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# Grassmannian Geometry Of Scattering Amplitudes

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**GRASSMANNIAN
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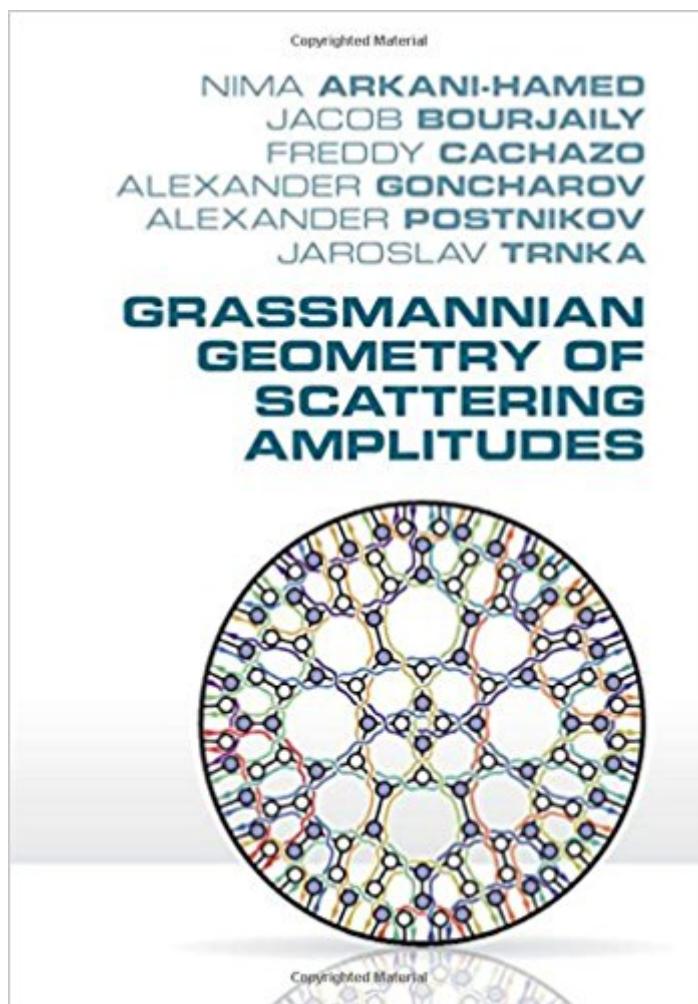
# Synopsis

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 principle 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.

# Book Information

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# Customer Reviews

"This book describes the interesting mathematical structures behind scattering amplitudes, which have led to important simplifications for explicit computations. A must-read for people interested in this active and fast-moving field." Juan Maldacena, Institute for Advanced Study, Princeton"In the continuing revolution in our understanding of scattering amplitudes in gauge theories, the emerging importance of Grassmannian geometry has been a considerable surprise. The consequences would have astonished the pioneers of quantum theory. 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. Warmly recommended." Graham Farmelo, University of Cambridge"This book is the 'Diagrammar' of the twenty-first century. Just as Gerard 't Hooft and Martinus Veltman laid out in 1973 the then-new calculus of Feynman diagrams for scattering processes in non-abelian gauge theories, so now have 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

An essential resource examining the ongoing revolution in our understanding of perturbative quantum field theory and its connection to Grassmannian geometry. This book outlines the foundations of this important new formulation, with a self-contained and authoritative analysis of its application to planar maximally supersymmetric Yang-Mills theory.

There is something fantastically deep here.While NAHs treatment is N=4 supersymmetric YM theory the amplituhedron method reproduces BCFW as just one of many ways to triangulate the amplituhedron.This method makes no mention of spacetime or unitarity yet they emerge nicely from the ideas presented by NAH et al.The future of emergent spacetime is very bright and it appears the amplituhedron may play a prime role in a different form as a route towards a non-supersymmetric YM theory or even a unified theoryWell done

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