## NC STATE UNIVERSITY Undergraduate Math

Issue 2, Spring 2016

# Koh Lectures Continue to Entertain and Inform

The Kwangil Koh Lecture on Mathematics in Our Time is a public lecture series that honors our late colleague. It is intended to communicate the importance of mathematics and its impact on science, technology, and society.

This year's Koh Lecture will take place on **Thursday, April 14, 2016 at 4:30 PM in 2203 SAS Hall**. The speaker will be Dr. Tadashi Tokieda, Professor of Mathematics at Cambridge University. The title of his work is *A World From a Sheet of Paper. Professor Tokieda says, "Starting from just a sheet of paper, by folding, stacking, crumpling, tearing, we will explore an unusual variety of sciences, from geometry and magic tricks to elastici-*



Dr. Tadashi Tokieda

ty and the traditional Japanese art of origami. Much of the lecture consists of table-top demos, which you can try later with friends and family." There will be a reception before the talk from 4:00 to 4:30.

Dr. Kwangil (Gil) Koh had a deep and lasting influence on the direction and development of our department. He is greatly missed as a colleague and a friend. Gil loved mathematics, doing it, talking about it, and helping others take part in it. We are delighted to remember Dr. Koh through an event that communicates and celebrates the beauty and power of mathematics. We hope to see you April 12 at the 2016 Koh Lecture!

#### http://www.math.ncsu.edu/undergrad

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#### **SUM Club Hosts 2nd Annual Career Panel**

This year's Career Information Session and Panel was held on February 17. The Society for Undergraduate Mathematics (SUM Club) partnered with the NCSU Career Development Center again for their second annual joint panel.

Panelists included the following professionals and NCSU alumni: Bethany Vohlers, Analytical Consultant at SAS; Saundra Williams, Chief Technology Officer at NC Community Colleges; Freda Porter, Owner of Porter Scientific; and Laura Poag, Clinical Pharmacology Programmer at Nuventra. Mary Rosage, College of Sciences Career Counselor, facilitated the panel discussion. During the panel, students learned how these professionals got into their different careers and how their degrees in mathematics helped them get there.

Students had the opportunity to ask questions about career options after graduation, what to look out for in graduate school, and ways to make themselves be more competitive on the job hunt. We would like to thank these professionals for sharing their insight and knowledge!

### MAA/AMA Joint Mathematics Meeting (JMM) Experience

Junior Emily Zucker and Senior Kenneth Jutz both participated in the mathematics REU program at NC State over the summer of 2015, each doing separate research in Applied Mathematics. Emily and her team studied how to more accurately model stock return data. Ken and his team looked into the error sensitivity measurements as a result of fitting a model to data. Both of these students were given the opportunity to present their research at the 2016 Joint Mathematics Meeting in Seattle.

"Attending JMM was an awesome experience. Presenting my research to math professors helped gave me more confidence talking professionally

with mathematicians. The judges gave feedback which allowed me to see where my strengths were and where I could improve for the next presentation. JMM also had many employers and graduate school recruiters attending, which showed me what opportunities exist for me after graduation. I also had the freedom to see any talk my heart desired, and there was every math application you could think of (+1,000 you would never think of) represented at this conference.

I definitely recommend attending JMM next year, it will be in Atlanta! The math department offers many grants to contribute to your travel costs, and the experience is well worth it." - Emily



Emily Zucker

"It was great just being surrounded by mathematicians and realizing how big the math community is. You get exposed to a lot of different things that other people are doing which expanded my understanding of what math is used for and what the current state of the field is.

My favorite part of the conference was experiencing all of Seattle and meeting a lot of awesome people. I met up with a group that came from the NCSU REU and we had the time of our lives exploring Seattle. The waterfront has a great view of the Rocky's to the north, and the view of Mt. Rainier over the waterfront to the south was absolutely breathtaking. Some other places we went to were Pioneer Square, Seattle's oldest neighborhood, and Capitol Hill, where the younger scene is (great food/bars/ clubs). One of the cool things about Seattle is that because it's so big, there's something for everyone. Every district we went to had a completely different scene/vibe to it." - Ken



#### MAA MathFest 2016

The 101st annual Mathematical Association of America MathFest will be held from August 3-6, 2016 in Colum-bus, Ohio. MAA MathFest brings together mathematicians of all kinds to celebrate and explore all aspects of the subject. From undergraduate and graduate workshops, to poster sessions, and panel sessions. MAA MathFest engages all aspects of collegiate mathematics and mathematics education. For more info, regristration, and abstract submissions, visit http://www.maa.org/

### Sonia Kovaleski Day 2016

The Association for Women in Mathematics (AWM) Student Chapter at NCSU is hosting a Sonia Kovalesky (SK) Day! SK Day is a national AWM event which entails inviting 7th-8th grade girls from local middle schools for a day of math games, workshops and talks, in order to encourage them to participate in the mathematical sciences.

