Analysis Seminar

Title: Magnums: Counting Sets with Surreals

Speaker: Peter Lynch

Date: Tue 23rd April 2019 at 3:00PM

Location: Seminar Room SCN 1.25

Abstract: How many odd numbers are there? How many even numbers? From Galileo to Cantor, the suggestion was that there are the same number of odd, even and natural numbers, because all three sets can be mapped in one-one fashion to each other. This jars with our intuition. Our objective is to define a measure of the magnitude of subsets of the natural numbers that corresponds to our intuition. The class of surreal numbers is the largest possible ordered field. Using the surreals, we define the 'magnum' for elements of the power set of the natural numbers. The magnum of a proper subset of a set is strictly less than the magnum of the set itself. There are difficulties evaluating limits over the surreals. We will review some recent progress in developing surreal analysis. For the real numbers, $0.999\ldots = 1$. For the surreals, this is not the case; $0.999\ldots = 1 - 10^{-\omega} < 1$. Many more similar examples can be given.