Arithmetic essence of curves

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This talk will survey the rich interplay between the local and global arithmetic of algebraic curves and that of their Jacobians. Using elliptic and hyperelliptic curves as examples, we will discuss how we would like to replace the difficult object that is a curve with a finite combinatorial structure (its "essence") that retains the main arithmetic data of the curve and its Jacobian. The key requirement for this structure will be to control the p-adic geometry of the curve, to be applicable to arithmetic problems such as the Birch and Swinnerton-Dyer conjecture, and to be computationally accessible. We will illustrate this approach by presenting various recent related results.