



Cours de Physique Théorique de l'IPhT, année 2009-2010

Organisés en collaboration avec

Ecole Doctorale de Physique de la Région Parisienne - ED 107

Dynamics of supersymmetric gauge theories

Mikhail Shifman

Minnesota U. et Chaire Blaise Pascal*

*financée par l'Etat et la région d'Ile-de-France

Alexei V. Yung

PNPI, S. Petersburg

Les vendredis 28/5, 4/6, 11/6, 18/6, 25/6, 2/7/2010.

In this lecture course we intend to give an introduction and review recent developments in nonperturbative aspects of supersymmetric gauge theories. Accumulation of results obtained in the 1980s culminated in a breakthrough discovery of the Seiberg--Witten solution (1994) in $N=2$ Yang-Mills theories. This was the first analytic demonstration ever of the dual Meissner effect as the underlying mechanism of color confinement. Since then we witnessed a remarkable progress in understanding non-Abelian string formation and their structure. A full understanding of what happens with the 't Hooft-Polyakov monopoles in the Higgsed theories and how they get confined was achieved. There are high expectations (supported in part by a number of recent results) that using certain dualities we will be able to pass from confined monopoles to confined quarks in $N=1$ theories. Dualities going beyond those of Seiberg and Seiberg and Witten were discovered and exploited, with great success, in dealing with various gauge theories at strong coupling. A tool kit was developed which allowed one to obtain a number of elegant exact results. The tentative plan of the lecture course is:

1. A brief introduction to centrally extended superalgebras;
2. A review of important models with central charges and their implications;
3. Non-Abelian strings; basic bulk gauge theories supporting non-Abelian strings;
4. World-sheet theories on non-Abelian strings;
5. From the 't Hooft-Polyakov monopoles to confined monopoles: a smooth journey without phase transitions;
6. Descending down to $N=1$ (heterotic non-Abelian strings);
7. Beyond Seiberg-Witten's dualities.

Horaires : les vendredis de 10h00 à 12h15.

Lieu : IPhT, CEA Saclay, Orme des Merisiers, Bât. 774, p.1A Salle C. Itzykson.

Accès : Par lignes de bus publics (269.02 et 91.06) ou

- navettes CEA: RER B Le Guichet vers CEA Orme Bât. 774, toutes les 15 min de 8h00 à 9h45;

- navette CEA: CEA Orme Bât. 774 vers RER B Le Guichet à 12h36.

Renseignements : <http://ipht.cea.fr> ou ipht-lectures@cea.fr