This year's event will be held on Saturday, April 2nd, from 8AM - 12PM in SAS. If you would like to volunteer to help out, please reach out to

### Dr. Alina Chertock Named Head of Mathematics Department



Dr. Alina Chertock

Dr. Alina Chertock, a longtime NC State professor and prominent mathematician, has been appointed as the Head of The Mathematics Department.

Dr. Chertock has been with NC State since 2002 and was serving as interim department head prior to her permanent appointment. She is also an adjunct professor at the Moscow Institute of Physics and Technology in Russia and has held visiting professorships in Germany, China and France.

As head of the department, Dr. Chertock oversees academic, administrative and budgetary matters for 500 students and more than 60 faculty. The department, which has programs in pure and applied mathematics and a strong interdisciplinary focus, has been recognized for its outstanding faculty and students, as well as its recruitment of women and underrepresented minorities.

Dr. Chertock has authored or coauthored nearly 50 research articles and has been a referee for more than 25 academic journals. She has been active on a number of faculty and

graduate student committees, including the department's Faculty Advisory, Hiring, and Graduate Program committees. She has also served as a reviewer and panelist for the U.S. Department of Energy, the U.S. National Science Foundation, the U.S. Air Force Office of Scientific Research, the United States-Israel Binational Science Foundation and the French Institute for Research in Computer Science and Automation.

Dr. Chertock received a master's degree in applied mathematics from Moscow State University in Russia and a Ph.D. in applied mathematics from Tel-Aviv University in Israel.

### SAMSI 2016 Workshops

NCSU Math hosts both an interdisciplinary Undergraduate and Industrial Math & Stat Modeling (IMSM) Graduate workshop each year in the NCSU SAS Building. Participants work in groups with industry advisers, and presentpublish group papers.

- May 22-27: Undergraduate event is an intro to applied math and stats research in computational neurosciences and forensics. Talks will be presented by statisticians and applied mathematicians who work with analyzing imaging, fingerprinting and many types of similar data. Participants use data to investigate questions related to several exciting and emerging areas, and present their findings. Applications received by Friday, April 1, 2016 will receive full consideration.
- July 17-28: Graduate IMSM event is for science graduate students who will be exposed to challenging real-world problems from industry and government laboratory research. Participants collaborate and problem

solve while mentored by advisors tentatively from US Army Corps of Engineers, Sandia National Labs, and Rho, Inc. Application deadline: 15 May 2016

SAMSI (Statistical and Applied Mathematical Sciences Institute) was established in RTP in 2002 as a Duke, NCSU, UNC, and NISS partnership. SAMSI is associated with, and funded by, NSF. SAMSI encourages student networking with advisors and direct hiring.

"SAMSI does a great job bringing in academics from a variety of institutions in the region who are actively working on projects in the workshop's area of focus. The SAMSI postdocs are also very knowledgeable and are a great help whether you have little experience relevant to the project, or



you're trying to incorporate some of your more advanced skills." -Karl Schneider, sophomore in Applied Math

For more information, applications, and calendars, visit http://www.samsi.info/

### **Puzzles**

#### Albert and Isaac

Two mathematicians, Albert and Isaac are chatting. Isaac says he has three children who all have the same birthday (but who weren't necessarily born in the same year). Albert asks their ages. Isaac replies, "The product of the ages of my children is 72."

Albert points out that this is not enough information to determine their ages. Isaac responds with another clue -- he tells Albert the sum of the ages of his children. But Albert again points out that there is not enough information.

Finally Isaac says, "My youngest child is named Galileo." At last, Albert correctly determines the ages of Isaac's children. What are the ages?



| 5-  | 20× | 2÷ | 5+  | 7+ |    |
|-----|-----|----|-----|----|----|
|     |     |    |     | 3+ | 2- |
| 60× | 24× |    | 16+ |    |    |
|     | 6+  |    |     |    | 3- |
|     | 5+  |    | 2÷  |    |    |
|     |     | 5  |     | 2- |    |

#### KenKen

#### Instructions:

1. You must fill in the numbers from 1 to 5 (for a 5x5 grid) in each row and column. Do not repeat a number in any row or column.

2. The areas of the grid with dark outlines around them are called cages. At the top left of each cage is a target number and operation. If the cage says "4+". That means the two numbers that go in that cage must add (+) up to 4.

3. Look for any cages that are around just one box. The target number will have no math operation symbol. Simply write the target number in that cage.

4. Look for other cages, rows, and columns where there is only one possible solution.

5. Keep going until you've completed the whole puzzle!

Solutions on page 6.

### Math Poetry from Darren Lipman

#### The Poet in the Mathematician

Mathematics implies poetry for math is not the accumulation of numbers but the precipitation of points along an infinite path toward mapping their relations and drawing their ideas together in pursuit of absolute convergence

If my hands are Venn diagrams overlapping yours what is the span of our fingers? If infinity stretches between any two points how many moments pass in a meager breath?

