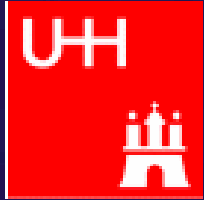


SFB 676

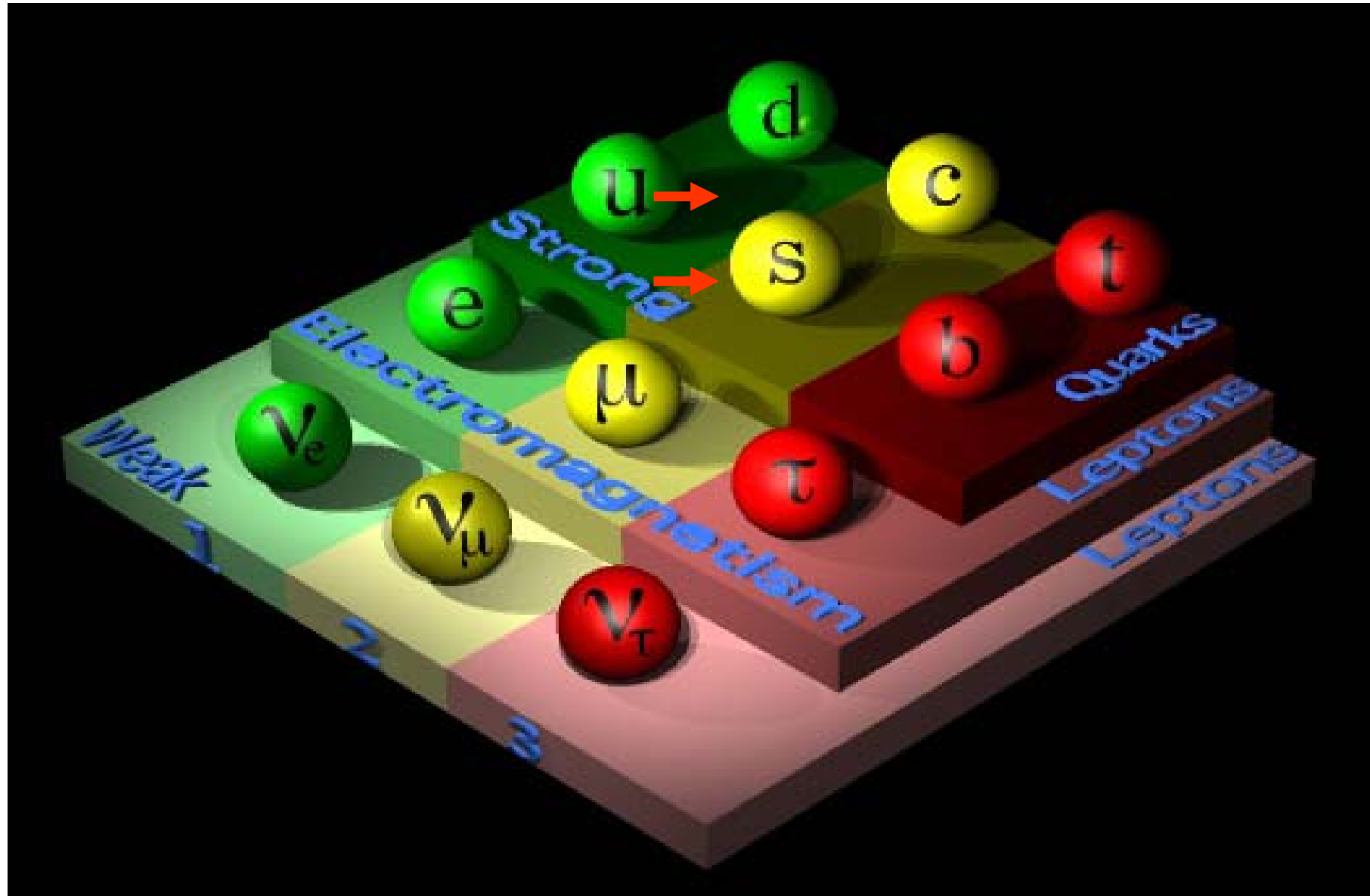
Particles, Strings and the Early Universe



Peter Schleper
Hamburg University
9.7.2008



The Standard Model



Particles and Forces

BOSONS

force carriers
spin = 0, 1, 2, ...

