

# Augarithms



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April 9, 2003

## Last Colloquium Date for Spring, 2003

The last Colloquium will be held on Wednesday, April 9, from 3:40 to 4:40 p.m. in Science 108. *Refreshments provided by K. S. Kaminsky.*

Wed. Apr. 9 Kirsten Halvorson & Jon-Erik Hokenson

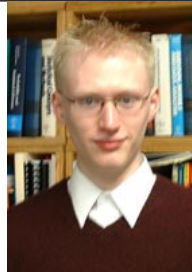


Kirsten Halvorson

## This week's speakers

are **Kirsten Halvorson** and **Jon-Erik Hokenson**, both students in Nick Coult's Differential Equations class.

Kirsten Halvorson will be speaking on using differential equation to



Jon-Erik Hokenson

model rate of memorization when trying to remember information such as lists of numbers. Jon-Erik Hokenson will be speaking on mathematical models of population growth under various kinds of harvesting.

## More Similes from High School Essays

She had a deep, throaty, genuine laugh, like that sound a dog makes just before it throws up.

The ballerina rose gracefully en pointe and extended one slender leg behind her, like a dog at a fire hydrant.

It hurt the way your tongue hurts after you accidentally staple it to the wall.

From the attic came an unearthly howl. The whole scene had an eerie, surreal quality, like when you're on vacation in another city and "Jeopardy" comes on at 7:00 p. m. instead of 7:30.

Shots rang out, as shots are wont to do.

The plan was simple, like my brother-in-law Phil. But unlike Phil, this plan just might work.

He was as lame as a duck. Not the metaphorical lame duck, either, but a real duck that was actually lame. Maybe from stepping on a land mine or something.

Her artistic sense was exquisitely refined, like someone who can tell butter from I Can't Believe It's Not Butter.

It came down the stairs looking very much like something no one had ever seen before.

The revelation that his marriage of 30 years had disintegrated because of his wife's infidelity came as a rude shock, like a surcharge at a formerly surcharge-free ATM.

It was an American tradition, like fathers chasing kids around with power tools.

Her voice had that tense, grating quality, like a first-generation thermal paper fax machine that needed a band tightened.

## Puzzle and Problem

The two *WRONGs* make a *RIGHT* puzzle from March 12 was solved by mathematics major **Hung Nguyen**. A solution to the elliptical billiard table puzzle from February 26 was submitted by **David Wallace**. And here is the last puzzle of the season:

Arrange the digits 0, 1, 2, ..., 9 in fractional form in such a way that

$$\frac{xx,xxx}{xx,xxx} = 9$$

**Greg McKusky** and **Hung Nguyen** submitted solutions to the sphere-radius problem of March 12. Here is the last puzzle of the season:

Your sock drawer has red socks and black socks. When two socks are randomly drawn, the probability that both are red is  $1/2$ . How small can the number of socks in the drawer be?

Send your solutions to the editor at [kaminsky@augsborg.edu](mailto:kaminsky@augsborg.edu), or drop them in the *Puzzles & Problems* box just inside the math suite, SCI 137.

*Augarithms* is available on-line at [augsborg.edu/math/augarithms/](http://augsborg.edu/math/augarithms/). Click on the date you want to see.

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## Augarithms

*The Bi-weekly Newsletter of  
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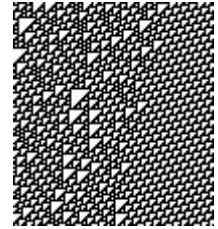
## The World According to Stephen Wolfram: Review of “A New Kind of Science”

by Brian Bue

Dr. Stephen Wolfram is an interesting character. He began studying experimental physics at age 12, published his first paper at 15, and received a PhD in theoretical physics from Caltech at 20. He is the primary architect behind Mathematica, a technical computing environment that has been used extensively in science and engineering since its first release in 1988. Wolfram’s studies have covered a number of disciplines, from physics to computer science, and his book “A New Kind of Science,” attempts to unite all of those areas under a single, unifying concept known as “Cellular Automata.”

Well, what exactly are Cellular Automata? Basically, Cellular Automata are discrete dynamical systems, configurations of objects called cells. Each cell has a fixed number of states, usually represented by a specific color, that are determined by the status of each cell’s neighbors. For example, a rule may change the state of the current cell if there is only one cell adjacent to it in the same state. From these simple structures and rules, Wolfram claims to have devised an entirely new approach to how science should be done, with a preference towards computation rather than equations.

According to Wolfram, Cellular Automata can be grouped into a total of four specific classes, based primarily upon the capabilities for each Automaton to “remember” information given from the initial condition(s). Most Cellular Automata fall into the first three classifications and have few, if any, interesting features. The automata in these classes either generate regular patterns or appear to be completely random. Class IV Automata, however, are capable of generating patterns that, according to statistical testing, are completely unpredictable, but upon inspection still display some regularity. For example, the Class IV Automaton defined by Wolfram’s 30<sup>th</sup> rule generates the grid in illustration 1. Note the seemingly random arrangement of shapes on the left side, in contrast to the fairly ordered pattern on the right. Wolfram argues that the seemingly random patterns generated by Class IV Automata are proof that great complexity can evolve from simple systems. Based on this discovery, he claims the assumption that complex phenomena must have complex underlying mechanisms is false, since he has found complex results from simple underlying mechanisms.



[1] Rule 30

Dr. Wolfram’s confidence in his findings is extremely evident from the very beginning of the book, and often borders on the egomaniacal. I have never encountered an author who claims that his work is “One of the more important single discoveries in the whole history of theoretical science.” This may make some skeptical about a great deal of the volume’s content. In all fairness, however, Dr. Wolfram has been a major contributor to the field of Cellular Automata since the mid-eighties, and has participated in related research many years prior to that. Given this information, the reader can make his or her own judgment on Wolfram’s credibility.

It is fairly apparent that Wolfram intended the book for a broader audience than the scientific community, which has both advantages and disadvantages. At times one may be under the impression that he is leaving out significant mathematical and theoretical detail in order to keep the non-technical readers interested - which makes the majority of the book easy to understand, but leaves sizeable holes in reasoning at some points. However, the appendix in the end of the book does an excellent job of documenting some of the concepts Wolfram describes, and could be used fairly effectively as a reference to help fill in some of the gaps left out of the main text.

Despite any skepticism caused by Wolfram’s overstatement of his work’s importance, I find “A New Kind of Science” to be quite informative. It serves as a good introduction to the theory behind Cellular Automata and other discrete dynamical systems, plus gives a wealth of examples that show how each system behaves (often both short and long term behavior).

### References

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*Notices of the AMS, Vol 50, number 2, February 2003.*

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OK, it’s really a little early to be wishing you a good summer, but this is the last Augarithms of the year, so have a good pre-summer...

**HAVE A GOOD SUMMER**  
**Schöne ferien**  
**שׂוֹנֵה פֶּרְיָה**  
**Que pases un buen**  
**Have a good one**  
**VERANO**  
**Bonne vacances**  
**SEE YOU IN THE FALL**  
**Trevlig sommar**  
**Vises i efteråret**