<u>Jonathan Farley</u>

1970-present

Jonathan Farley is a young African-American mathematician who is showing the world that African-Americans are still able to do higher mathematics and make it in the world today. As a young mathematics scholar, Farley has his lifetime ahead of him to contribute greatly to the world of mathematical theory.

Jonathan Farley was born on April 30, 1970 in Rochester, NY to Rawle and Ena Farley. He did not decide to become a mathematics professor until he was fourteen years old. In his tenth grade English class, he had a questionnaire that would help determine their ideal vocation. When he took this questionnaire, it came out as either a mathematician or statistician. He focused on the mathematics part because he thought statistics was boring. Jonathan Farley's parents were both professors. Therefore, he had parental support for pursuing his career choice. He had fun in high school running cross-country and indoor and outdoor track. He was also a DJ in his school's radio station. Farley was a member of the Latin Club as well as Mathletes, the math team. He enjoyed all of his subjects, such as English, social studies, physics, and chemistry.

His father, Rawle Farley, is an economist from Guyana. His mother, Ena Farley, is an historian of African and African-American history from Jamaica. Farley has three brothers. His oldest brother, Anthony, graduated from Harvard Law School. Anthony worked as Assistant U.S. Attorney for the District of Columbia, and he is now a law professor at Boston College. His brother Felipe also graduated from Harvard with a degree in biochemistry. He played semiprofessional basketball in Puerto Rico. He then graduated from Harvard Law School in 1991. He is a patent lawyer in Atlanta, Georgia today. His other brother, Christopher, graduated from Harvard in 1988 as well. He is a senior writer and pop music critic for *Time* magazine. Christopher is also the author of *My Favorite War*, which is a satirical novel. Jonathan Farley also graduated from Harvard University summa cum laude, which is Latin for "with highest honors." He graduated with an A.B. in Mathematics in 1991. He had the second highest g.p.a. in his class. He earned 29 A's and 3 A-'s.

Later, Farley went to the University of Oxford in England on a Marshall Scholarship. While he was there, he won the Senior Mathematical Prize in 1994 for his research, which is Oxford's highest mathematics award. There, he earned his D.Phil. in mathematics in 1995. At Harvard, he won several awards, including the Phi Beta Kappa in 1990, which is one of twelve junior men elected. He also was awarded the John Harvard Scholarship in recognition of academic achievement of the highest distinction. In 1989, he received the Wendell Scholarship, which is awarded to the "most promising" sophomore scholar. In 1988, Farley received the Detur Prize. This is Harvard's oldest prize, which is for an A average in his freshman year.

From 1995-1997, Farley was a Fellow of the Mathematical Sciences Research Institute in Berkeley, California. He also worked with the Black Recruitment and Retention Center, the Pan-African Student Union, the African Students Association, the Caribbean Students Association, the Black Graduate Engineering and Science Students, and Students Against Proposition 209. Farley was a tutor at Berkeley High School, as well. During this time, he also worked with former leaders of the Black Panther Party. Jonathan Farley became an Assistant Professor of Mathematics at Vanderbilt University in Nashville, Tennessee, where he is currently working.

Farley solved a mathematics problem in 1999 that had been posed by a famous professor at MIT. This problem had been unsolved for 24 years. He solved another mathematics problem in 1998 that had been posed by a famous mathematician. This particular problem had been unsolved for 34 years. Farley studied many areas of mathematics while at Harvard and Oxford. However, he contributes his main training to become a mathematician to independent research he conducted, supervised by his advisor, Dr. H. A. Priestley.

Farley is interested in African history, politics, and philosophy, in addition to mathematics. Two of his heroes are Dr. Huey P. Newton, co-founder of the Black Panther Party, and Frantz Fanon, author of *The Wretched of the Earth*. Farley enjoys going to movies, reading books, watching plays and performances of dance troupes, writing for a weekly publication in Nashville called the *Urban Flavor*, and spending time with friends at clubs and cafes in his spare time.

Farley has written many articles for different magazines pertaining to many different topics. His topics range from heroes and icons of the century to topics such as getting straight A's in college and getting into the college of your choice and the Black Panther Party. He was named a "Leader of the Future" in the January 2001 issue of *Ebony* magazine.[1] Farley is one of only four people in the United States to obtain a 2001-2002 Fulbright Distinguished Scholar Award to the United Kingdom. Therefore, he will be conducting research at the University of Oxford for a year.[2] Dr. Farley is a rising icon of the 21st century.

