PROCEEDINGS OF SCIENCE

Propaedeutical Course in Supersymmetry

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An introductory course on basic aspects of (rigid) Supersymmetry was given. This was intended for students which did not have any exposure to supersymmetry, before. Given the format of this course, which served just as a background for the regular courses at the School, only the list of topics discussed will be given, together with a list of the references these lectures were based on.

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1. Summary of the course

The course was meant for students which did not have any exposure to supersymmetry, before. For this reason this was a very basic course.

There are many books on supersymmetry as well as nice reviews which are available on the archive. For this reason I do not provide new written lectures below, but just list the topics I discussed. In the reference list one can find both a list of known books on supersymmetry [1] and a list of reviews [2].

1. *Introduction*. A brief list of theoretical and phenomenological motivations for the validity of the supersymmetric option as a way to describe particle physics beyond the Standard Model was given, together with a discussion on its consequences.

2. *The supersymmetry Algebra*. The supersymmetry algebra was introduced as a natural extension of the Poincaré algebra, and its physical meaning discussed. Though the main focus was on $\mathscr{N} = 1$ supersymmetry, in this lecture and the following one the structure of extended supersymmetry was also discussed.

3. *Representations*. A superparticle (that is, a supermultiplet of particle states) was introduced as an irreducuble representation of the supersymmetry algebra. Both massless and massive representations were discussed, as well as BPS-saturated multiplets (for theories with extended supersymmetry).

4. *Superspace and superfields*. The superspace formalism was introduced and superfields were defined as field in superspace. Here we focused on $\mathscr{N} = 1$ supersymmetry and chiral and vector superfields were introduced.

5. *Supersymmetric Actions*. The goal was to construct the most general $\mathscr{N} = 1$ supersymmetric action describing the interaction of radiation and matter. On the way, renormalization theorems were discussed and the concepts of Kähler potential and superpotential were introduced.

References

[1] J. Wess and J. Bagger, *Supersymmetry and supergravity*, Princeton, USA: Univ. Pr. (1992).
P. C. West, *Introduction to supersymmetry and supergravity*, Singapore: World Scientifi c (1990).
M. F. Sohnius, *Introducing Supersymmetry*, Phys. Rept. **128** (1985) 39.
S. Weinberg, *The quantum theory of fields. Vol. 3: Supersymmetry*, Cambridge, UK: Univ. Pr. (2000).

[2] A. Bilal, *Introduction to Supersymmetry*, hep-th/0101055.
J. D. Lykken, *Introduction to Supersymmetry*, hep-th/9612114.
S. P. Martin, *A Supersymmetry Primer*, hep-ph/9709356.