L'Augarithms

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Mathematics Colloquium FALL Lineup

Colloquia are typically held Wednesdays 3:40—4:40 in Oren 113. Refreshments will be served.

Sep.	16	Annual Meet and Greet (the Department, that is)
Sep.	30	Ben Jordan, Harvard University, "The procession of math science and art"
Oct.	21	Al Garver, Augsburg College, "(0, 2) - Graphs and Young Tableaux"
Nov.	4	Ken Kaminsky, Augsburg College, "Force of Mortality, Elves, Vampires, and more"
Nov. →	18	John Singleton and Ben Hoffman, URGO Project with Pavel Bělík, "Bundle gerbes and their many splended uses[1]
Dec.	2	Steve Fredlund, Augsburg '92, "Assessing Market Risk"

[1]This week's speakers—Singleton & Hoffman[2]

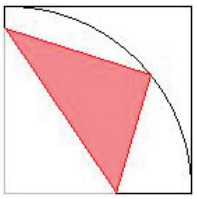
Bundle gerbes and their many splendid uses: A bundle gerbe is a geometrical model of certain 1-gerbes with connection, or equivalently of a 2-class in Deligne cohomology. $U(1)$-principal bundles over a space M and 2-form curvatures. The topology of a $U(1)$ bundle is classified by its Chern class, which is an element of $H^2(M)$, the second integral cohomology of M. Gerbes, or more precisely 1-gerbes, are abstract descriptions of Deligne 2-classes, which each define an element of $H^3(M)$, the third integral cohomology of M. Historically the most popular construction of a gerbe is a category-theoretic model featured in Giraud's theory of gerbes, which are roughly sheaves of groupoids over M. In 1994 Murray introduced bundle gerbes, which are geometric realizations of 1-gerbes. For many purposes these are more suitable for calculations than Giraud's realization, because their construction is entirely within the framework of classical geometry. In fact, as their name suggests, they are fiber bundles. This notion was extended to higher gerbes the following year. In Twisted K-theory and the K-theory of Bundle Gerbes the authors defined modules of bundle gerbes and used this to define a K-theory for bundle gerbes. They then showed that this K-theory is isomorphic to Rosenberg's twisted K-theory, and provides an analysis-free construction. In addition they defined a notion of twisted Chern character which is a characteristic class for an element of twisted K-theory. The twisted Chern character is a differential form that represents a class in the twisted cohomology with respect to the nilpotent operator $d + H$, where d is the ordinary exterior derivative and the twist H is a 3-form. This construction was extended to equivariant K-theory and to holomorphic K-theory by Mathai and Stevenson.

[2]In fact, we were unable to extract an absract from John & Ben, so this is our best guess.

Mathy Humor

1. "The number you have dialed is imaginary. Please rotate your phone 90 degrees and try again."
2. Q: What is the world's longest song?
   A: "$\aleph_0$ Bottles of Beer on the Wall."
3. Q: Why do Computer Scientists get Halloween and Christmas mixed up?
   A: Because Oct 31 = Dec 25.
4. A short math joke: Let $\varepsilon < 0$.
5. An actuary is someone who wanted to be an accountant, but didn't have the personality for it.
6. Q: To what question is the answer "9W."
   A: "Dr. Weiner, do you spell your name with a V?"
7. Q: How many times can you subtract 7 from 83, and what is left afterwards?
   A: I can subtract it as many times as I want, and it leaves 76 every time.

Problem of the week...



We had only one solver of the POTW from vol. 23.04. That was **Al Jibra.** Here is the new problem:

Take a square piece of paper with sides of length 1 and draw on it a quarter-circle of radius 1 with center at one of the vertices. Fold the paper over so that the vertex which is the center of the circle just touches the quarter-circle. See the figure. What is the largest and smallest areas that the shaded triangular region can have?

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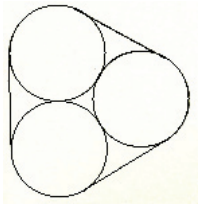
Puzzle of the week...

Maggie Flint, from South High School, solved the 'square within a triangle' Puzzle of the Week from vol 23.02. She got 20/7. **David Nestrud** came close experimentally to the right answer of 2 hours and 48 minutes for the 'candle' puzzle of vol 23.04. Here you have the next puzzle:



In the Figure there are three heads of an electric razor. If each head is one inch in diameter, how far is it all the way around the razor?

Submit puzzle & problem solutions to kaminsky @augsburg.edu., or under Ken Kaminsky's door at SCI 137E, or in the puzzles and problems box just outside of Su's office.

