Worlds Beyond Our Solar System: Exploring the Origins, Atmospheres, and Interiors of Exoplanets

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The discovery of planets beyond our Solar System, known as exoplanets, has revolutionized our understanding of planet formation and the potential for life elsewhere in the universe. These distant worlds display remarkable diversity in mass, size, temperature, orbital architecture, and chemical composition. From scorching hot Jupiters to temperate, Earth-sized rocky planets, exoplanets challenge traditional models and demand new frameworks for understanding planetary systems. In this talk, I will explore the physical and chemical processes that govern the formation of exoplanets, highlighting why many of them differ so dramatically from those in our own Solar System. I will also discuss the tools and techniques used to probe their atmospheres and interiors, integrating data from both space-based and ground-based observatories with advanced atmospheric and structural models. These approaches help reveal the building blocks, thermal structures, and potential habitability of these distant worlds. Additionally, I will present some of our recent efforts to constrain exoplanetary atmospheres using data from the James Webb Space Telescope (JWST) and offer a glimpse into the exciting future of this rapidly evolving field.