

30 Years of SUSY

**The XXX International Conference on
Supersymmetry and Unification of Fundamental Interactions
Southampton, UK**

PN

Northeastern University, Boston
Massachusetts, USA

July 17-21, 2023

Southampton SUSY is the 30th, a milestone!

A brief history of SUSY

- The first SUSY conference: Northeastern University, Boston (1993).
- Between 1993-2000, the conference alternated between USA and Europe.
- Since 2001, it has become a global conference and has been held in locations beyond USA and Europe. These include

Australia, China, India, Japan, Korea, Mexico, Russia, Taiwan.

SUSY has been held at academic institutions as well as national laboratories most active in the exploration of fundamental physics.

2023: Southampton, UK

2022: Ioannina, Greece

2019: Texas A&M, USA

2017: Mumbai, India

2015: UC Davis, USA

2013: ICTP Trieste, Italy

2011: Fermilab, Batavia, USA

2009: Northeastern University, Boston, USA

2007: Karlsruhe, Germany

2005: IPPP Durham, UK

2003: The University of Arizona, USA

2001: Dubna, Russia

1999: Fermilab, Batavia, USA

1997: UPenn, USA

1995: Paris, France

1993: Northeastern University, Boston, USA

2021: Beijing, China

2018: Barcelona, Spain

2016: Melbourne, Australia

2014: Manchester, UK

2012: Peking University, Beijing, China

2010: Physikalisches Institut, Bonn, Germany

2008: Seoul, Korea

2006: UC Irvine, California, USA

2004: KEK, Tsukuba, Japan

2002: DESY, Hamburg, Germany

2000: CERN, Geneva, Switzerland

1998: Oxford, UK

1996: Maryland, USA

1994: UMichigan, USA

SUSY Conference

- Supersymmetry
- Unification

Histories of physics discoveries show a see-saw between experiment and theory

Experiment driving theory:

An example is the flavor changing neutral current anomaly

$$(K^0 \rightarrow \mu^+ \mu^-)/(K^+ \rightarrow \mu^+ \nu_\mu) = (6.84 \pm 0.11) \times 10^{-9}.$$

An explanation of it led to the proposal of the charm quark where charm loop cancels the u quark loop with a natural cancellation of one part in 10^9 !

S. L. Glashow, J. Iliopoulos and L. Maiani, Phys. Rev. D **2**, 1285-1292 (1970).

Theory driving experiment

Example: Higgs boson prediction[1] tested by experiment[2].

[1] F. Englert and R. Brout, Phys. Rev. Lett. 13 (1964) 321;
P. W. Higgs, Phys. Lett. 12 (1964) 132;
G. Guralnik, C. Hagen, and T. Kibble, Phys. Rev. Lett. 13 (1964) 585.

[2] ATLAS Collaboration, Phys. Lett. B 716 (2012) 1;
CMS Collaboration, Phys. Lett. B 716 (2012) 30.

It is to be noted that the time gap between theory prediction of the Higgs boson and the experimental confirmation was 48 years!.

SUSY in the same category as the Higgs

- Prediction of sparticles in SUSY is driving their search at colliders and in cosmology.
- Compared to Higgs mass of 125 GeV, the weak SUSY scale is estimated at ~ 1 TeV.
- However, there is typically a large dispersion in the sparticle spectrum and some sparticles such as the stau or a light chargino could still be low enough to be discovered at Run3 or Run4 of LHC. There is a hint of some sparticles being light in Fermilab ($g - 2$) 2021 experiment.
- As noted it took almost 50 yrs from prediction to confirmation for Higgs boson, so we can be a bit patient while waiting for sparticles to show up.

Further progress in SUSY and more generally in BSM hinges on experiment, and this is amply reflected in the Southampton SUSY Scientific Program with proper focus on experiment.

- Talks

- SUSY/BSM related searches and hints/anomalies in [CMS](#)
- SUSY/BSM related searches and hints/anomalies in [ATLAS](#)
- SUSY related searches at [LHCb](#)
- Dark Matter Search [Experiments](#).
- Dark Matter Indirect [Searches](#): status and new directions.

- Scientific Program

- SUSY: Phenomenology and [Experiment](#).
- Supersymmetry: Models, Phenomenology and [Experimental Results](#)
- Higgs theory and [Experiment](#).
- Particle cosmology: Theory and [Experiment](#).
- Flavour physics: Theory and [Experiment](#).

THANKS TO OUR HOSTS

The University of Southampton
&
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Stefano Moretti (co-chair)

Giovanna Salvi

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Nakorn Thongyoi

For their gracious offer to host the conference and for the very significant effort they have put in over the past year in organizing this international event.



Bonn-SUSY -2010