Mathematics is a quest for meaning, understanding creativity and logic in problem solving and what is poetry if not a faltering attempt to constrain the world in variables in words a meandering proof showing experiences as theorems wishing for peer-reviewed validity or internal consistency

If you would like to see more of Darren's work, visit https://silentsol.wordpress.com/

If you would like to submit work for the next newsletter, email sumclub@math.ncsu.edu

#### The Mathematical Structure of Poetry

Rhyme

is an equivalence relation on the sounds of words every word rhymes with itself it's reflexive, involuntary and if B rhymes with C then C rhymes with B and we call it symmetry So finally if C rhymes with D then B rhymes with D then B rhymes with D it's transitivity the nativity of an equivalence class

Meters are metrics they define distance between sounds and lisps iambic whispers stress an integral that curls around sounds areas inside well-defined structures

But metaphor most of all is algebra a system of relations and observations Watch how the words commute and form groups with added operations meanings acquired by lines and stanzas Watch how these hands come together like communities continuity between maps inside the mind taking my memories onto yours the human experience isomorphic to itself and simile is like analysis derivative the same path followed by everyone else but essential to understanding our own limits

### MA 430

### Mathematical Models in the Physical Sciences

MA430 this fall will be focused on two principal themes. There will be an introduction to linear geometry and how various such geometries relate to physics. Linear geometries are defined by real or complex valued bilinear maps on a vector space and are called metrics by physicists and geometers. Certain metrics induce Euclidean geometry and Newtonian mechanics, others induce Lorentzian geometry and special relativity, still others induce symplectic geometries central to Hamiltonian mechanics. Although there will be a somewhat brief discussion of the Lorentzian metrics and special relativity, for the most part we will discuss the symmetries of Euclidean and symplectic metrics and how they relate to conservation laws in physics. In particular we will show how symmetry groups of matrices and their corresponding Lie algebras of matrices induce familiar conservation laws in Newtonian and Hamiltonian mechanics.

You need not have had previous exposure to Hamiltonian mechanics. You will need to know the basics of matrix theory, the material from MA242, and to have had one course in physics.

Instructor: Ronald Fulp

Prerequisites: MA341, 405

### Society for Undergraduate Mathematics

SUM Club is NC State's premier student organization for those with a passion for math. We help bridge the gap between undergraduates and the rest of the university and provide students with opportunities for growth in academics, service, and leadership. This is accomplished through mathematical presentations at meetings, career events, social get-togethers, and other college- and university-wide involvement.

Open to any student, math major or otherwise, we meet on the first Thursday of every month to get to know one another, do a math puzzle or two, discuss opportunities within the college, and plan events for the club and the community. The club plans to host a variety of events, including collaborations with the Career Development Center and the Statistics Club. We wish to impact the community as well by volunteering and tutoring at local schools and STEM programs.

From bowling to movie and game nights, we hope to continue to create a strong undergraduate connection within our field and bring together students within the university. We would love to see more people involved! Email us at sumclub@math.ncsu.edu with any suggestions, comments, questions, or to be added to our email list.



| SUM Club Executive Board         |                                |  |  |  |
|----------------------------------|--------------------------------|--|--|--|
| President                        | Ben Pierson                    |  |  |  |
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| Treasurer                        | Shane Finkel                   |  |  |  |
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| Public Relations Guru            | Sorena Dadgar                  |  |  |  |
| College of Sciences Council Reps | Kathryn Ray<br>Amanda Williams |  |  |  |

#### Albert and Isaac

Solution: If the product of his three children's ages is 72, there are 12 possibilities: 1\*1\*72, 1\*2\*36, ..., 2\*6\*6, 3\*3\*8, 3\*4\*6

Isaac later gives Albert the sum of their ages, but we don't know what number he says. We do, however, know that Albert can't figure it out from that information. So, we take the 12 possibilities and add them up: 1+1+72=74, 1+2+36=39, ..., 2+6+6=14, 3+3+8=14, 3+4+6=13

The only way Albert wouldn't be able to figure out Isaac children's ages by knowing the sum is if the sum was 14, because there are two possibilities. So either the children's ages are 2, 6, and 6, or 3, 3, and 8. But Isaac points out that he has a youngest child. So the ages must be 2, 6, and 6.

#### **KenKen Solution**

| ₅-<br>6  | 20×<br>4         | <sup>2÷</sup><br><b>3</b> | 5+<br><b>1</b>          | <sup>7+</sup> 5        | 2                  |
|----------|------------------|---------------------------|-------------------------|------------------------|--------------------|
| 1        | 5                | 6                         | 4                       | <sup>3+</sup> <b>2</b> | ²−<br><b>3</b>     |
| 60×<br>3 | <sup>24×</sup> 6 | 4                         | <sup>16+</sup> <b>2</b> | 1                      | 5                  |
| 4        | 6+<br><b>3</b>   | 2                         | 5                       | 6                      | <sup>3−</sup><br>1 |
| 5        | <sup>5+</sup> 2  | 1                         | <sup>2÷</sup><br>6      | 3                      | 4                  |
|          |                  | 5                         |                         | 2-                     |                    |

Newsletter feedback: sumclub@math.ncsu.edu