1023-11-65 **Jonathan M. Borwein*** (jborwein@cs.dal.ca), Faculty of Computer Science, 6050 University Ave, Halifax, NS B3H 1W5, Canada. *Experimental discovery of Apéry-type identities for even zeta values.*

This talk will describe older and very recent work, see [1], in which Bailey, Bradley and I hunted for various desired generating functions for zeta functions and then were able to methodically prove our results.

One example is

$$3\sum_{k=1}^{\infty}\frac{1}{\binom{2k}{k}(k^2-x^2)}\prod_{n=1}^{k-1}\frac{4x^2-n^2}{x^2-n^2} \;=\; \sum_{n=1}^{\infty}\frac{1}{n^2-x^2} \tag{1}$$

$$\left[=\sum_{k=0}^{\infty}\zeta(2k+2)\,x^{2k} \;=\; \frac{1-\pi x\cot(\pi x)}{2x^2}\right].$$

The constant term in (1) recovers the well known identity

$$3\sum_{k=1}^{\infty}\frac{1}{\binom{2k}{k}k^2}=\sum_{n=1}^{\infty}\frac{1}{n^2}=\zeta(2).$$

As I hope to show, this led to one of the most satisfying experimental mathematics experiences we have had.

[1] David Bailey, Jonathan Borwein and David Bradley, "Experimental Determination of Apéry-type Formulae for $\zeta(2n+2)$," *Exp Math*, in press, 2006. [D-drive Preprint 295]. (Received July 25, 2006)