**Joint Meeting of Unione Matematica Italiana and American Mathematical Society**

# Session 25 – ARITHMETIC ALGEBRAIC GEOMETRY

June 13 2002, Pisa


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*Towards a p-adic theory of q-difference equations*


**ABSTRACT:** Let $q$ be a nonzero complex number. One usually calls $q$-difference operator the operator $\varphi_q(f)(x) = f(qx)$ or the associated $q$-derivation $d_q(f)(x) = \frac{f(qx)-f(x)}{(q-1)x}$, both acting on a convenient ring of functions. The relation $d_q x^n = (1 + q + \ldots + q^{n-1})x^{n-1}$ shows intuitively that $d_q \to \frac{d}{dx}$ when $q \to 1$: this phenomenon is known as confluence. In a recent paper J. Sauloy proves the confluence of the so-called *Birkhoff matrix* to the complex monodromy.

We will introduce $p$-adic $q$-difference equations and their first properties: namely their weak Frobenius structure and transfert theorems. These results are motivated by the $p$-adic confluence to differential equations.