CCSU
DEPARTMENT OF MATHEMATICAL SCIENCES

COLLOQUIUM

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3:00 – 4:00 PM
Maria Sanford, Room 101

THE DOUBLE-SPEED UNIVERSES AND THE N-BODY PROBLEM

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Abstract: Have you ever used the ×2 option on YouTube to watch a video at double speed? In this talk we explain the n-body problem and describe a curious consequence for Newtonian gravity.

Imagine a hypothetical universe in which the only force is Newtonian gravitation (unlike our real universe, where other forces are present). Then, for any mathematically consistent universe of gravitating bodies, there is a second mathematically consistent universe in which every motion runs twice as fast, and all distances are four times smaller.

As a consequence, whenever a group of bodies follows a periodic motion in the first universe, there is a corresponding periodic motion in the second universe with the same shape, four times smaller, and whose period is eight times shorter. For example, an analog of our solar system in the second universe would have an Earth that takes about 45.66 days to go around the Sun, at a distance of roughly 23.25 million miles instead of 93 million miles.

We illustrate this idea with a numerical six-body solution: two triples of equal masses moving on a large circle, each triple tracing a figure-eight pattern reminiscent of the classical three-body figure-eight solution.