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Integrality of the Betti Moduli Space

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This is a report on joint work with Hélène Esnault. Let X be a smooth projective variety over the complex numbers $\mathbb{C}$. Let M be the moduli space of irreducible representations of the topological fundamental group of X of a fixed rank r. Then M is a finite type scheme over the spectrum of the integers $\mathbb{Z}$. We may ask whether M is pure over $\mathbb{Z}$ in the sense of Raynaud-Gruson, for example we can ask if the irreducible components of M which dominate $\mathrm{Spec}(\mathbb{Z})$ actually surject onto $\mathrm{Spec}(\mathbb{Z})$. We will explain what this means, present a weak answer to this question, apply this to exclude some abstract groups as the fundamental groups of smooth projective varieties over $\mathbb{C}$, and we discuss what other phenomena can be studied using the method of proof.

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