"A must-read for people interested in this active and fast moving field."
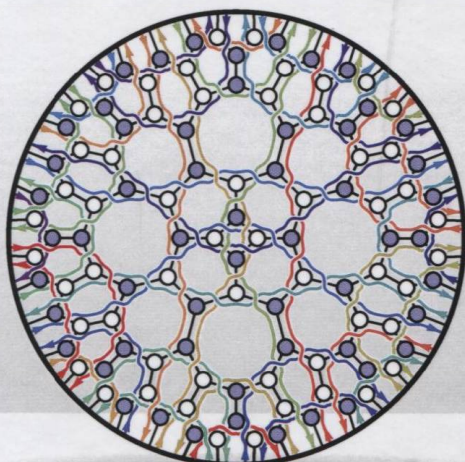**Juan Maldacena,** *Institute for Advanced Study*

"This wonderful book, written by six of the field's leading pioneers, presents the new developments so clearly and eloquently that it will enable everyone with a basic knowledge of field theory to enter this hugely exciting branch of theoretical physics."
Graham Farmelo, *University of Cambridge*

"...Nima Arkani-Hamed and his co-authors set forth a new perspective on scattering amplitudes, which leads away from locality and unitarity toward other principles, and they have provided a detailed and elegantly illustrated how-to manual for the practitioner."
Lance Dixon, *Stanford University*

Outlining a revolutionary reformulation of the foundations of perturbative quantum field theory, this book is a self-contained and authoritative analysis of the application of this new formulation to the case of planar, maximally supersymmetric Yang-Mills theory. The book begins by deriving connections between scattering amplitudes and Grassmannian geometry from first principles before introducing novel physical and mathematical ideas in a systematic manner accessible to both physicists and mathematicians. The principal players in this process are on-shell functions which are closely related to certain sub-strata of Grassmannian manifolds called positroids – in terms of which the classification of on-shell functions and their relations becomes combinatorially manifest. This is an essential introduction to the geometry and combinatorics of the positroid stratification of the Grassmannian and an ideal text for advanced students and researchers working in the areas of field theory, high energy physics, and the broader fields of mathematical physics.

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