Unified Electroweak spin = 1		
Name	Mass GeV/c ²	Electric charge
γ photon	0	0
W^-	80.4	-1
W^+	80.4	+1
Z^0	91.187	0

Strong (color) spin = 1		
Name	Mass GeV/c ²	Electric charge
g gluon	0	0

FERMIONS

matter constituents
spin = 1/2, 3/2, 5/2, ...

Leptons spin = 1/2

Quarks spin = 1/2

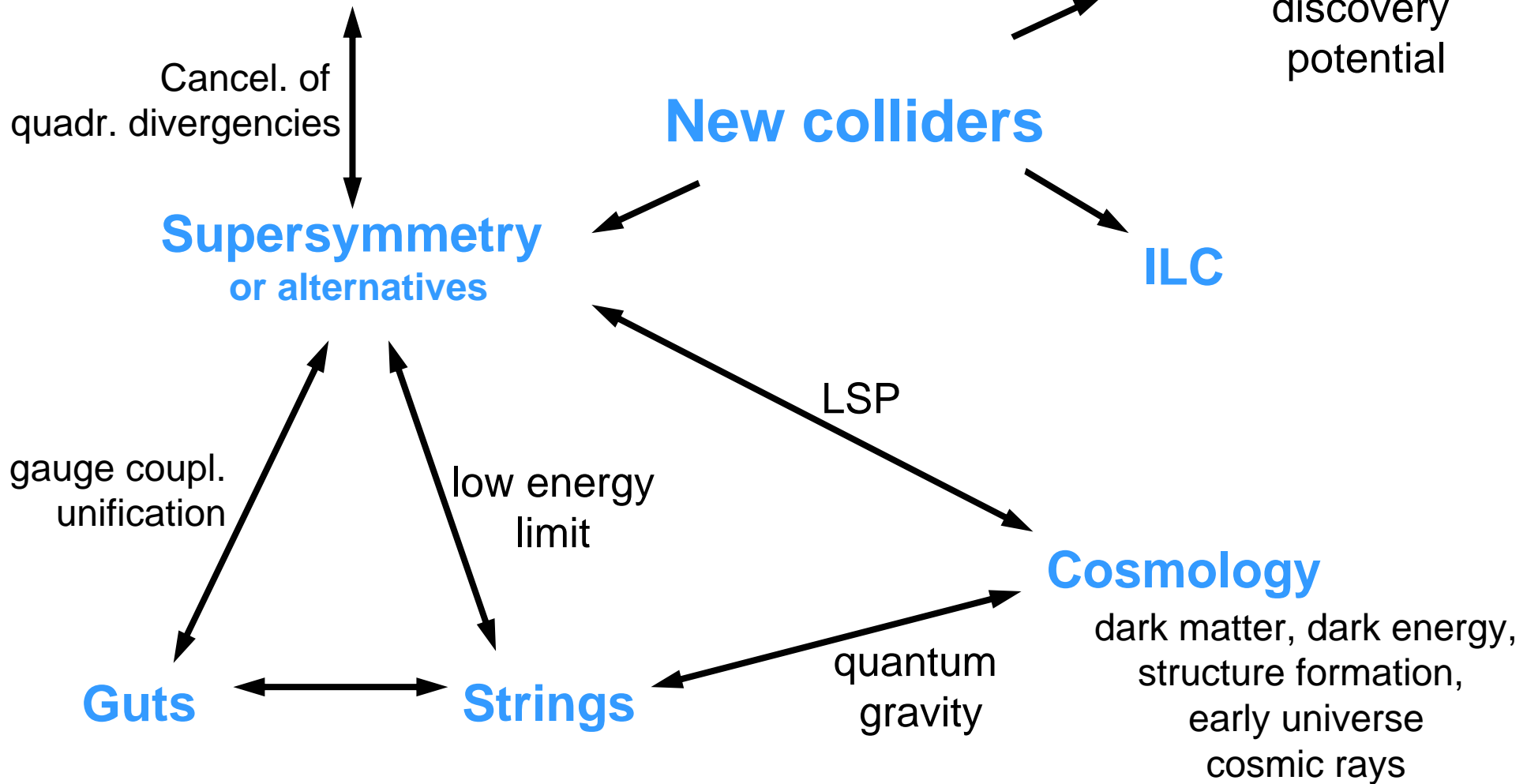
Flavor	Mass GeV/c ²	Electric charge
ν_e electron neutrino	$<1 \times 10^{-8}$	0
e electron	0.000511	-1
ν_μ muon neutrino	<0.0002	0
μ muon	0.106	-1
ν_τ tau neutrino	<0.02	0
τ tau	1.7771	-1

