Put on paper, this math calculation would cover Manhattan

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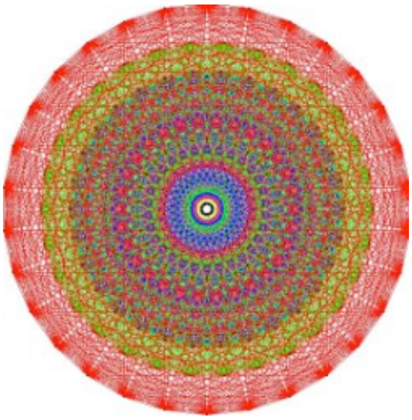
SooToday.com
Monday, March 19, 2007



NEWS RELEASE

AMERICAN INSTITUTE OF MATHEMATICS

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A calculation the size of Manhattan

Mathematicians solve E_8 structure which will lead to potential new discoveries in mathematics, physics and other fields

PALO ALTO, Calif. - March 19, 2007 – The American Institute of Mathematics (AIM), one of the leading math institutes in the U.S., announced today that after four years of intensive collaboration, 18 top mathematicians and computer scientists from the U.S. and Europe have successfully mapped E_8, one of the largest and most complicated structures in mathematics.

Partners on this project included MIT, Cornell University, University of Michigan, University of Utah and University of Maryland.

The findings will be unveiled today, Monday, March 19 at 2 p.m. Eastern, at a presentation by David Vogan, Professor of Mathematics at MIT and member of the team that mapped E_8.

The presentation is open to the public and is taking place at MIT, Building 1, Room 190.

E_8 (pronounced "E eight") is an example of a Lie (pronounced "Lee") group.

Lie groups were invented by the 19th century Norwegian mathematician Sophus Lie to study symmetry.

Underlying any symmetrical object, such as a sphere, is a Lie group.

Balls, cylinders or cones are familiar examples of symmetric three-dimensional objects.

Mathematicians study symmetries in higher dimensions.

In fact, E_8 is the symmetries of a geometric object like a sphere, cylinder or cone, but this object is 57-dimensional.

E_8 is itself is 248-dimensional.

[Illustration above shows a 2-dimensional projection of an 8-dimensional depiction of E_8's root system.]

For details on E_8, click here.

"E_8 was discovered over a century ago, in 1887, and until now, no one thought the structure could ever be understood," said Jeffrey Adams, project leader and mathematics professor at the University of Maryland.

"This groundbreaking achievement is significant both as an advance in basic knowledge, as well as a major advance in the use of large scale computing to solve complicated mathematical problems."

The mapping of E_8 may well have unforeseen implications in mathematics and physics which won't be evident for years to come.

"This is an exciting breakthrough," said Peter Sarnak, Eugene Higgins Professor of Mathematics at Princeton University and chair of AIM's scientific board.

"Understanding and classifying the representations of E8 and Lie groups has been critical to understanding phenomena in many different areas of mathematics and science including algebra, geometry, number theory, physics and chemistry. This project will be invaluable for future mathematicians and scientists."

The magnitude and nature of the E_8 calculation invite comparison with the Human Genome Project.

The human genome, which contains all the genetic information of a cell, is less than a gigabyte in size.

The result of the E_8 calculation, which contains all the information about E_8 and its representations, is 60 gigabytes in size.

This is enough to store 45 days of continuous music in MP3-format.

If written out on paper, the answer would cover an area the size of Manhattan.

The computation required sophisticated new mathematical techniques and computing power not available even a few years ago.

While many scientific projects involve processing large amounts of data, the E_8 calculation is very different, as the size of the input is comparatively small, but the answer itself is enormous, and very dense.

"This is an impressive achievement," said Hermann Nicolai, Director of the Albert Einstein Institute in Potsdam, Germany. "While mathematicians have known for a long time about the beauty and the uniqueness of E_8, we physicists have come to appreciate its exceptional role only more recently. Understanding the inner workings of E_8 is not only a great advance for pure mathematics, but may also help physicists in their quest for a unified theory."

According to Brian Conrey, executive director of the American Institute of Mathematics: "The E_8 calculation is notable for both its magnitude as well as the way it was achieved. The mapping of E_8 breaks the 'mold' of mathematicians typically known for their solitary style. People will look back on this project as a significant landmark and because of this breakthrough, mathematics will now be viewed as a team sport."

The Atlas of Lie Groups Project

The E_8 calculation is part of an ambitious project sponsored by AIM and the National Science Foundation, known as the Atlas of Lie Groups and Representations.

The goal of the Atlas project is to determine the unitary representations of all the Lie groups (E_8 is the largest of the exceptional Lie groups).

This is one of the most important unsolved problems of mathematics.

The E_8 calculation is a major step, and suggest that the Atlas team is well on the way to solving this problem.

The Atlas team consists of 18 researchers from around the globe.

The core group consists of Jeffrey Adams (University of Maryland), Dan Barbasch (Cornell), John Stembridge (University of Michigan), Peter Trapa (University of Utah), Marc van Leeuwen (Poitiers), David Vogan (MIT), and (until his death in 2006) Fokko du Cloux (Lyon).

The Atlas project is funded by the National Science Foundation through the American Institute of Mathematics.

About American Institute of Mathematics

The American Institute of Mathematics, a nonprofit organization, was founded in 1994 by Silicon Valley businessmen John Fry and Steve Sorenson, longtime supporters of mathematical research.

AIM is one of the seven mathematical institutes in the U.S. funded by the National Science Foundation, an independent federal agency that supports mathematics, computer and social sciences.

The goals of AIM are to expand the frontiers of mathematical knowledge through focused research projects, by sponsoring conferences, and helping to develop the leaders of tomorrow.

In addition, AIM is interested in helping preserve the history of mathematics through the acquisition and preservation of rare mathematical books and documents and in making these materials available to scholars of mathematical history.

AIM currently resides in temporary facilities in Palo Alto, California, the former Fry's Electronics headquarters.

A new facility is being constructed in Morgan Hill, California.

For more information, visit www.aimath.org

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