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**Title:** Galois Orbit Bounds for Surface Degenerations

**Abstract:** Given a family  $g : X \rightarrow S$  of smooth projective algebraic varieties over a number field  $K$ , one often wants to constrain the points  $s$  in  $S$  where the fibre  $X_s$  acquires "extra" algebraic structure. A basic sort of constraint which is important in unlikely intersection theory is that of a Galois-orbit lower bound: an inequality  $h(s) \leq \text{poly}([K(s) : K])$ , where  $h$  is some logarithmic Weil height and  $K(s)$  is the field of definition of  $s$ . Recent work has focused on how to use  $G$ -functions constructed from degenerations of  $g$  to produce such inequalities. We describe some new results in the case where  $g$  is a one-parameter degeneration of surfaces, and the central role played by rigid and "adelic" geometry. This leads to new cases of the Zilber-Pink conjecture for 1-parameter families of  $K3$  surfaces.