Flavor	Approx. Mass GeV/c ²	Electric charge
u up	0.003	2/3
d down	0.006	-1/3
c charm	1.3	2/3
s strange	0.1	-1/3
t top	175	2/3
b bottom	4.3	-1/3

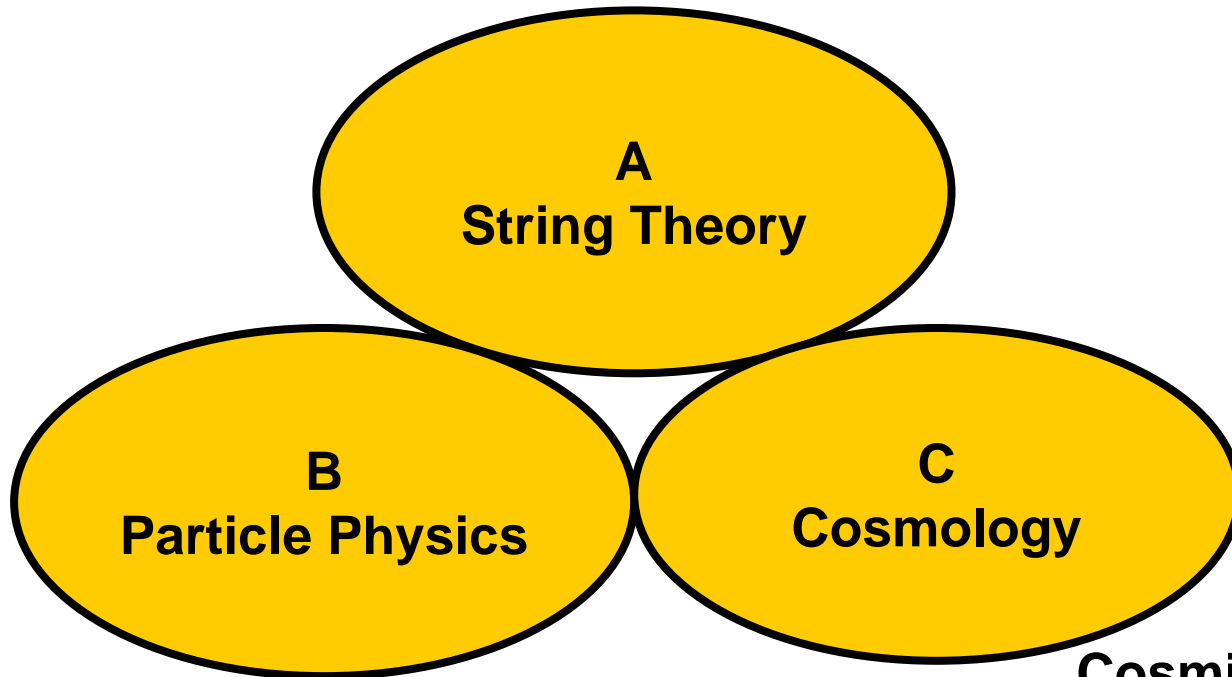
The Higgs Particle ?

