

# Character varieties in low-dimensional topology

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## Abstract

Given a discrete group  $\Gamma$  and a linear group  $G \leq \mathrm{GL}(n, \mathbb{C})$ , a homomorphism  $\Gamma \rightarrow G$  is called a  $G$ -representation of  $\Gamma$ . All these representations form an algebraic variety, called the  $G$ -representation of  $\Gamma$  and denoted by  $\mathcal{R}_G(\Gamma)$ . An semi-simple  $G$ -representation  $\rho$  is up to conjugacy uniquely determined by its *character*, which by definition is the function  $\chi_\rho : \Gamma \rightarrow \mathbb{C}$  sending  $g$  to  $\mathrm{tr}(\rho(g))$ . All such characters form the  $G$ -character variety of  $\Gamma$ , denoted by  $\mathcal{X}_G(\Gamma)$ . If  $\Gamma$  is the fundamental group of some 3-manifold  $M$ , then  $\mathcal{X}_G(\Gamma)$  encodes much geometric/topological information on  $M$ . In this talk the following about character varieties will be introduced: (1) basic notions and facts; (2) their roles in low-dimensional topology; (3) proceedings of some research topics.