Seminar: The Interplay of Geometrical Topology and Gauge Theory.

Organizer: Prof. V.Pidstrygach
Time: Thu, July 15, 2004   **13:00**
Place: SZ

Why do we live in four dimensions?

Manifolds have been central objects in mathematics for a long time. A full description of curves and surfaces, that is manifolds of dim≤ 2, has been known since XIXth century. Mathematicians of XXth century provided a picture of high dimensional (dim≥ 5)manifolds. Despite some great achievments in the last several decades, the theory of low-dimensional manifolds is far from good understanding.

In 70's M.Freedman gave a complete answer to the question, whether 2 given 4-manifolds are *homeomorph*. It was Donaldson who surprised in 80's mathematical world proving that 4-manifold can have a lot of smooth structures. For example, standard $\mathbb{R}^4$ has uncountably many such structures! Some ten years after Donaldson's discover, a new theory of Seiberg and Witten appeared, which is now the main tool in the problem of classification of smooth structures.

The main goal of the seminar is to give a glance in the modern theory of 4-manifolds. We shall mainly concentrate on the following questions:

- how can one distinguish different smooth structures on o given four-manifold?

- how can one construct new smooth four-manifolds from the known?

More precisely, we would like to consider the following topics:

1. Examples of 4-manifolds and basic invariants.

2. Kirby calculus (handlebodies, surgery, plumbings...).

3. Lefschetz pencils.

4. Applications to symplectic manifolds.

All interested are welcomed!
Further questions on haydys@uni-math.gwdg.de

References

[1] R.E. Gompf, A.I. Stipsicz. 4-Manifolds and Kirby Calculus, AMS, 1999.

[2] R.C. Kirby. The Topology of 4-Manifolds, Springer-Verlag,1989.