Meeting: 1003, Atlanta, Georgia, SS 31A, AMS-SIAM Special Session on Integrable Systems and Special Functions, I

1003-33-328 **Mohamud Mohammed*** (mohamudm@math.rutgers.edu), Department of Mathematics, Rutgers University, Hill Center-Busch Campus, Piscataway, NJ 08854-8019, and **Doron Zeilberger** (zeilberg@math.rutgers.edu), Department of Mathematics, Rutgers University, Hill Center-Busch Campus, Piscataway, NJ 08854-8019. *The Sharpenining of WZ Theory.*

We give a new proof of the Fundamental Theorem for Hypergeometric (and q-Hypergeometric) summation/integration, that does not make explicit use of Sister Celine's method nor of Gosper's algorithm, but is inspired by these two algorithms. As a consequence, we describe a simplified version of the Zeilberger, q-Zeilberger, and Almkvist-Zeilberger algorithms. We also considerbly improve the upper bounds for the orders of the recurrence and differential equations outputted by these algorithms. Most importantly, using the new approache, we will extend the above algorithms from one to several dimensions. [work in progress]. (Received September 10, 2004)