1086-11-1342 **David H Bailey*** (dhbailey@lbl.gov), Mail Stop 50F-1650, Berkeley, CA 94720. *Computational Discovery of Number Theory Identities for Mathematical Physics Integrals.*

A frequent theme of 21st century "experimental mathematics" is the computer-based discovery of identities for mathematical entities arising in mathematical physics. This is typically done by means of computing some mathematical entity (a sum, integral, limit, etc.) to very high numeric precision, then using the PSLQ algorithm to identify the entity as a relatively simple expression involving well known constants.

Perhaps the most successful application of this methodology has been to identify integrals and summations arising in mathematical physics. This talk will present several examples of this type, including integrals from quantum field theory, Ising theory, random walk theory, 3D lattice problems, and Mordell-Tornheim-Witten zeta functions. Computing these integrals or sums to very high precision (typically several hundred digits) is itself a daunting technical challenge, requiring advanced techniques. In some cases, it is necessary to compute these entities to over 3000-digit precision. Rigorously proving the discovered identities is a separate challenge, requiring distinct methods. (Received September 21, 2012)