UIC WISEST VISITING SCHOLARS PROGRAM

2008-2009

Symmetries, Ping-pong, and Outer Space

Biological Sciences

Chemistry

Earth & Environmental Sciences

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Trustee, American Mathematical Society

4:00 PM, Monday, October 13, 2008, Lecture Center D4

Physics

Bioengineering

Chemical Engineering

Civil & Materials Engineering

Computer Science

Electrical & Computer Engineering

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Mathematics, Statistics & Computer Science

ABSTRACT

The symmetries of any geometric object form a system which obeys a small set of natural "rules." Mathematicians have observed that systems obeying the same set of rules occur throughout mathematics, though with wildly different descriptions. Since such systems, called ***groups***, lie at the heart of many calculations in mathematics and the sciences, we are very interested in trying to understand them better. The branch of mathematics in which I work, called ***geometric group theory***, studies abstractly defined groups by trying to find concrete geometric objects whose symmetry groups are basically the same as the group under investigation. A close look at such an object often reveals characteristics of the group which were not obvious from the original description. A nice aspect of geometric group theory is that the search for such objects and attempts to visualize them often lead to very beautiful mathematical imagery.

One of the simplest of all types of groups are the so-called ***free groups***; here the word ***free*** can be interpreted as saying that the group is free of any complicated internal structure. It is often very useful to be able to recognize when a group which looks like it might be very complicated is in fact secretly just a free group. One very appealing way to solve this problem is to find an appropriate geometric object, which we then use as a table on which to play mathematical "ping-pong"; the reason for this name becomes clear after seeing an example. Much of my work involves trying to understand symmetries of free groups. I will describe an appropriate ping-pong table, known as ***Outer space***, which can sometimes be used to settle this question.

DETAILS

Reception October 13, 3:00-3:45 PM, SEO 300

Lecture October 13, 4:00 – 5:00 PM, LC D4

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