

# BAMA 2

School Year 2011–2012  
Join us for a free talk...

## Matthias Beck

*How to change coins, M&M's, or chicken nuggets:  
The linear Diophantine problem of Frobenius*



San Jose State University\*  
Science Building, Rm. 142

7:30 pm  
Wednesday, November 9, 2011

How many ways are there to change 42 cents? How many ways will there be if we don't use any pennies? How about if nickels were worth four cents? Depending on the culinary preference of the audience, we may state these questions in terms of bags of M&M's or boxes of Chicken Nuggets. More generally, suppose we have coins of certain fixed denominations. We can try to find a formula for the number  $c(n)$  of ways to change  $n$  cents, or simply ask if it is at all possible to change  $n$  cents. We will see that if our denominations do not have any common factors then we can change  $n$ , provided  $n$  is large enough. A natural task then is to find the largest integer that cannot be changed. This problem, often called the linear Diophantine problem of Frobenius, is still open for  $d > 3$ . We will outline several elementary approaches to this classical problem. En route we will discuss some basic Number Theory and Discrete Geometry connected to  $c(n)$ .

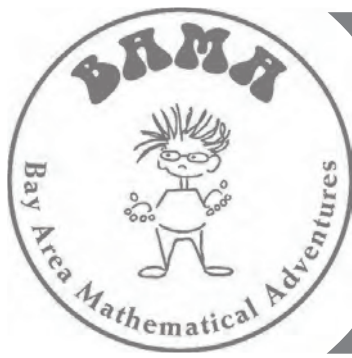
After studies at the University of Würzburg, SUNY Oneonta, and Temple University, and postdoctoral positions at SUNY Binghamton, the Mathematical Sciences Research Institute, and the Max-Planck-Institute in Bonn, **Matthias Beck** arrived at San Francisco State University, where he is currently an Associate Professor in the Mathematics Department. His research is situated in the intersection of combinatorics, geometry, and number theory. He (co-)authored two books and over 40 research papers, more than a third of which feature student coauthors. He directs the NSF-sponsored  $(CM)^2$  GK-12 program at SF State and is one of the codirectors of the San Francisco Math Circle.



\* See back for map and directions.

Visit the Bay Area Mathematical Adventures (BAMA) at <http://mathematicaladventures.org>

To receive email notifications about BAMA talks, please contact Frank Farris at [ffarris@scu.edu](mailto:ffarris@scu.edu).



# BAMA

## Bay Area Mathematical Adventures

A series of presentations on diverse topics by remarkable mathematicians. All talks are free and open to the public.

### WHY?

BAMA aims to challenge and motivate students to think mathematically. Speakers will present real mathematics, and will share with the audience modern views of mathematics. Some talks will provide students with related problems, or will enable teachers to expand later on the topics with their students.

### WHO?

BAMA is aimed at bright high-school age students. However, all are welcome: younger or older students, teachers, parents, and the general public.

### WHEN?

Evening talks will be given approximately once a month between September and April. Each talk will be self-contained (speakers will not assume their audiences have attended previous talks).

### WHERE?

San Jose State University  
Science Building, Rm 142

- From 101 take the First Street or Guadalupe Expressway exit and go to Fourth Street.
- Take Fourth to San Salvador Street; turn left onto San Salvador and park in the South Garage. The automated pay stations located on level 3 and above accept coins, \$1, \$5 and \$10 bills, Visa or Master Cards. Parking is \$1.00 per ½ hour or \$5.00 day pass after 5:30.
- From 280 take the 7th Street exit and turn North on Seventh St. The garage is on the left after 5 or 6 blocks.



#### SPONSORS:

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**Santa Clara University**  
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**Mathematical Sciences Research Institute**

#### FOR MORE INFO:

<http://www.mathematicaladventures.org>

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