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Flags, crystals, and orthogonal polynomials

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Abstract

When non-mathematicians ask me what research I do, I say symmetry. From symmetry of polyhedra, to symmetries of universes like spheres and tori, now we are fascinated by "paths" of symmetries, and this is the source of loop groups. It turns out that loop groups capture amazing geometry, combinatorics, and representation theory. I will endeavour to explain what the integrable representations for loop groups look like (paraboloids, mountains, craters, and tubes) and how these shapes are a reflection of the corresponding geometry (of an infinite dimensional flag variety). And then, miraculously, the characters of these modules turn out to be (specialised) Macdonald polynomials!

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