

The Quaternion

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The Ultimate Machinery of Life

by Greg McColm & Richard Stark

Among the great accomplishments of the Twentieth Century were the discoveries of the basic mechanisms of life. Before, scientists had searched for a ghostlike *essence* that made things alive; now we see ordinary atoms constructed into complex machines – proteins – able to construct, dismember, manipulate, or move other molecules around. One kind is designed to precisely fit around a nutritious molecule and chop a specific piece of it; just one tool for the small intestine's toolbox. Another changes shape when hit by a photon. A third, zipper-like, opens up DNA. All living organisms are made of vast arrays of these little machines.

But we do not reduce to mere assemblies of these machines: it is out of their interactions that life arises. These assemblies are vast: there are vastly more such machines in a fly than there are stars in the local super-cluster of galaxies. The identification, classification, and study of these machines, and their communities, are the business of *bioinformatics*, a field that ranges from data mining (to identify bio-molecules) to topology (to model the structure of bio-molecules) to thermodynamics (to model their interactions).

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In Memoriam: Jack Britton

Jack Britton was born in 1908, and was salutatorian at Worcestor High. He got an A.B. from Clark University and a Ph.D. in 1936 from the University of Colorado at Boulder, which promptly hired him as an Assistant Professor. During World War II, he spent a year working in R & D for the U.S. Rubber Company, and then nine months as an instructor at the U.S. Air Force Pre-Meteorology program. He returned to Colorado in 1943, where he ultimately became the Chair of the Department of
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In Memoriam: Al Goodman

Professor Al Goodman passed away on July 30, 2004 in his home in Tampa. He was an outstanding mathematician and educator, and a member of this department since 1964.

Al Goodman was born on July 20, 1915 in San Antonio, Texas. He obtained a B.Sc. in Chemical Engineering and an M.A. in Mathematics from the University of Cincinnati. During World War II, he worked at the United States Navy Yard, the Army Specialized Training Program, and for Republic Aviation Corporation. After the war, he received his Ph.D. degree in Mathematics from Columbia University.

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Bioinformatics, from page 1

The Department of Mathematics joined the Departments of Biochemistry & Molecular Biology, of Computer Science & Engineering, of Biomedical Engineering, of Epidemiology & Biostatistics, and of Information Systems and Decision Sciences to launch an interdisciplinary program in Bioinformatics and Computational Biology. It is now a Master's program, designed to supplement the graduate education of students in these three departments. However, with the growth of the biotechnology and pharmaceutical industries (and the related nanotechnology industries), the program is certain to expand.

The Mathematics Department offers three of the nine core courses in the program, one in combinatorics (to understand the mathematical structures used to model bio-molecules), probability (to understand the random processes that underlie bio-molecule interaction) and the mathematical theory of bioinformatics itself. This deep involvement of mathematics is not surprising: in any science, once the basic mechanisms have been identified and characterized, the tools needed to study them are often mathematical.

Most bioinformatics students are now working towards a career in pharmaceutical research, which involves not only the complicated business of identifying and studying genes and proteins, but also of designing chemicals to have (medically) desirable properties. Others will pursue the fundamental molecular processes of the cell, which will lead us to a greater understanding of life and its origins ... and its frailties and what to do about them.

Britton, from page 1

of Applied Mathematics. He worked in analysis, especially on integral transforms, and had four doctoral students. He started a Ph.D. program there, and then in 1966, he went to the newly created University of West Florida.

In 1967, he joined USF.

At USF, he was involved in the calculus program, and continued his publication of textbooks. He was a very popular teacher, and also served in positions at levels ranging from the department to national professional organizations.

He was also very helpful in coming up with practical applications to problems mathematicians (and other scientists) brought to him.

Upon his retirement, he was appointed a Professor Emeritus. He is survived by his wife, Janie, three daughters, and many grandchildren.

Goodman, from page 1

Al Goodman then spent two years at Rutgers University as an instructor and then fifteen years at the University of Kentucky as an Associate and later Full professor. In 1964 he moved to the University of South Florida where he became a Distinguished Service Professor. He retired from teaching in 1993, becoming a Distinguished Service Professor Emeritus in 1995.

Professor Goodman published over seventy research papers – mostly in geometric function theory but also in set theory, number theory, and graph theory. In 1948, he published a mathematical conjecture on coefficients of p -valent functions which remains open in spite of many efforts. In 1983, he published his two-volume work *Univalent Functions*. Despite his frequent contention that he spent his life studying the unit circle, his most popular work probably is his lower bound on the number of monochromatic triangles in a 2-colored complete graph, one of the classic results of Ramsey theory.

Al Goodman also wrote twelve elementary textbooks, including *Analytic Geometry and the Calculus*, which went through four editions. In 2001/02 he published a five-volume work *Algebra from A to Z*, on high school and college algebra.

Mathematics Education

The mathematics education faculty welcomes a new faculty member, **Helen Gerretson**, as an Assistant Professor of Mathematics Education. Dr. Gerretson received her Ph.D. from the University of Florida and is joining USF from the University of Northern Colorado where she had a position in the mathematics department.

The Mathematics Education program is launching a new Master of Arts in Teaching Middle Grades Mathematics (5-9) program this fall. This program, which leads to initial certification to teach mathematics in the middle grades, is designed for individuals who are entering teaching after working in some other area or receiving a non-education degree.