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Mathematician Biography: Florence Nightingale*

May 12, 1820 - August 13, 1910

Written by Cynthia Audain, Agnes Scott College ('98)

Florence Nightingale is most remembered as a pioneer of nursing and a reformer of hospital sanitation methods. For most of her ninety years, Nightingale pushed for reform of the British military health-care system and with that the profession of nursing started to gain the respect it deserved. Unknown to many, however, was her use of new techniques of statistical analysis, such as during the Crimean War when she plotted the incidence of preventable deaths in the military. She developed the "polar-area diagram" to dramatize the needless deaths caused by unsanitary conditions and the need for reform. With her analysis, Florence Nightingale revolutionized the idea that social phenomena could be objectively measured and subjected to mathematical analysis. She was an innovator in the collection, tabulation, interpretation, and graphical display of descriptive statistics.

Florence Nightingale's two greatest life achievements--pioneering of nursing and the reform of hospitals--were amazing considering that most Victorian women of her age group did not attend universities or pursue professional careers. It was her father, William Nightingale, who believed women, especially his children, should get an education. So Nightingale and her sister learned Italian, Latin, Greek, history, and mathematics. She in particular received excellent early preparation in mathematics from her father and aunt, and was also tutored in mathematics by James Sylvester. In 1854, after a year as a unpaid superintendent of a London "establishment for gentlewomen during illness," the Secretary of War, Sidney Herbert, recruited Nightingale and 38 nurses for service in Scutari during the Crimean War.

During Nightingale's time at Scutari, she collected data and systematized record-keeping practices. Nightingale was able to use the data as a tool for improving city and military hospitals. Nightingale's calculations of the mortality rate showed that with an improvement of sanitary methods, deaths would decrease. In February, 1855, the mortality rate at the hospital was 42.7 percent of the cases treated (Cohen 131). When Nightingale's sanitary reform was implemented, the mortality rate declined. Nightingale took her statistical data and represented them graphically. She invented polar-area charts, where the statistic being represented is proportional to the area of a wedge in a circular diagram (Cohen 133).

As Nightingale demonstrated, statistics provided an organized way of learning and lead to improvements in medical and surgical practices. She also developed a Model Hospital Statistical Form for hospitals to collect and generate consistent data and statistics. She became a Fellow of the Royal Statistical Society in 1858 and an honorary member of the American Statistical Association in 1874. Karl Pearson acknowledged Nighingale as a "prophetess" in the development of applied statistics.

References

1. Cohen, I. B. "Florence Nightingale," Scientific American, 250 (March 1984),128-137.
2. Cohen, I.B. The Triumph of Numbers: How Counting Shaped Modern Life, W. H. Norton, 2006. Chapter 9 is devoted to Florence
3. Nightingale. [Read excerpts from Google Book Search]
4. Sandra Stinnett. "Women in Statistics: Sesquicentennial Activities," The American Statistician, May 1990, Vol 44, No. 2, 74-80.
5. Kopf, E.W. "Florence Nightingale as a Statistician," J. Amer. Statist. Assoc., 15 (1916), 388-404.
6. Nuttall, P. "The Passionate Statistician," Nursing Times, 28 (1983), 25- 27.
7. Grier, M.R. "Florence Nightingale and Statistics," Res. Nurse Health, 1 (1978), 91-109.
8. Lipsey, Sally. "Mathematical Education in the Life of Florence Nightingale," Newsletter of the Association for Women in Mathematics, Vol 23, Number 4 (July-August 1993), 11-12.
9. Wadsworth Jr., Harrison, Kenneth Stephens and A. Blanton Godfrey, Modern Methods for Quality Control and Improvement, Wiley & Sons, 1986. Discusses the history of graphical methods in quality control and F. Nightingale's contributions.
10. Florence Nightingale Museum website
11. MathSciNet [subscription required]
12. Biography at the MacTutor History of Mathematics Archive

Humor (non-mathy)

The *Washington Post* publishes a yearly neologism contest. Readers are asked to supply alternative meanings for common words:

1. *Esplanade (n.)*, an explanation attempted while drunk.
2. *Lymph (v.),* to walk with a lisp.
3. *Negligent (adj.),* a condition in which a woman absentmindedly answers the door in her nightgown.
4. *Coffee (n.),* the person upon whom one coughs.
5. *Frisbeetarianism (n.),* The belief that, when you die, your soul flies up onto the roof and gets stuck there.
6. *Gargoyle (n.),* olive-flavored mouthwash.
7. *Flabbergasted (adj.),* appalled over how much weight you have gained.
8. *Abdicate (v.),* to give up all hope of ever having a flat stomach.