ZURICH GRADUATE COLLOQUIUM

Wednesdays, 13-15 (FIM Tea to follow)

Hermann Weyl Zimmer (HG G43, ETH Zentrum)

Speaker: **Uli Wagner**

Title: **Halving Facets – An Invitation to Discrete Geometry**

Date: Wednesday, April 14th

Abstract: The goal of this talk is to convey a little bit of the flavor of ”discrete” or ”combinatorial” geometry by considering one of the most notorious problems in this area.

Suppose we are given an even number n of points in the Euclidean plane. How many ways are there to partition the points into two subsets of cardinality $n/2$ by a straight line (which itself avoids all the points)? The answer will depend on the specific point set S at hand, so let us modify the question and ask: What is the maximum number $h(n)$ of such partitions over all sets of n points? This question was first studied by Erdös, Lovász, Simmons, and

Strauss, in the early 1970's, and later turned out to have numerous applications in discrete and computational geometry. It also turned out to be very difficult; all that is known at the moment is that $h(n)$ is at least $n\exp(c\cdot\sqrt{n})$ and at most $C\cdot n^{4/3}$ for some constants $c, C > 0$.

In the first part of this talk, we will review some of the basic ideas for those partial answers. We will also mention some applications, for example to Sylvester's "Four-Point" problem from geometric probability. In the second part of the talk, which might be a little ambitious given the time-frame, I hope to give a glimpse of some methods from equivariant topology used in combinatorics. Among other things, these can be used to obtain bounds for the generalization of our planar problem to higher dimensions.

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