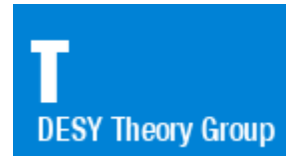


Theoretical Physics at DESY and the University of Hamburg

PHDs @ DESY – Research Topics & BBQ



II. Institute for Theoretical Physics



Universität Hamburg

Department
Physik



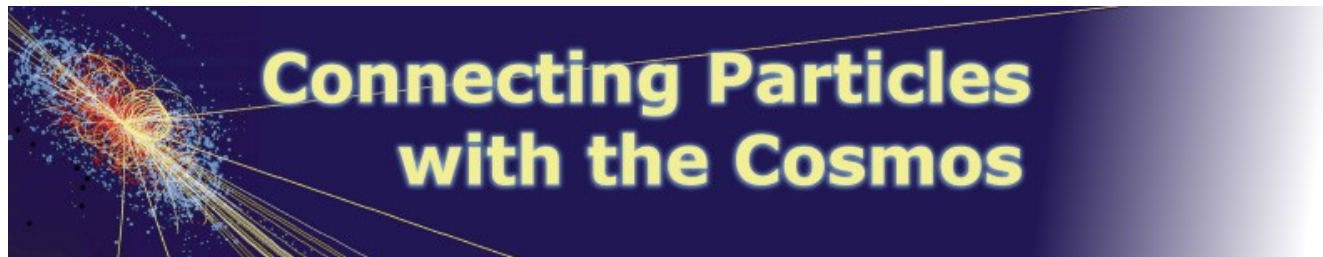
Michael Greife (DESY Theory Group)

PHDs @ DESY – Research Topics & BBQ

3 August 2010

Facts about the Theory Groups

- In total ~ 125 members
 - ~ 50 at the DESY Theory Group in Hamburg
 - ~ 15 at the DESY Theory Group in Zeuthen
 - ~ 60 at the II. Institute for Theoretical Physics of the UHH
- ~ 35 PhD students
- The theory groups participate in several collaborative projects



Research Topics in Theoretical Physics

- The Theory Groups in Hamburg and Zeuthen cover a large Variety of Topics in High-Energy Physics



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Algebraic QFT



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Astroparticle Physics



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Algebraic QFT

Astroparticle Physics



**Elementary Particle
and Collider
Phenomenology**

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**Elementary Particle
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Particle Cosmology



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Algebraic QFT

Astroparticle Physics

String Theory



**Elementary Particle
and Collider
Phenomenology**

Particle Cosmology



Algebraic Quantum Field Theory (AQFT)

- > General Framework for the Description of the Physics of Elementary Particles
- > Synthesis of Quantum Theory and Special Relativity
- > Emphasizes the role of algebraic relations among observables which properly determine a physical system
- > ...



Astroparticle Physics

- > Propagation of Cosmic Rays

- Important Tool to understand Cosmic Ray Signals

- > Tests of Physics beyond the Standard Model

- > Dark Matter

- Indirect Detection: Search for Dark Matter Signatures in Cosmic Ray Signals

- > Neutrino Physics

- > ...



Elementary Particle and Collider Phenomenology

- > Physics Studies at Present and Future Colliders, in particular LHC and a future linear electron-positron collider
- > Precision Tests of the Standard Model
 - Higher Order Corrections
- > Physics of Electroweak Symmetry Breaking
 - Higgs Physics at the LHC
- > Physics beyond the Standard Model
 - Supersymmetry (SUSY)
 - Extra Dimensions
 - Determination of Underlying Parameters from Collider Signals
- > Flavor Physics
 - B Physics
 - Flavor Physics beyond the Standard Model
 - Neutrino Physics
- > Quantum Chromodynamics (QCD)
 - Parton Distribution Functions
 - Factorization Functions
 - Lattice QCD
 - Determination of the Strong Coupling Constant

> ...



Particle Cosmology

- > Interdisciplinary Studies connecting High-Energy Physics, Astroparticle Physics, General Relativity and Early Universe Physics
- > Dark Matter
 - Gravitino Dark Matter
 - Implications for Baryogenesis, Big Bang Nucleosynthesis, Indirect Dark Matter Searches and Collider Searches
- > Baryogenesis
 - Creation of the Matter-Antimatter Asymmetry in the Early Universe
 - Leptogenesis
 - Quantum Mechanical Description
- > ...
- > Dark Energy and Inflation
 - Cosmological Constant or Dynamical Field?
 - Embedding in Particle Theories beyond the Standard Model
- > Axionlike Particles, WISPs and the Low-Energy Frontier
 - Axions
 - Axion-like Particles
 - Weakly Interacting Sub-eV Particles
 - Cosmological Consequences
 - Light-Shining-through-the-Wall experiments like ALPS



String Theory

> String Theory and Gravity

- Combination of Gravity with the Principles of Quantum Theory
- Supersymmetric Quantum Field Theory
- Supergravity

> String Theory and Gauge Theory

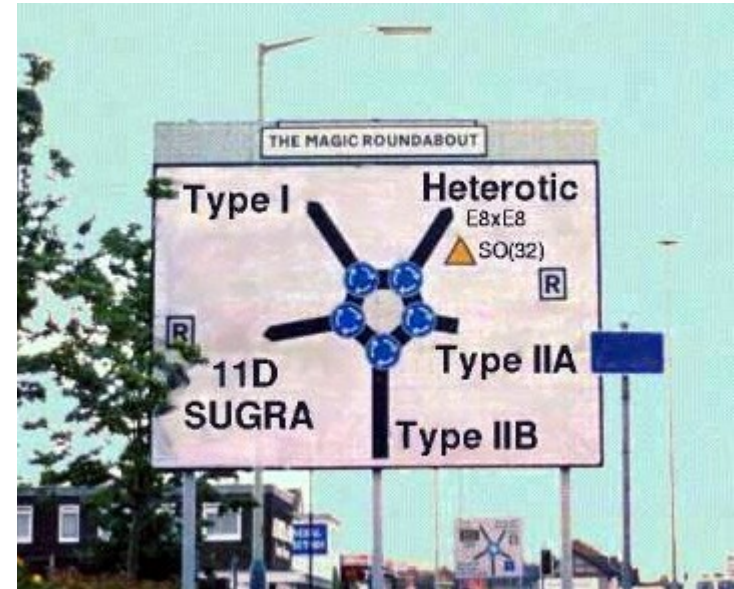
- AdS/CFT Correspondence
- Duality between Gauge and String Theories

> 2-Dimensional Field Theories

> Non-Linear Sigma Models

- Exactly Solvable String Theories on Curved Spaces

> ...



Differences to Other Groups

- > Less or no Service Duties
- > Several Seminars with invited Speakers but no internal Group Meetings
- > No Shifts (People work all Night long voluntarily)
- > ...