Standard Model of Particles

Higgs?



Mathematical foundations
String phenomenology
String theory and QCD
String cosmology



Physics beyond the SM
Neutrinos in the SM
QCD at HERA and LHC
Heavy (s)quarks

Cosmic neutrinos
Dark matter, dark energy
Leptogenesis, Inflation
Variable constants in nature
QFT in expanding universe

Questions to Nature

- **What is the origin of matter and what are the interactions of its fundamental constituents?**
- **How will deviations from the Standard Model be detected in the collider experiments LHC, ILC or at cosmic ray neutrino facilities?**
- **What is the origin of dark matter? What is the origin of dark energy? How do both fit into models of Particle Physics and Cosmology?**
- **How are the Standard Model of Particle Physics and the Standard Model of Cosmology embedded in a unified fundamental theory?**
- **Can we improve our understanding of String Theory? What are the consequences for Particle Physics and Cosmology?**

Projects of the SFB

String Theorie

- Particle Physics from String Compactifications
- Time Dependent String Backgrounds
- Strings and QCD
- Mathematical Foundation of String Theory
- Mathematical Aspects of String Compactifications

Particle Physics

- Physics Beyond the Standard Model at ILC
- Supersymmetry at LHC
- Neutrinos in the Standard Model
- Field Theoretic Aspects of New Physics
- Strong Interactions and New Physics at LHC

Cosmology

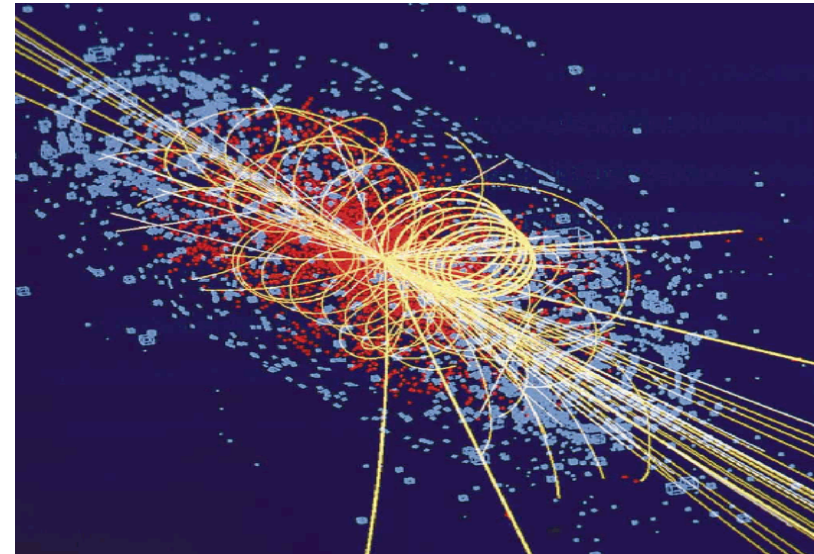
- Extremely Energetic Cosmic Neutrinos
- Search for Dark Matter
- Leptogenesis and Dark Matter
- Variations of Fundamental Constants
- Type Ia Supernovae and Dark Energy
- Scalar fields in Cosmology: Inflation, dark matter, dark energy
- Thermodynamics of Quantum Fields in non-stationary space-times

Hamburg University

- Institute for Theoretical Physics
- Institute for Experimental Physics
- Hamburger Sternwarte (Astronomy)
- Department of Mathematics

DESY

- Theorie Group



Agenda

- P. Schleper
- E. Elsen
- L. Motyka:
- Ch. Sander

Coffee

- A. Srivastava
- all

Welcome

DESY scientific program

SFB: selected theoretical topics

SFB: selected experimental topics

Defects in Semiconductors

Discussion

