



## DMS Investigators in the News

### Quanta Magazine features work of DMS-supported researchers

[Quanta Magazine](#) has recently showcased the work of several researchers who have been supported by DMS:

#### Building Mathematical Bridges

DMS is pleased to have supported work of several investigators who have established connections between number theory and geometric analysis with their work in the **Langlands program**. The [research](#) connects Galois groups and representations with modular forms and their generalizations. Read more in the Quanta Magazine article [The Mathematician Who Delights in Building Bridges](#), by Steve Nadis, about work of [Ana Caraiani](#) and co-authors [Patrick B. Allen](#), [Frank Calegari](#), [Toby Gee](#), [David Helm](#), [Bao V. Le Hung](#), James Newton, Peter Scholze, [Richard Taylor](#), and Jack A. Thorne.

Learn more in the Quanta Magazine article [‘Amazing’ Math Bridge Extended Beyond Fermat’s Last Theorem](#), by Erica Klarreich.

#### Structure in Biased Polynomials

Mathematicians have established a new, more precise connection between the rank of a polynomial over a finite field and the extent to which it favors certain outputs. The recent results establish improved bounds connecting rank and bias, for [degree-three](#) homogeneous polynomials and for [general-degree](#) polynomials over large enough finite fields, respectively. The Quanta Magazine article [Mathematicians Find Structure in Biased Polynomials](#) by Tamar Lichter Blanks explains more; the publications by Alex Cohen and Guy Moshkovitz acknowledge the DMS-supported [New York City Discrete Mathematics Research Experiences for Undergraduates Site](#).

#### Mathematicians Prove (Theoretical) Melting Ice Stays Smooth

Quanta Magazine reports on [work](#) of mathematicians Alessio Figalli, Xavier Ros-Oton, and Joaquim Serra, who have made fundamental progress on analysis of a model, formulated by Josef Stefan in 1889, for the evolution of the boundary between two phases of a material undergoing a phase change. The research analyzes the singularities that can develop on the boundary, showing that they must be rare and short-lived. The Quanta Magazine article [Mathematicians Prove Melting Ice Stays Smooth](#), by Mordechai Rorvig, explains how the new work draws inspiration from previous results for mathematical models of soap films. DMS is pleased to have [supported](#) earlier work of Fields medalist Figalli.

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### **Mathematical Analysis of Fruit Fly Wings Hints at Evolution's Limits**

Investigators affiliated with the [NSF-Simons Center](#) for [Quantitative Biology](#) at Northwestern University conducted a detailed study of the variation that can exist within a species. The [work](#) addresses a longstanding question in biology about how organisms balance robustness of traits with the variability that is inherent in evolution. The Quanta Magazine article [Mathematical Analysis of Fruit Fly Wings Hints at Evolution's Limits](#), by Elena Renken, explains how the painstaking study of morphological variation in fruit fly wings by Vasyl Alba, James E Carthew, Richard W Carthew, and Madhav Mani supports the thesis that natural selection acts primarily on a small number of linked, variable traits, while robustness tightly constrains the rest.

### **Researchers Defeat Randomness to Create Ideal Code**

A remarkable [recent result](#) in coding theory was featured in Quanta Magazine in the article [Researchers Defeat Randomness to Create Ideal Code](#), by Mordechai Rorvig. The article explains how, by carefully constructing a multidimensional and well-connected graph, a team of researchers has finally created a long-sought locally testable code that can immediately betray whether it's been corrupted. DMS is pleased to have [supported](#) earlier work of research team member Alex Lubotzky and other researchers in the field.