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**James A Sellers\*** ([sellersj@psu.edu](mailto:sellersj@psu.edu)), Department of Mathematics, Penn State University, 104 McAllister Building, University Park, PA 16802. *A Combinatorial Proof of a Relationship Between Maximal  $(2k - 1, 2k + 1)$ -cores and  $(2k - 1, 2k, 2k + 1)$ -cores.*

Integer partitions which are simultaneously  $t$ -cores for distinct values of  $t$  have attracted significant interest in recent years. When  $s$  and  $t$  are relatively prime, Olsson and Stanton have determined the size of the maximal  $(s, t)$ -core  $\kappa_{s,t}$ . When  $k \geq 2$ , a conjecture of Amdeberhan on the maximal  $(2k - 1, 2k, 2k + 1)$ -core  $\kappa_{2k-1,2k,2k+1}$  has also recently been verified by numerous authors.

In this work, we analyze the relationship between maximal  $(2k - 1, 2k + 1)$ -cores and maximal  $(2k - 1, 2k, 2k + 1)$ -cores. In previous work, Nath noted that, for all  $k \geq 1$ ,

$$|\kappa_{2k-1,2k+1}| = 4|\kappa_{2k-1,2k,2k+1}|$$

and requested a combinatorial interpretation of this unexpected identity. Here, using the theory of abaci, partition dissection, and elementary results relating triangular numbers and squares, we provide such a combinatorial proof. This is joint work with Rishi Nath. (Received September 09, 2016)