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[David Roberts to Study Unusual Polynomials with NSF Grant](#)

MORRIS, Minnesota (December 9, 2016)—David Roberts, professor of mathematics, was recently awarded a three-year National Science Foundation (NSF) research grant to support his work in number theory. His particular topic is a class of very unusual polynomials with origin in work around 1900 by the German mathematician Adolf Hurwitz. Roberts first became interested in this topic through a joint paper published in 2015 with Akshay Venkatesh of Stanford University.

An example of one of the unusual polynomials Roberts studies is  $x^7+9x^5-10x^4+15x^3-36x^2-25x+6$ . A first step in studying polynomials is to calculate their discriminants, which are very large numbers. The special nature of the example is revealed by the fact that its discriminant 9,331,200,000 factors into a product of powers of 2, 3, and 5 only. On the other hand, if one changed the constant term from 6 to 7, the polynomial would be no longer special at all. Its discriminant would become 10,691,191,429,293,449, which is the product of the primes 6,427 and 1,663,480,850,987.

Roberts and Venkatesh conjectured that similarly unusual polynomials exist with arbitrarily many terms. One reason number theorists are interested in these polynomials is their existence contradicts previous expectations. Another reason is that actually writing down these polynomials involves intensive calculations in areas of mathematics well outside traditional number theory.

In addition to furthering the understanding of number theory, Roberts also plans to share this work with his students.

“I teach a number theory course every two years,” he says. “Earlier in my career, it was more of a traditional course. But now I make it sort of an exposure to research for students, so they can see what math research is, because even math majors don’t get too much exposure.”

Roberts’s research also impacts his students through the senior seminars he supervises.

Roberts is currently in the early stages of his research for the NSF grant and is working with the intention to publish one or two papers on these special polynomials per year.

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