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Module categories of analytic groups, by Andy R. Magid, Cambridge Tracts in Math., vol. 81, Cambridge Univ. Press, New York, 1982, x + 134 pp., $29.50.

The relationship between a group G and the collection of its finite-dimensional linear representations (or the category Mod(G) of finite-dimensional G-modules) is often subtle. For compact Lie groups, there are classical duality results affirming that the group is recoverable from a knowledge of its representations and how they tensor. For example, in case G is abelian, Pontryagin duality gives an isomorphism between G and $\hat{\hat{G}}$. Here the dual group $\hat{G}$ consists of the 1-dimensional representations of G (complex-valued characters), the product of characters corresponding to the tensor product of associated representations.

Tannaka duality [**5**] does something similar for arbitrary compact Lie groups. The role of $\hat{G}$ is played by the collection of all finite-dimensional representations of G, whose "representations" are in turn identified with elements of G. In Chevalley's formulation [**1**], one forms the Hopf algebra $R(G)$ of $\mathbf{C}$-valued "representative functions" (matrix coordinate functions for representations of G), with a coproduct reflecting the product in G. Because G is compact, $R(G)$ is finitely generated, hence gives rise to a complex linear algebraic group $\overline{G}$. The points of $\overline{G}$ can be thought of as algebra homomorphisms $R(G) \to \mathbf{C}$, by identifying $R(G)$ with functions on $\overline{G}$. Duality means that G is realized as the group of real points of $\overline{G}$. In this formulation, $R(G)$ plays the role of a dual group, encapsulating the structure of Mod(G) as a category with tensor products.

In a long series of joint papers (1957–1969), G. Hochschild and G. D. Mostow explored the Hopf algebra of representative functions of an arbitrary complex analytic group (cf. [**3**]). In case G is semisimple, its finite-dimensional representation theory is essentially that of its compact real form; so $R(G)$ is finitely generated and gives G the structure of an algebraic group. But in general the story is far more complicated. In particular, distinct groups may give rise to the "same" category Mod(G). This happens in a fairly transparent way when G fails to have a faithful finite-dimensional (analytic) representation,