Boğaziçi
MATH COLLOQUIUM

The Obituary for the Holy Grail of Topological Combinatorics

Murad Özaydın
University of Oklahoma

Abstract: The title above is stolen from Gil Kalai's blog on the Topological Tverberg conjecture. The lead article in the August issue of the Notices of the AMS is also about this and related results and conjectures. Topological Tverberg conjecture was stated for all $n > 1$, it turns out to be true only for prime powers. Both the positive result for prime powers (proven in 1987) and the negative result for the remaining positive integers (whose proof spanned three decades) are applications of equivariant algebraic topology to combinatorial geometry. The technique employed (later dubbed the configuration space/ test map method) is now a standard in topological combinatorics.

The affine version is a generalization of a theorem of Radon in convexity (corresponding to $n = 2$) and was conjectured by Birch for all $n > 1$, and proven by Tverberg (1966). The $n = 2$ case of the topological version (conjectured for all $n > 1$ by Barany) is equivalent to the Borsuk-Ulam theorem. Barany-Shlosman-Szucs proved the (topological) case when n is a prime (1981). Over the years several proofs of the prime power case were given, the first in 1987 along with a negative result showing that the equivariant method employed can only work in the prime power case. Using this negative result, the existence of counterexamples for non prime powers was announced last year. In between most efforts were towards trying to prove the Topological Tverberg conjecture for arbitrary n.

In the talk (aimed at a general mathematical audience) I plan to give the precise statements of the theorems and the conjectures mentioned above, give some history of topological combinatorics in general and the topological Tverberg conjecture in particular and try to indicate and/or sketch some of the proofs.

Date : Wednesday, October 12, 2016
Time: 15:00
Place: TB 250, Boğaziçi University