Supergravity, Strings and Dualities

A Meeting in Celebration of Chris Hull's 60th Birthday

George Papadopoulos

King's College London

28-29 April 2017
Imperial College

1980's

- String Theory
- Sigma model approach to Strings
- Geometry of 2-dimensional supersymmetric sigma models

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At Queen Mary College

Gauge symmetries for (p,q) supersymmetric sigma models

C.M. Hull, G. Papadopoulos, Bill J. Spence (Queen Mary, U. of London)

Apr 1991 - 29 pages

Nucl.Phys. B363 (1991) 593-621
(1991)
DOI: 10.1016/0550-3213(91)80035-K
QMW-91-04

Abstract (Elsevier)
The conditions for two-dimensional (p, q) supersymmetric non-linear sigma models with Wess-Zumino term to have rigid "isometry" symmetries are derived and related to the target-space geometry. This paper addresses the gauging of such rigid symmetries by coupling to (p, q) super Yang-Mills multiplets. We formulate (p, q) super Yang-Mills theory in (p, q) superspace and find that, in addition to the conventional multiplets, there are new twisted Yang-Mills multiplets. The (p , 0) and (p , 1) supersymmetric sigma models are coupled to (p , 0) and (p , 1) super Yang-Mills to obtain gauge-invariant actions in (p , 0) and (p , 1) superspace, respectively. The (2, 2) sigma models with torsion and off-shell closure of the supersymmetry algebra can be formulated in terms of chiral and twisted chiral (2, 2) superfields and we find that the gauging of such models requires both conventional and twisted (2,2) Yang-Mills multiplets. We give two versions of the gauged (2, 2) sigma model with torsion. The (4, q) gauged supersymmetric models are finite by power counting.

Keyword(s): INSPIRE: sigma model: nonlinear | supersymmetry: multiplet | multiplet: supersymmetry | dimension: 2 | Wess-Zumino term | gauge field theory: Yang-Mills | potential: Killing | quantization | field theory: finite

Record added 1991-06-25, last modified 2016-05-12

Later in 1990's

QMW-93-11
DAMTP/R-93/8
KCL-93-5
May 1993

Potentials for (p,0) and (1,1) supersymmetric sigma models with torsion

C.M. Hull[1], G. Papadopoulos[2] and P.K. Townsend[3]

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[2] *Dept. of Mathematics, King's College, London, England*
[3] *DAMTP, University of Cambridge, Silver Street, Cambridge, England*

arXiv:hep-th/9307152v1 2 Jul 1993

ABSTRACT

Using (1,0) superfield methods, we determine the general scalar potential consistent with off-shell (p,0) supersymmetry and (1,1) supersymmetry in two-dimensional non-linear sigma models with torsion. We also present an extended superfield formulation of the (p,0) models and show how the (1,1) models can be obtained from the (1,1)-superspace formulation of the gauged, but massless, (1,1) sigma model.

- Classification of supergravity backgrounds that preserve a fraction of spacetime superymmetry
- Initial focus on the maximally supersymmetric solutions

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IIB plane wave

arXiv:hep-th/0110242v1 26 Oct 2001

A NEW MAXIMALLY SUPERSYMMETRIC BACKGROUND OF IIB SUPERSTRING THEORY

MATTHIAS BLAU, JOSÉ FIGUEROA-O'FARRILL, CHRISTOPHER HULL, AND GEORGE PAPADOPOULOS

ABSTRACT. We present a maximally supersymmetric IIB string background. The geometry is that of a conformally flat lorentzian symmetric space G/K with solvable G, with a homogeneous five-form flux. We give the explicit supergravity solution, compute the isometries, the 32 Killing spinors, and the symmetry superalgebra, and then discuss T-duality and the relation to M-theory.

CONTENTS

1. INTRODUCTION

There are precisely four types of maximally supersymmetric solutions of eleven-dimensional supergravity [16, 5, 7]. The first three types are the familiar cases of flat eleven-dimensional space (Minkowski space

Theorem [Figueroa-O'Farrill, GP]: The maximally supersymmetric backgrounds of IIB supergravity are locally isometric to one of the following; Minkowski space, $AdS_5 \times S^5$ or the maximally supersymmetric plane wave

From Plato to M-theory

- Ancient Greek Mythology
- Gods, Goddesses, Heroes and mere Humans
- All locked in a battle for recognition, excellence and lasting immortality
- For millennia laboratory for understanding human nature

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Crete Meeting in String Theory 2003

- Relate the tsunami from Thera to Crete in 1,550BC with the plane wave solutions
- First recorded application of string theory (1,550BC>): The suggestion of Ariadne to Theseus to use an open string to find his way out of the Knossos maze.
- Allegory for using string theory to find our way out of the maze of theoretical physics

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Aegean Islands

Untitled layer

- Chris explained the myth of Ariadne and Theseus
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M-theory

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as a reminder of the challenge ahead.

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Happy Birthday Chris-Many Happy Returns