thereby computing the Betti numbers of  $\Delta(n)$ . This is joint work with Ruth Davidson and Daniel Parry. (Received August 14, 2015)