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Irreducibility and components rigid in moduli of the Hilbert scheme of smooth curves

Denote by $\mathcal{H}_{d,g,r}$ the Hilbert scheme of smooth curves, which is the union of components whose general point corresponds to a smooth irreducible and non-degenerate curve of degree d and genus g in $\mathbb{P}^r$. A component of $\mathcal{H}_{d,g,r}$ is rigid in moduli if its image in the moduli space $\mathcal{M}_g$ of smooth curves of genus g under the natural map $\pi : \mathcal{H}_{d,g,r} \dashrightarrow \mathcal{M}_g$ is a one point set. In this talk, we discuss about the non-existence of a component rigid in moduli for $g > 0$ and $r = 3$. In case $r \geq 4$, we also discuss about the non-existence of a component of $\mathcal{H}_{d,g,r}$ rigid in moduli in a certain restricted range of d, $g > 0$ and $r \geq 4$. In the course of the discussion, we establish the irreducibility of $\mathcal{H}_{d,g,3}$ beyond the range which has been known before.