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BPS Dendroscopy on local Calabi-Yau threefolds

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The spectrum of BPS states in D=4 supersymmetric field theories and string vacua famously jumps across codimension-one walls in vector multiplet moduli space. The Attractor Flow Tree conjecture postulates that the BPS index $\Omega(\gamma, z)$ for given charge γ and moduli z can be reconstructed from the 'attractor indices' $\Omega_*(\gamma_i)$ counting BPS states of charge γ_i in their respective attractor chamber, by summing over all possible decompositions $\gamma = \sum_i \gamma_i$ and over decorated rooted flow trees. Physically, flow trees provide a mesoscopic representation of BPS states as nested multi-centered bound states of elementary constituents. I will present a rigorous version of this formula in the context of quivers with potential, which governs the BPS spectrum in type IIA string theory compactified on certain conical Calabi-Yau threefolds, in the vicinity of orbifold-type points in Kahler moduli space. Moving away from such orbifold points requires generalizing the flow tree formula from the Abelian category of quiver representations to the derived category of the same. I will present recent progress in this direction in the simplest case of local P^2, and argue that its global BPS spectrum and flow tree structure can be deduced from a scattering diagram with simple initial data.

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