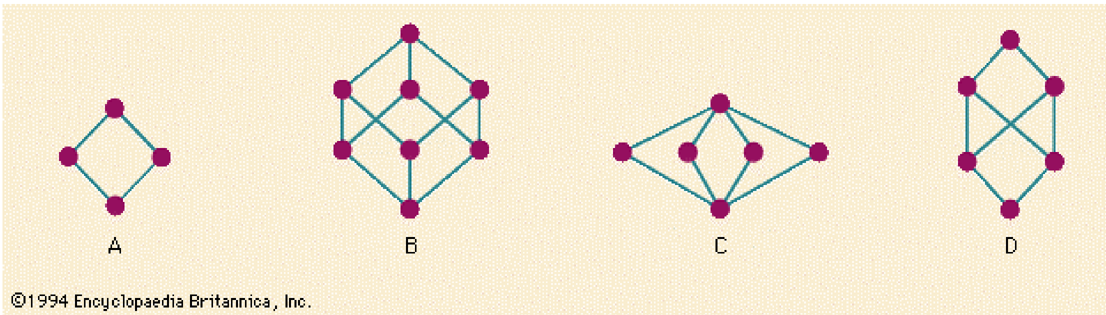
Jonathan Farley's area of research is lattice theory. Lattice Theory is a branch of Abstract Algebra. Lattice Theory also deals with partially ordered sets. First of all, a partially ordered set is a set P with a binary relation, which is denoted as $\leq$. This is reflexive, which means that $p \leq p \ \forall \ p \in P$. Also, it is transitive, which means if $p \leq q$ and $q \leq r$, then $p \leq r$. This is anti-symmetric, which means if $p \leq q$ and $q \leq p$, then $p = q$. An example of a partially ordered set is the natural numbers with the usual meaning of $\leq$. The power set lattice is the set of all subsets of a set with $\leq$ meaning, "is a subset of" is a partially ordered set. A lattice is a partially ordered set such that any two elements x and y have a least upper bound and a greatest lower bound. The least upper bound is saying there is a smallest element that is bigger than x and y. The greatest lower bound is saying there is a biggest element smaller than both x and y.[3]

According to some definitions of lattice theory, it is the branch of mathematics that deals in precise mathematical language with the relation of different parts of a same whole to each other. The basic concept is that one part, which we will call x, either includes or contains another part, which we will call y. This relation can be written symbolically as x greater than or equal to y. Lattice Theory looks at and analyzes

[1] Email correspondence with Jonathan Farley.
[2] http://atlas.math.vanderbilt.edu/~farley/

families of subsets X, Y, … of a given set U under the operation of intersection of sets. This is similar to the way group theory looks at families of symmetry transformations of alpha, beta, … when combined by taking their composite.[4]

Below are some examples of lattices and non-lattices.



Notice that 5a is the lattice of all subsets of a set of two elements, while 5b is a lattice of all subsets of a set of three elements. We see that 5c is the lattice of all subgroups of the group G of all six symmetries of an equilateral triangle. The bottom element represents the trivial subgroup, which consists of the group identity. The first three elements above it are the subgroups generated by the reflections in the three altitudes. The fourth element is a subgroup of rotations of the triangle into itself. The top element is G. Therefore, 5d is not a lattice because the two elements immediately above the bottom element do not have a least upper bound.

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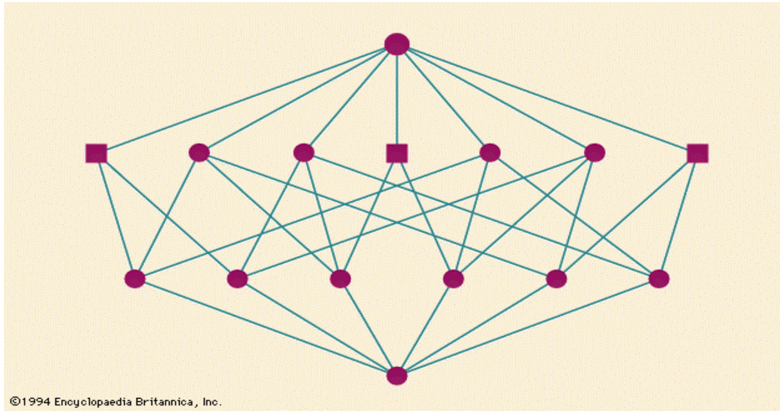
[3] Email correspondence with Jonathan Farley
[4] http://www.britannic.com/eb/article?eu=120646



The picture above represents the partition lattice called Π_4 of all partitions of a set of four elements, which means that by a partition of a set is meant a division of its elements into subsets that do not overlap. The square elements represent the three partitions of the set {a, b, c, d} into two subsets. The two subsets contain two elements. The three partitions are (ab)(cd), (ac)(bd),and (ad)(bc). The circle elements on the same level are representing the four partitions which are (123)(4), (124)(3), (134)(2), and (234)(1), into two subsets. One of the subsets contains three elements and the other subset contains one element.[5]

Therefore, Jonathan Farley has proven himself to be a great mathematician despite his youth. His contributions are found to be helpful in cryptography. He has already made many advances in the study of lattice theory, and he will continue to do so as he furthers his studies of the chosen topic. Jonathan Farley will grow as an icon of the 21st century.

[5] http://www.britannica.com/eb/article?eu=120646&tocid=76871

References:

1. http://atlas.math.vanderbilt.edu/~farley/

2. http://www.britannica.com/eb/article?eu=120646

3. http://www.britannica.com/eb/article?eu=120646&tocid=76871

4. Email from Jonathan Farley

Opinion of References:

1. http://atlas.math.vanderbilt.edu/~farley/ This was a good resource, but there was very little information on his mathematics.

2. http://www.britannica.com/eb/article?eu=120646 This was helpful in giving definitions.

3. http://www.britannica.com/eb/article?eu=120646&tocid=76871 This was helpful in giving examples of lattices and non-lattices.

4. Email from Jonathan Farley This was the most helpful. He gave information on his life and background that we could not find anywhere else. He also gave us some definitions of lattices and terms that are associated with lattices.

5. http://www.math.hawaii.edu/~ralph/LatDraw/ This was helpful in letting us see what a lattice was. It also let us rotate the lattice and see its strong attractive forces, its repulsive forces, and its balanced forces.

6. http://www.math.hawaii.edu/LatThy/comb-probs.html This gave us no new information.

7. http://www.math.buffalo.edu/mad/PEEPS/farley_jonathan.html This gave us the same information that we already had.