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Rydberg-dressed Atoms

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Rydberg atoms are showing promise to create quantum logic gates based on their long-range interactions that cause blockade and allow for conditional logic. They may also be useful for applications in many-body physics, creating systems with long-range, anisotropic interactions. Although typical Rydberg-Rydberg interactions are orders of magnitude too strong to be used in this application, atoms that are coherent admixtures of a ground state and a small amount of Rydberg character, "Rydberg-dressed atoms," allow for suitably tunable long-range interactions. I will discuss challenges and prospects for creating and using Rydberg-dressed atoms.