

# Genus 3 curves and explicit realisations of $\mathrm{GSp}_6(\mathbb{F}_\ell)$ as a Galois group over $\mathbb{Q}$

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**Abstract:** Let  $n$  be a natural number and  $\ell$  a prime number. Given a genus  $n$  curve  $C$  defined over  $\mathbb{Q}$ , the group of  $\overline{\mathbb{Q}}$ -defined  $\ell$ -torsion points of its Jacobian variety  $J_C$  is endowed with an action of the absolute Galois group  $G_{\mathbb{Q}}$ , giving rise to a Galois representation  $\rho_{J_C, \ell} : G_{\mathbb{Q}} \rightarrow \mathrm{GSp}_{2n}(\mathbb{F}_\ell)$ . When  $\rho_{J_C, \ell}$  is surjective, it provides us with a realisation of  $\mathrm{GSp}_{2n}(\mathbb{F}_\ell)$  as a Galois group over  $\mathbb{Q}$ . To study Galois realisations (over  $\mathbb{Q}$ ) with particular ramification properties at  $\ell$ , it is of great interest to have conditions at auxiliary primes different from  $\ell$  that ensure surjectivity, while allowing great flexibility in the behaviour at the prime  $\ell$ .

In this talk we focus on the case  $n = 3$ , and provide an explicit construction of curves  $C$  defined over  $\mathbb{Q}$  such that  $\rho_{J_C, \ell}$  is surjective for a prefixed prime  $\ell$ .

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