Student News

This year we awarded four Ph.D.s: Ahmed Yousef Farah Abdallah, (under Y. You, *Global Dynamics of Damped Boussinesq Equations*), Hasan Husni Al-Najjar, (under B. Curtin, *Tridiagonal Pairs in Representation Theory*), Zhao Chen, (under A. N. V. Rao, *Bayesian and Empirical Bayes Approches to Power Law Process and Microarray Analysis*), Kalpana Mahalingam, (under N. Jonoska, *Involution Codes: With Application To DNA Strand Design*).

And eighteen masters: Aaron A. Anderson, Gokarna Raj Aryal, Sayanti Banerjee, Nathan Nguyen Chau, Elliot Martin Findley, Armando Hoare, Maheshwar Kaladar, Jayasheela Karnala, O'Neil Lynch, Mario Vantroy Marshall, Branko Miladinovic, Inna Petrova Nikolova, Nishant D. Patel, Dmitri Prokhorov, Chad J. Smudde, Elenica Stojanovski, Christopher R. Trent, and Elena Vasileva Valkanova.

And thirty-two bachelors: in Fall, 2003, Lisa Borzewski (cum laude), Nathan Chau (cum laude), Christina Hamlet, Lisa Hughes, Min Jeong, Alexis Johndrow, Erika Johnson (summa cum laude), Bonnie Plesco, Andrew Purcell, Marion Riggs, Jaime Robinson Gray (magna cum laude), Melanie Schlager; in Spring, 2004: Alvaro Blanco, Marie Bosley, Richard Decker, Cheryl Fernandes, June Pak, Wilson Perez, Josue Pierre-Louis, Harold Polhill, Paula Ralph (cum laude), James Reynolds (magna cum laude), Xay Salavong, Leisha Spinosa, and in Summer, 2004: Hashir Ali Ahmed (cum laude), Judi Michelle Charley-Sale, Brian C. Frasier, Alex Jorge Guevara (cum laude), Jessica Simm Halsell, Tanya Anne Jones, E'Leon Rashad Mills, Daryl Lenier Williams.

Transitions

The department is in the process of launching an independent Statistics Institute, housing statisticians

from all over campus to better serve the university community.

One of our new statisticians, **Saralees Nadarajah**, who had received his Ph.D. from the University of Sheffield in 1994, and had worked in England, California and New Zealand before coming to USF, left us last fall. An author of six books and over seventy articles, he is now at the University of Nebraska. We wish him well on his further adventures.

We welcome **George Yanev**, who received a Ph.D. in mathematics from the University of Sophia (Bulgaria) in 1991, and was a Research Fellow at the Bulgarian Academy of Sciences for six years. He got a Ph.D. in mathematics with a statistics concentration from USF in 2001. His research interests include statistical modeling, branching stochastic processes and Bayesian inference. For the past four years he was an Assistant Professor with the Environmental Science, Policy and Geography program at USF St. Petersburg campus. Recently, Dr. Yanev has been working on statistical analysis of Florida Keys coral reef data. He resides in St. Petersburg, enjoys gardening and playing chess with his 12-year old son.

Center for Mathematical Services

The 2004 Summer Program in Mathematics, Computers and Science for Gifted and High Achieving Students ran from June 4 through July 9 with 31 students, who studied mathematics (taught by **M. Manougian** and **K. Pothoven**), as well as environmental science, computer programming, and conflict resolution. The program was funded primarily by student fees of \$600 per student, with additional funding from the Honors College of USF and the College of Arts and Sciences.

This was also the last year the Center was directed by **Ken Pothoven**, who has stepped down after ten years. His successor is **Jogi Ratti**.

Student Clubs

The USF math club consists of the USF Chapter of the Mathematical Association of America (MAA) and the Florida Epsilon Chapter of Pi Mu Epsilon, the national Math Honor Society. They met thirteen times last year, with invited speakers and discussion topics ranging from math education and actuarial sciences to applications of mathematics to cryptography and membrane computing. Pi Mu Epsilon hosted the Fall and Spring Hillsborough County Math Bowls: all 23 High Schools attended the Bowls, each sending four teams of four students each; Plant High was the overall winner.

Eleven new Pi Mu Epsilon members were inducted last Spring, and Osman Amin and Jaime L. Gray, were co-winners of the 2004 Florida Epsilon Chapter Outstanding Scholar Award.

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We'd Like to Hear from YOU!

The Department of Mathematics would like to hear from alumni, friends, collaborators, members of the community, and fellow explorers of and guides to the world of mathematics.

Contact us at: 974-2643, or fax 974-2700. E-mail <mathdept@math.usf.edu>. We have a web-page at <<http://www.math.usf.edu/>>. Snail-mail address is Department of Mathematics, University of South Florida, 4202 E. Fowler Ave., PHY114, Tampa, FL 33620.

The Continuing Crisis

The budget crisis – which may be a bit chronic to call a crisis – continues to constrict the department's operations. There will be no Nagle Lecture again this year, and the Institute for Constructive Mathematics remains dormant. Meanwhile, the Associate Chair is scrambling to find graders for undergraduate courses, and (as usual) many lower division sections are being taught by adjuncts.

USF in general, and the Mathematics Department in particular, can use all the help it can get. Contact the USF Alumni Association or the Department of Mathematics if you have any stray change.